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THE AUGSBURG WEB PRINTING PRESS.

We gave a brief account about a month ago of the celebrated Walter press, two of which machines are now in operation in the establishment of the New York *Times*. The apparatus illustrated in the present engraving is a modification of the Walter invention, and is manufactured by a German house, the *Maschinenfabrik Augsburg*. The principal point of difference between this press and its English prototype is that the paper is taken from the under side of the web instead of the top, and is carried to the lower cylinders first instead of passing to the upper portion of the machine and thence down. This enables the whole printing part of the press to be kept lower, and consequently a somewhat different position is given to the distributing apparatus for the lower cylinder. The speed of the machine is about the same as that of the Walter, namely, 12,000 sheets per hour, though we are informed that, in the New York *Times* office, that of the latter has been increased to 17,000 sheets. The size of sheet is 20·67 by 30·31 inches, and of the type forms, 19·09 by 28·54 inches.

According to *Engineering*, from which journal we extract our engraving, the action of the Augsburg machine is very simple. The paper first passes through damping rollers, which can be arranged to give it any required degree of wetness; and then it makes its way, through rollers which are adjustable to regulate its tension, to the first type cylinder. The two type cylinders and the two impression cylinders lie in the same vertical plane. Their position is seen in the illustration, the lowest and highest cylinders being the type cylinders and the two middle ones the impression cylinders.

The paper is printed from stereotypes cast in semicircular molds so as to fit round the type cylinders. This method is adopted in all web printing machines, and by using it the founts of type may last twenty years instead of two, while the actual printing is quite as clear and good as if it were done from the type direct. The paper first passes between the lowest pair of cylinders, and is there printed on the first side. It is carried upward and backward by the revolution of the lower impression cylinder, and passed from it forward again over the upper impression cylinder; and in passing between the latter and the upper type cylinder, it is printed on the second side. As these four cylinders are all exactly of the same diameter, and are placed close together, the printing on the second side must coincide exactly in its position on the sheet of paper with that on the first. The printing operation being now completed, the paper passes horizontally forward to the cutting cylinders. These are placed at the same level as the upper type and impression cylinders, and are necessarily of the same diameter, that diameter being such that their circumference is exactly equal to the length of the sheet which is to form one copy of the newspaper. On one of the rollers is an ingeniously arranged cutter, and on the other, at a corresponding point, a kind of groove or seat for the projecting knife. As the paper on leaving the cutting cylinder is not led upwards at a steep angle as in the Walter press, it is not necessary to leave a small width on each side uncut, but the sheet is cut right across. The tapes, it will be seen, slope slightly upwards from the cutters in order to give sufficient hight for the delivery apparatus. By an ingenious adjustment of their speed, the speed of each sheet is accelerated as it rises; so that by the time it reaches the delivery roller, there is a distance of several inches between it and the one next behind it. The delivery takes place downwards, and alternately to right and left on to the tables shown in the engraving, and the space between the sheets is necessary in order to allow time for the oscillation of the delivery frame. The apparatus for distributing the ink is very complete; that for the lower type cylinder will be seen behind and below it, and that for the upper type cylinder behind and above it. Just outside the frame which carries the cutting cylinders, there is an index, not shown in the illustration, which marks the number of copies printed as they are cut off. There are many interesting and ingenious details about the machine, but they are unfortunately of a nature which cannot well be made intelligible without the aid of detail drawings.

The Augsburg press was recently exhibited in the Vienna show, in company with two other types of web machines, the Victory and the Marinoni. The former is a folding as well as printing apparatus, and the latter has its special feature in a "divider" by the aid of which the sheets, after they are printed, are sent in four different directions.

Engineering states that since 1869 the London *Times* has been entirely printed from web paper, with a saving in working cost so great that the capital sunk in the displaced machinery was recouped in less than two years. The general catalogue of the Vienna exhibition, as well as several of the special catalogues, were printed on the Walter press in the office of the last named newspaper, and are noticeable, we believe, as being the first books printed from continuous paper.

The Walter press derives its name from Mr. Walter, M.P., the proprietor (the credit of its invention and construction being due to the manager and engineer) of the *Times*.

Small Swift Steam Propellers.

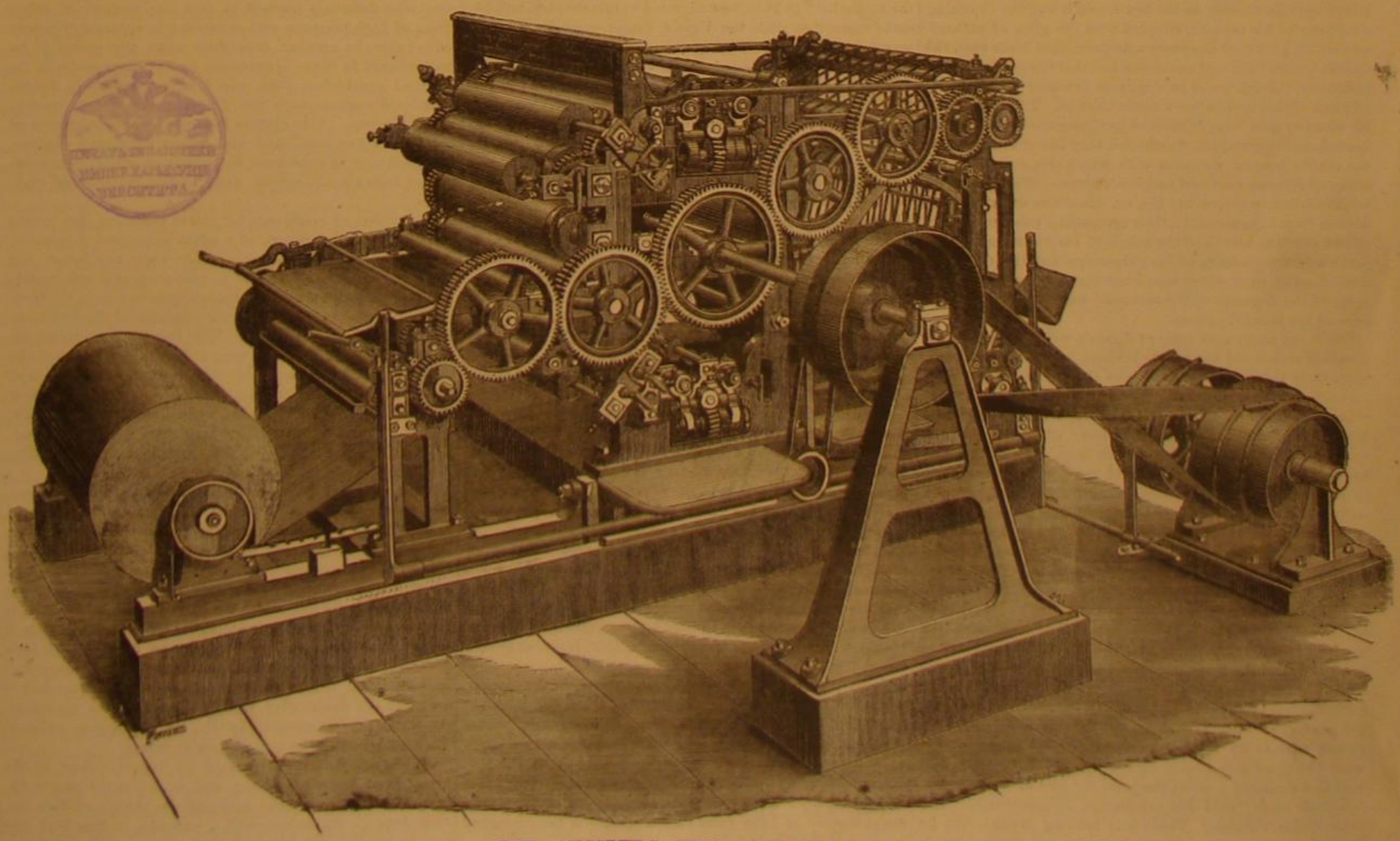
In our issue of July 6, 1872, there appeared a letter from Mr. A. Gray, of Burlington, Iowa, describing a small steam propeller built by him for the Chicago, Burlington, and Quincy Railroad, and used to cross the Mississippi river between the above named town and the stock yards of the company. The boat, named the Robert Harris, is fifty feet long, of 7 feet beam, and draws about 30 inches aft and 1 foot forward. She has a locomotive boiler 11 feet long, with fire box 2½ feet by 3½ feet, with 27 two inch flues 7 feet long.

There are two direct-acting vertical engine cylinders, 5 inches bore and 10 inches stroke. The screw is forward of the rudder, and is 4 feet in diameter and has a quarter pitch. The engines are fitted with circular slide valves.

At the outset it was found that the vessel would run a full mile with three shovelsful of coal, and that, with 55 lbs. of steam and 104 revolutions, carrying 16 passengers, she crossed the river, a distance of ⅝ mile, in 7 minutes; and returning, with 90 lbs. of steam and 140 revolutions, she made the same distance in 3½ minutes.

Mr. Gray has recently favored us with a second letter, in in which he says that the above details, as published in our columns, brought him letters of inquiry from all parts of the civilized world, and even from such out-of-the-way localities as China, and Finland, on the northwestern border of Russia. He informs us that the boat has been running nearly every day during the past two seasons, and was most severely tested in stormy weather, besides encountering stone heaps, log piles, sand bars, and all the obstructions to be found in shallow water.

A few days ago, a formal examination of the engines was made. Not a moment's time has been lost, or a dime spent for repairs, since this boat came out in the spring of 1872; nor have the steam chests been opened. The valves proved to be as tight as when first fitted, not the slightest sign of "blow," or wear, being perceptible. The tool marks were yet visible, and they were not even scoured bright. The engines made 133 revolutions to the minute, with 80 lbs. of steam, which constantly rose while they were in motion, with a 4 foot propeller one third out of water, which makes her uniform speed about 15 miles an hour down, and 10 to 12 up, stream. She has passed every boat that competed with her. The river has been repeatedly crossed with 8 to 12 lbs. of steam, showing a remarkable contrast, in economy of fuel and steam, with a much smaller boat formerly used, having engines built from the same patterns.



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Contents:

(Illustrated articles are marked with an asterisk.)

LOUIS AGASSIZ.

Professor Agassiz is dead. Suddenly, unexpectedly, and apparently in the full vigor of his physical and mental power, the great master has been stricken down in the very midst of his labors, leaving to other hands the completion of his manifold enterprises, to other minds the development of the grand works to which his days have been so earnestly, so purely, devoted. Grief, sincere and deep, will everywhere greet these saddest of tidings, for the loss is not to the country but to the world; and wherever civilization extends her sway, there will his mourners be found.

It is but a melancholy duty of the journalist to pen the brief lines which constitute the last tribute to the memory of one distinguished in any walk of life, from whose lips and to whose actions the people have learned to look for counsel as from the oracles of old, or to indite the curt sentences which imprint *finis* on the work of which death has forbidden the continuance. Doubly sad is the task which now devolves upon us, in thus recording that the voice which so often, through these pages, has imparted to the world the great efforts of a master genius is for ever hushed, and that the indefatigable student and wise teacher, whose achievements have added so brilliant a luster to the works of American Science, is now but a thing of the memory, a reminiscence to be cherished, but buried in the irrevocable past.

We leave to others, who have been his immediate colaborers in the cause of education, the detailing the chronicle of his private life. To the outside world, however, we may justly say that it seemed as if he were every one's immediate friend; his personality was of that magnetic order which appeals directly to the heart, and it was the charming simplicity of his manner, coupled with the glow of enthusiasm which pervaded his every utterance, that made even the dullest units of his vast audiences feel that the subject under treatment, though never so dry, was invested with new attributes of rare and before unseen interest. It mattered little whether men were capable of grasping the thread of his consummate arguments, or whether they failed to appreciate the single hearted devotion with which he embraced the study of Science for itself and itself alone. When their intellects failed to respond to his, or, conscious of inferiority, shrank from the encounter, their sympathies were irresistibly drawn towards him; and the magic of his voice his winning smile and the sincerity of his purpose gained the trust and confidence of even those who condemned his opinions and opposed the donation of the necessary means for the furtherance of his favored projects.

There are many anecdotes of Agassiz which just now are invested with a sad but timely interest, and which, perhaps, more truly indicate the character of the man than the most carefully worded eulogy which we might produce. It was this overflowing cordiality of his nature which gained him his object even above the most stubborn of opposition, and to his qualities of heart, probably as largely as to those of brain, did he owe the completion of many of his most cherished schemes. His Cambridge Museum was built by private subscription, and his celebrated voyage up the Amazon was carried out through the munificence of a Boston millionaire. Did he need a State appropriation, he fairly charmed it out of the stingiest of legislatures; and indeed a Massachusetts law maker at one time opposed his being allowed to press his request in person, for the reason, as stated, that no opposition could stand before him. Penikese, with the princely sum accompanying, was the gift of one unskilled in Sciences. And the few enthusiastic *extempore* speeches made by him in San Francisco, after the Hassler voyage, brought forth the unexampled donation of Mr. James Lick, and gave Science on the Pacific coast an inestimable assistance. He gained friends by thousands simply by his smile. "We want you to come and beam upon us, that is all," said a friend who had arranged a social reception for him in Washington. "Agassiz came," said his entertainer, subsequently, "and merely shook hands. There was nothing formal, but he beamed on everybody with such a pleasant smile that it seemed as if he were diffusing happiness through the whole company." And yet, with all his success in the cause of education, it is even the more remarkable that he persistently refused to use his efforts for his private ends. "You would make any amount of money in the business," urged a wealthy capitalist who was desirous of securing Agassiz as a partner, and using his great technical knowledge for commercial enterprises. "I have no time to make money," replied the Professor. Similar to this was his answer to a publisher, who pressed him to write text books for schools. "I wrote them," said he, and his eyes sparkled with indignation, "that I was not the man to do this sort of work. And I told them, too, that the less of this work was done, the better. It is not school books that we want, but students. The book of Nature is always open. All that I can say or write shall be to make them study that book, and not pin their faith to any other." These were not the only brilliant offers, pointing to almost unlimited wealth, which he rejected, while his salary was only $1,500 a year. One more story and we pass to a brief review of his life. Agassiz detested "Science falsely so called" most cordially; and if in anything he manifested impatience or became actually incensed, it was when theories or ideas which he believed false or deceptive were submitted to his examination. In such cases, indeed, his wrath became mighty. It is related that some friends once invited him to a spiritualist exhibition to make a scientific investigation of the alleged manifestations. He turned his back upon them and motioned them to the open door in almost speechless rage, nor did he return to the subject except to express surprise at the insult which he considered had been offered him.

Louis John Rudolph Agassiz was born in Motiers, Switzerland, on May 28, 1807, his father and indeed his ancestors for six generations back being clergymen. Originally beginning the study of medicine, he entered the medical school at Zurich, thence he went to Heidelberg, and finally, at the age of twenty, began a course at the University of Munich. Here he commenced his studies in embryology, and received instructions from Wagler, Oken and Martins, and issued his first publications in the shape of brief treatises on special subjects. Subsequently becoming deeply interested in a work that he was selected to perform, namely, the classification of a variety of fishes, brought back by a Brazil exploring expedition, Agassiz gave up the practice of medicine, though not until after he had obtained his doctorate both in that art and in philosophy. His course, during the following years, was upward; for becoming a favored pupil of the great Cuvier and enjoying the association of such men as Owen, Milne-Edwards, and others of equal eminence, he laid the basis for his establishment of fossil ichthyology, and its translation to a cognate from a hitherto unknown science. Aided by Baron Von Humboldt, he was enabled to publish his great work, in which about 1,000 species are fully described and 700 more partially so, and thus to firmly establish his fame as a naturalist. Then came the enunciation of his glacial theory, the assertion of the existence of a vast sheet of ice which overspread existing continents, leaving its tracks behind. The view has been vehemently opposed, but it has triumphed, and is now an accepted scientific fact. Numerous other works were published by Agassiz in Europe, to which we need not stop to allude, except perhaps to say that they are standard volumes of reference, and invaluable to the naturalist. In 1846, he emigrated to this country, and became connected with the United States coast survey. It was not long, however, before he recognized the position of the United States in the scientific world. He saw that as a nation, we were far in the rear, and that, although in point of fertility of inventive genius, we were unsurpassed, yet Science for itself met with no fostering, and that we were content to depend upon the efforts of the learned men of the old world. Original thought was comparatively absent, and original research unknown to the masses. Seeing the need, he at once devoted his energies to its fulfilment. Accepting the chair of zöology and geology in Harvard College, he began the endeavors which have culminated in the establishment of the Cambridge museum (the most extensive of its kind in the world) and the education of scores of able and learned students of natural science. Of the more recent labors in which Professor Agassiz has been engaged, it is hardly necessary for us particularly to speak. Important expeditions have been made by him, years ago to Lake Superior, and Florida Reefs, and more lately up the Amazon and around Cape Horn.

As an opponent of the Darwinian theory, Agassiz has of late been drawn into the immediate attention of the entire world. His last writings were upon this subject; and in the *Atlantic Monthly* for January, we find an exhaustive and brilliant paper, beginning a series, in the course of which the writer designed to go over his entire ground, and clearly explain the arguments supporting his position. In his concluding lines he says: "The more I look at the great complex of the animal world, the more sure do I feel that we have not yet reached its hidden meaning, and the more do I regret that the young and ardent spirits of our day give themselves to speculation rather than to close and accurate investigation. I hope in future articles to show, first, that, however broken the geological record may be, there is a complete sequence in many parts of it, from which the character of the succession may be ascertained; secondly, that since the most exquisitely delicate structures, as well as embryonic phases of the most perishable nature, have been preserved from very early deposits, we have no right to infer the disappearance of types because their absence disproves some favorite theory; and lastly, that there is no evidence of a direct descent of later from earlier species in the geological succession of animals."

The place of a precentor, of an instructor whose grasp of the subjects of which he taught extended to their minutest ramifications, left by Agassiz, it will indeed be difficult to fill; and the cause of scientific education has sustained a bereavement, the magnitude of which time alone will suffer us to realize. The example of the master is, however, immortal, his renown is part of the history of his adopted country; and posterity, in striving to emulate the one, will have before it a constant beacon pointing to the attainment of the proud rewards of the other.

LOOK TO YOUR STOVES.

The noxious effects of carbonic acid and carbonic oxide gas were recently illustrated, in an alarming manner, at Oakland, Pa., at a school near the Susquehanna depot. The chool had been in session about two hours in the morning, when, to the astonishment of the teacher, one of her smaller pupils fell to the floor, apparently in a swoon; very soon three or four others were in a similar condition; then the number quickly increased to a dozen, all thrown down and unconscious. The teacher, greatly alarmed, dismissed the school, but only a portion of the scholars were able to move from their seats. The windows and doors were thrown open and assistance summoned. The teacher, with the aid of older scholars, dragged out the unconscious ones. A physician came; and after long effort, all were restored to consciousness and recovered, except a few who are still suffering.

It appeared, on examination, that the smoke pipe had been jammed too far into the chimney, causing a stoppage of the draft of the stove, throwing all the deadly gases of combustion into the school room. The escape of the children as well as they did is matter for congratulation.

The gases of combustion, chiefly carbonic oxide and carbonic acid, are, when taken into the lungs in comparatively small quantities, dangerous to life. One one-hundredth part of carbonic oxide gas in a given volume of air renders such air noxious.

Carbonic acid gas is not quite so bad. It may be taken into the stomach without injury. Soda water, as everybody knows, is water charged with carbonic acid gas. But when the gas is taken into the lungs, even in small quantities, its effects are injurious. One of the great causes of ill health is the accumulation and breathing of the deadly carbonic acid gas in the dwellings and apartments in which people live. Too little attention is paid to ventilation. Every one hundred volumes of air discharged from the lungs contain four volumes of carbonic acid gas. Now if air containing one two hundredth part of the gas is breathed, headache and languor are soon produced. Air that has been once breathed is therefore highly dangerous. The average amount of the gas thrown out by every person is seven cubic feet per hour. A single six foot gas light in a room gives off as much carbonic acid gas as a person in breathing.

THE REPORT OF THE CHIEF ENGINEER OF THE NAVY

Chief Engineer W. W. W. Wood, United States Navy, in charge of the Bureau of Steam Engineering, submits an annual report which contains a large amount of interesting and valuable information. Among other topics discussed, we note opinions upon compound engines, which may be taken as the result of a series of careful experiments and comparisons made by a board of prominent officers. The conclusion definitely reached is that the method of using steam of high pressure and expanding in separate cylinders (one or more in number, depending upon the power to be transmitted) is more economical and advantageous in its practical application than the former method, in simple cylindered engines, with the pressures heretofore used in such cylinders. This opinion is based upon comparisons of some forty non-compound and fifteen compound engines, though it may be considered as merely an official corroboration of facts already agreed upon by the majority of engineers.

The subject of machinery for steam vessels of war is next discussed, and the report of a board appointed to examine designs is embodied. Commenting upon the latter, the Chief of the Bureau says that no plan presented was considered as a whole superior to those emanating from the Government engineers, and hence the designs of the last mentioned officers were adopted. The following contracts for construction were awarded, work to be completed six months from their date: Atlantic Works, Boston, two engines of 800 H. P., cost $175,000 and $163,000. James Murphy, New York, one pair, 175,000. John Roach, New York, one pair, 560 H. P., for $120,000. Woodruff Iron Works, Hartford, one pair, 800 H. P., for $175,000, and Wm. Wright & Co., Newburgh, one pair, 800 H. P., for $175,000.

With reference to the internal corrosion of naval boilers, the report states that, by a careful analysis made at the Naval Laboratory in New York, this difficulty in vessels using surface condensers is found to be caused by oleate of copper, formed in the condenser, from which it passes to the boiler, where it is slowly transformed into oleate of iron, deriving the iron from the different parts of the boiler with which it comes in contact and precipitating its copper. The oleate of copper adhering to the iron under the condition of high pressures and temperatures, the deposition of copper and the absorption of iron begins. As a preventive, a method of arresting the destructive agents formed in the condenser, through a process patented by Mr. W. C. Selden of New York, is spoken of in quite favorable terms.

The most interesting part of the report relates to the question of screw propellers, and embodies the results obtained in certain changes made in the screws of vessels—from four to two blades—with a view of rendering such vessels more efficient while under sail alone. With equal propelling surfaces, it has been determined that no advantage

whatever can be derived from using a screw of two blades, instead of four, when sailing; because, when screws are uncoupled and revolving freely, those of four blades oppose no greater resistance to the vessel than those of two. When fixed and held stationary, in a vertical position behind the stern post, the loss of speed due to the resistance of the screw, expressed in percentage of speed, has been shown by careful experiment to be 18·29 per cent; while the four or two bladed screw, revolving freely by the pressure of the water, gives a resistance of only 9·96 per cent, being nearly two to one in favor of the revolving screw. The four bladed screw also produces less vibration in a ship than one of three, and the latter less than one of two blades. The propelling efficiency of a screw is entirely independent of the number of its blades, but is wholly dependent upon the area, the pitch, the fraction of the pitch used, and the area of the circle described by the blades.

To diminish the shocks and vibration, more or less incidental to the use of the screw propeller, the largest amount of clearance admissible for the screw between the stern and rudder post should be given. It is obvious, then, says the report before us, that a post, intended for a screw, the area of which is contained in four blades having the same surface, pitch, and fraction of pitch, for that screw must be just double the length of the former in the line of its axis. Consequently, the two bladed screws, which were substituted for those of four blades, were necessarily constructed of less propelling area, as the post openings of the vessels could not be enlarged: hence the inefficiency of the screws as reported.

THE MANUFACTURE OF EARTHENWARE.

The potter's art has long furnished Great Britainand other European countries with most important branches of commerce. It was first introduced into England by two foreigners, at a place called Bradawoods, which is now Longport, situated about two miles from Burslem, Staffordshire. These two men commenced in a small way and kept themselves very secluded. The ware which they made was of quality very inferior to that of the present day; the business was only in its infancy, and the only mode of glazing the ware was by simply throwing salt into the saggars or vessels in which the crockery was baked. It was reserved for the famous and ever noted Josiah Wedgewood to be the pioneer in introducing new glazes and bodies, and to improve and bring to perfection the manufacture of earthenware. This was during the commencement of the eighteenth century. He it was who laid the foundation of the famous Staffordshire potteries, which now extend some ten or twelve miles in length and two or three miles in width. The district contains the towns of Tunstall, Burslem, Longport, Dalehall, Hanley, Stoke upon Trent, Fenton, and Longton. The potteries are right amidst the clays that are used in the manufacture. The same clays are also found in abundance in Derbyshire, which is the next county, but the most important and valuable clay is found in Cornwall. It is called china clay, and is purely white. This clay is not found anywhere else in the United Kingdom. Another valuable acquisition to the potteries is the valuable coal beds which abound in North Staffordshire, and furnish very important material in the manufature of earthenware.

The clay is generally weathered for one or two years before being used, that is, it is exposed to the effects of the atmosphere, to make it of a better color and more pliable. After which, certain quantities of each kind are weighed out, put in large vats, and worked together until they are thoroughly mixed, and become of the consistency of thick milk. Other ingredients are then mixed with these clays. They are china clay, felspar, and a few other materials to give body and consistence to the ware. After the whole has been ground and mixed up together, it is put in a large press (a new invention which has been patented); and by means of heat, the materials become more solid, are pressed into large blocks, and are ready to be used. An earthenware manufactory is arranged in such a manner that each branch is kept separate to itself.

In making a water pitcher, for instance, the body of the pitcher is made in two equal parts, and the handle is made separately. The presser, as he is called, takes sufficient clay for the molds he is going to use; the mold is made of plaster of Paris. When both halves of the mold are filled, he puts them together, and straps them tightly; he then finishes the inside of the pitcher, by smoothing it by means of a wet sponge, to fill up the seams. He then takes off the strap, and places the mold with its contents in a small room which is kept at a high temperature. This is done to harden the clay, and evaporate the water. After being in a few hours, the clay appears white; and the mold is taken out and opened. The pitcher is then finished off and the handle is put on. This being done, it is ready for what is called the biscuit oven, where it undergoes its first baking. A similar process is gone through in making dishes, plates, cups and saucers, and other articles, except that the molds are of different shape. The ovens, or kilns as they are called, are built of brick and are of a conical shape, something like a sugar loaf.

After the ware is finished, it is placed in what are called saggars, vessels made of clay and baked before using; sand is sprinkled in these saggars and round the ware to prevent the whole from sticking together. When placed in the oven, it is exposed to a very severe heat for forty-eight hours; the fires are then allowed to go down and the ware to cool gradually. The oven and the ware are still very warm; and the men employed to take the pottery from the oven have to wear flannel over their hands and bodies to protect themselves from being scorched. They cannot remain many minutes at a time in the oven. The ware is then carried to what is called the biscuit warehouse, where it is sorted over by women and girls. In this state, it is called biscuit and is of a porous nature. The position of fireman of the biscuit oven is a very important post, and it requires a man of great experience and skill. If the ware be not fired or baked up to a certain point, it is very apt to craze, a phrase used amongst manufacturers to imply that it is liable to have those small cracks upon it which are sometimes seen upon earthenware or crockery. After being sorted over, it is prepared to go through a second firing.

The printing is done upon the biscuit ware before it receives the glaze. But figured earthenware has been largely superseded in this country by what is called white granite or white ironstone china, which is clear white. It looks much cleaner than the printed goods, and is much more easily matched. The ware, having been examined in the biscuit warehouse, is then taken to the dipping house. The dipping is a noxious process, owing to the white lead that is used in the glaze, in which the articles are dipped. The glaze is composed of borax, lead, flint, soda and other materials, which are ground together in a liquid state and put in large tubs, into which the ware is plunged and afterwards put on racks to dry. After this process, the ware is ready for the gloss oven, to give it the finishing touch. It is placed in saggars, the same as in the biscuit oven, some round and some oval, according to the size and description of the ware; but instead of sand being put in, the flat pieces, such as dishes, plates, saucers, etc., are kept separate by what are called cockspurs, small three pointed articles, made of clay and put between the wares. One may often see the marks of these cockspurs on the back of the ware. The time of firing the ware in the gloss oven is twenty-four hours, just half the time used in the biscuit oven. When the ware is drawn out of the gloss oven, it is taken to the gloss warehouse, where it is sorted over, and all the chipped, cracked, or damaged ware is put on one side. The good ware is packed in crates or casks by experienced packers, and shipped to its destination.

The importation of earthenware to the United States has been gradually increasing for many years. There were a few manufactories, established in this country, previous to the late war; and since its close many more have been started, and are doing a large business.

The duty upon earthenware is 40 per cent *ad valorem*; the freights are also high; and during the past year, the price of earthenware has been raised some 25 per cent in Staffordshire, owing to the high price of coal, labor, and materials, which have increased very much during the past two years. From these causes the importation has been much less in former years; and thus has been the means of giving more employment to the manufacturers on this side. There is no doubt but that all the materials used in the manufacture of both earthenware and china can be found in the United States; although many of our manufacturers are importing the china clay they use from Cornwall, at a great expense. This clay can be superseded by one which is found in large quantities in Alabama, and is being introduced generally. Missouri abounds with all the materials that are used in the manufacture of earthenware, and also is well supplied with extensive coal beds. There are also large earthenware manufactories at Trenton, N. J., East Liverpool and Cincinnati, Ohio, Geddes, N. Y., and St. Louis, Mo.

Considerable improvements have been made in the bodies and glazes of the ware during the past two years, and there are indications that this valuable business is firmly established in this country. Many gentlemen once connected with the manufacture of this class of ware in the Staffordshire potteries are now superintending works on this side, and there are several manufactories to be erected at different points during the coming year.

NOTE RELATIVE TO THE ESTIMATION OF THE COMMERCIAL VALUE OF COALS CONTAINING LARGE QUANTITIES OF ASH.

BY PROFESSOR R. H. THURSTON.

A question has lately been presented, involving the determination of the effects of an excessive amount of ash in modifying the commercial value of anthracite coal. The method of determination adopted will probably be of interest, since there is at present no generally accepted and standard method in use among engineers.

The value of a coal depends upon many circumstances. The proportions of uncombined carbon and hydrogen, the form in which hydrocarbons are contained in the fuel, the physical characteristics of the coal, and the chemical constitution and the percentage of the ash, all affect its market value. In individual cases, also, the form of heating or other apparatus in which the coal is burned influences the relative value of fuels equally good in other respects, one steam boiler, for example, being well adapted for anthracite, and another for bituminous coal.

Where the difference between two coals lies principally in their relative percentages of ash, the comparison is easily made.

The anthracites contain so little other combustible matter that, as shown by Professor Johnson,* their calorific value is proportional to the percentage of contained carbon, very nearly. Their commercial value is somewhat different.

The depreciation produced by presence of non-combustible matter occurs in the following ways:

First. A certain amount of carbon is required to heat the whole mass to the temperatnre of the furnace, of which a large part is lost. It follows, therefore, that a coal containing a certain small quantity of combustible would have no calorific value, and, consequently, would be worthless in the market.

Second. The presence of a high percentage of ash in a fuel checks combustion by its mechanical mixture with the combustible portion of the coal. A coal will, hence, have no commercial value when the proportion of refuse reaches a limit at which combustion becomes impossible in consequence of this action.

Third. The cost of transportation of ash being as great as that of transporting the combustible, the consumer paying for ash at the same rate as for the carbon, and also being compelled to go to additional expense for the removal of ash, these facts would also determine a limit beyond which an increased proportion of ash would render the fuel value less.

Fourth. The determination of the financial losses due to increased wear and tear of furnaces and boilers, of incidental losses due to inequality or insufficiency of heat supply, and to the many other direct and indirect charges to be made against a poor fuel, will also indicate a limit which will have a different value for each case; but which will, in most cases, be difficult of even approximate determination.

The determination of the minimum proportion of combustible, under the first case, is thus made, assuming this heat to be entirely wasted.

The specific heat of ash is usually nearly 0·20. Let X represent the percentage of ash which is sufficient to render the coal valueless. Then, since each pound of carbon has a heating power of 14,500 thermal units: $14{,}500(100 - X) = A$, represents the available heat of a unit in weight of the fuel.

$100 \times 0{\cdot}20 \times 3{,}000^\circ = B$: represents the heat required to raise this same amount of coal to a temperature equal to that of the furnace, which is here assumed at 3,000° above the surrounding atmosphere.

Since these quantities, A and B, are equal: $14{,}500\,(100 - X) = 100 \times 0{\cdot}2 \times 3{,}000^\circ$, and $X = 96$ per cent.

The minimum quantity of fuel permissible is, therefore, four per cent, where the first consideration only is taken into the account.

The influence of the second is at present indeterminable in the absence of experiment.

The cost of transportation of ash to the consumer, as a part of the fuel, has no bearing in the determination of its value to him. The removal of ash is a tax upon the consumer which may be considered as the equivalent of the loss of a certain weight of combustible received. Since this cost fluctuates with the market value of coal, and since its amount is determined by the same causes, it is easy to make the statement in that form.

This cost is about ten per cent of the value of coal, weight for weight, and is therefore assumed at ten per cent of the proportion of ash found in the coal.

The losses, direct and indirect, coming under the fourth head, vary greatly and are sometimes very serious. An approximate estimate for an average example is taken, and is considered to be equal, at least, to a percentage of the total value of coal, in utilizable carbon, which equals one half the percentage of ash.

Comparing two anthracites, which we will suppose to contain, respectively, fifteen and twenty-five per cent ash, eighty-five and seventy-five per cent carbon, the first being a well known standard coal, selling in the market at six dollars per tun, we may, using this system of charging losses against equivalent values in combustible carbon, determine the proper commercial value of the second kind.

FIRST EXAMPLE.—From the 85 per cent carbon:

Deduct for heating to furnace temperature	0·040
" " transportation of refuse, 10 per cent of 15	0·015
" " other losses, 50 per cent of 15	0·075
Total	0·130

Leaving available and valuable carbon 85 — 13 = 72 per cent.

SECOND EXAMPLE.—From the 75 per cent carbon:

Deduct for heating to furnace temperature	0·040
" " removal of ash, 10 per cent of 25	0·025
" " sundry losses, 50 per cent of 25	0·125
Total	0·190

Leaving valuable available carbon 75 — 19 = 56 per cent.

Finally, if $6.00 is paid for 72 per cent available combustible, for 56 per cent we should pay $\frac{56 \times 6}{72} = \$4.66\frac{2}{3}$.

Taking a third example, in which the fuel contains the unexceptionally large proportion of 30 per cent ash, we should, by similar method, proceed as follows, deducting from the seventy per cent carbon, as before, the estimated charges against it.

THIRD EXAMPLE:

Deduct for heating	0·040
" " removal of ash, 10 per cent of 30	0·030
" " sundry expenses, 50 per cent of 30	0·150
Total	0·220

Leaving available carbon, 70 — 22 = 48 per cent, which would be worth $\frac{48 \times 6}{72} = \$4.00$.

Had the first coal had a market value of seven dollars per tun, the second and third would have been worth, respectively, $\$5.44\frac{4}{9}$ and $\$4.66\frac{2}{3}$.

This method is evidently largely empirical, and its results are but approximate. It is, however, simple and easily applied, and will often be found of use in the absence of more precise means of determination. Those whose experience may differ from that of the writer can readily modify the values for themselves.

Stevens' Institute of Technology, Hoboken, N. J.
December, 1873.

*Report to the Navy Department on American coals.

THE ALBERT IRON BRIDGE.

The Albert Suspension Bridge, over the river Thames, at Chelsea, London, was designed by Mr. R. W. Ordish, upon his rigid suspension principle. It is 710 feet long, with one center span of 400 feet, and two side spans of 155 feet each, the roadway being 71 feet wide between the parapets. The appearance of the structure is seen from the annexed engraving, Fig. 1, and one of the piers, with the tower and a cross section of the roadway, is also shown on a larger scale in Fig. 2.

THE ALBERT IRON BRIDGE, LONDON, ENGLAND.—Fig. 1.

Each river pier is formed of two concrete columns within cast iron cylinders, placed 53 feet 6 inches apart from center to center. At base the cylinders are 21 feet diameter, 4 feet 6 inches deep, and 1¼ inches thick. Above the conical pieces, P, Fig. 2, the cylinder is 15 feet diameter, made in lengths of 6 feet, and 1¼ inch thick. As the iron cylinders have no permanent load upon them, no exact bearing is required in the joints, which are, therefore, not faced.

A joint, formed of hemp wrapped on hoop iron, was found sufficient to compensate for irregularities in the castings, and to keep out the water in the process of sinking. The cylinders were forced down by dead weight, through eight feet of gravel and one foot of sand, into the London clay, the excavation being carried on within the cylinders as they sank. The clay, when pierced to a depth of ten feet, was found sufficiently hard for a foundation, and upon this the the concrete was deposited. This concrete is made of shingle, sand, and Portland cement, and at base the cement forms one third of the mixture, the proportion being reduced with successive layers of concrete to 1 in 7 at the top. Within a week of the columns being completed the concrete became as hard as stone, affording ample strength for the load of about seven tuns per square foot which comes upon it. The two columns forming each pier are united and stayed by the lattice girder, B. Upon each concrete column an octagonal base plate, C, 11 feet 6 inches diameter, 2 feet 2 inches deep, and weighing 20 tuns, is placed, the upper surface of the base plate being faced in the lathe to receive the superstructure of the towers. The towers are made entirely of cast iron, successive tiers of columns being united at intervals by large octagonal castings. The castings, D D, are constructed as saddle plates for the main chains, and smaller saddles, E E, above receive the catenary wire rope. The hight from the bottom of the cylinders to the top of the concrete column is 50 feet, and thence to the upper saddle 70 feet 6 inches.

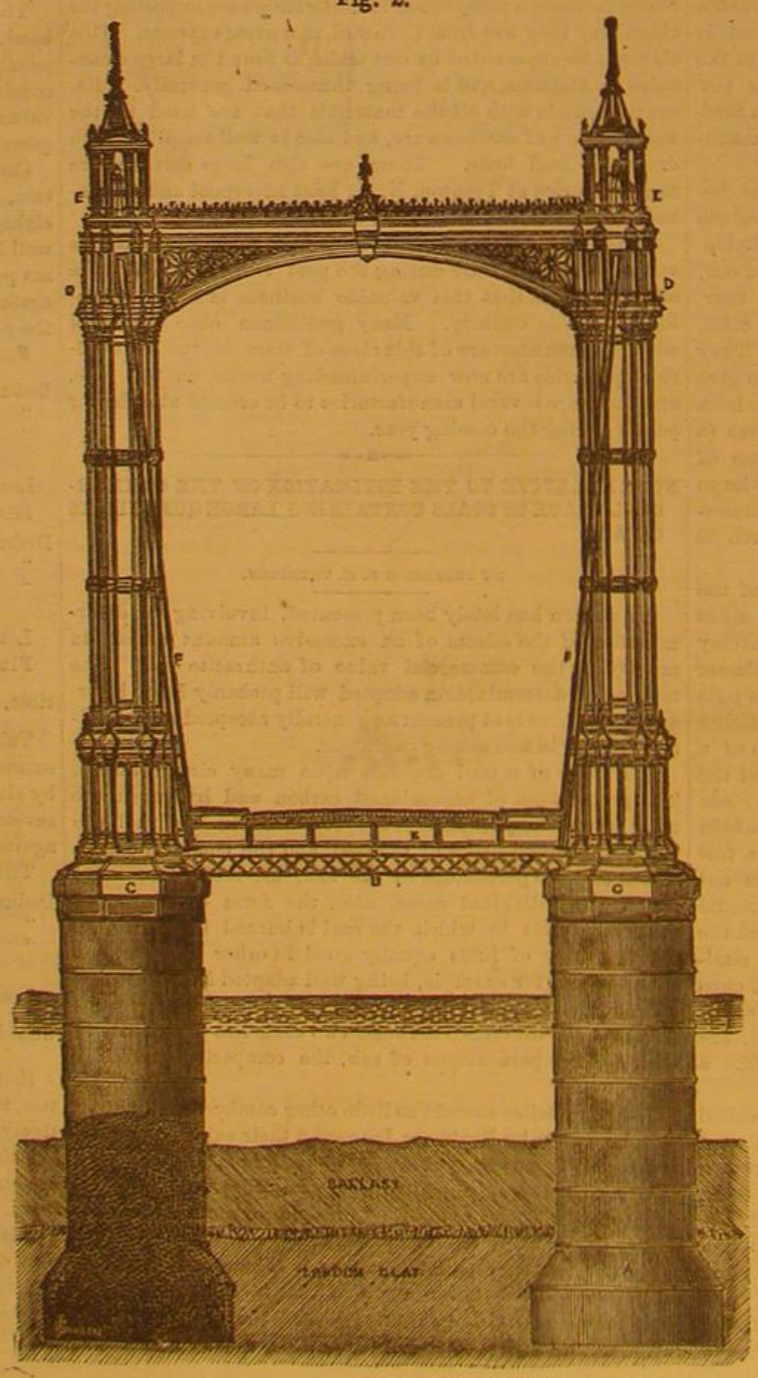
The platform is composed of two lines of plate girders, G G, 7 feet 6 inches deep, with bottom flanges 16 inches wide, and top flanges 9 inches wide. At intervals of 8 feet, cross girders, K, 2 feet 6 inches deep, are riveted to the main girders, and stiffened by longitudinal girders or distance pieces, H. The roadway is formed of fir blocks 4 inches deep, laid on longitudinal fir planks 7 inches deep.

It will be seen from the cross section of the bridge that the plane in which the chains lie is inclined, and that the web of the main girder lies in the same inclined plane. By this arrangement, the entire width of the platform is kept within the opening of the towers, and the roadway is not contracted at the towers, as is the case where the attachment of the chains to the platform is perpendicular to the saddle.

The anchorage for the chains and the catenary is formed in a peculiar manner within an iron structure, and is perfectly independent of the great mass of masonry generally employed. It consists of a cast iron cylinder, 20 feet 6 inches deep and 3 feet internal diameter, enlarged at the bottom into a chamber 5 feet diameter, for anchoring the chain. This cylinder is watertight, and provided with a man hole and steps, so that the anchorage can be examined at any time, and cleaned and painted when necessary.

The bridge is calculated to carry, with a strain of 5 tuns per square inch on the chains and 9 tuns on the steel wire, a moving load of 70 lbs. per square foot. The headway for vessels below the platform varies from 21 feet to 38 feet, according to the tide. The weight of iron work in the bridge is 1,530 tuns. We are indebted to *Iron* for these illustrations.

Fig. 2.



To Impart to Coarse Wood the Appearance of Polished Mahogany.

The following process is recommended in *Wiederhold's Trade Circular:* The coarse wood is first coated with a colored size, which is prepared by thoroughly mixing up, in a warm solution of 1 part of commercial glue in 6 parts of water, a sufficient quantity of the commercial mahogany brown, which is in reality an iron oxide, and in color stands between so-called English red and oxide of iron. This is best effected by adding in excess a sufficient quantity of the dry color with the warm solution of glue, and thoroughly mixing the mass by means of a brush until a uniform paste is obtained, in which no more dry red particles are seen.

A trial coat is then laid upon a piece of wood. If it is desired to give a light mahogany color to the object, it is only necessary to add less, and for a darker color more, of the brown body color. When the coat is dry, it may be tested, by rubbing with the fingers, whether the color easily separates or not. In the former case, more glue must be added until the dry trial coat no longer perceptibly rubs off with the hand. Having ascertained in this way the right condition of the size color with respect to tint and strength, it is then warmed slightly, and worked through a hair sieve by means of a brush. After this it is rubbed upon the wood surface with the brush, which has been carefully washed. It is not necessary to keep the color warm during the painting. Should it become thick by gelatinizing, it may be laid on the wood with the brush, and dries more rapidly than when the color is too thin. If the wood is porous and absorbs much color, a second coat may be laid on the first when dry, which will be sufficient in all cases. On drying, the size color appears dull and unsightly, but the following coat changes immediately the appearance of the surface. This coat is a spirit varnish. For its production 3 parts of spirits of wine of 90° are added in excess to 1 part of red acaroid resin in one vessel, and in another 10 parts of shellac, with 40 parts of spirits of wine of 80°. By repeated agitation for three or four days, the spirit dissolves the resin completely. The shellac solution is then poured carefully from the sediment, or, better still, filtered through a fine cloth, when it may be observed that a slight milky turbidity is no detriment to its use. The resin solution is best filtered into the shellac solution by pouring through a funnel loosely packed with wadding.

When filtered, the solutions of both resins are mixed by agitating the vessel, and letting the varnish stand a few days. The acaroid resin colors the shellac, and imparts to it at the same time the degree of suppleness usually obtained by the addition of Venetian turpentine, or linseed oil. If the varnish is to be employed as a coat, the upper layers are poured off at once from the vessel. One or two coats suffice, as a rule, to give the object an exceedingly pleasing effect. The coats dry very quickly, and care must be taken not to apply the second coat till the first is completely dry.

Profits of Co-operation.

Some eight or ten years ago, Joseph D. Holmes, Charles Jordan, and William Millard, three young farmers living almost within a stone's throw of each other, decided to join in establishing a dairy milk route from their farms to Pawtucket, R. I., some six miles away. Neither farm was large enough to sustain a route alone, but the three together could do it easily. Neither wanted to take the place of a middleman and do all the marketing, nor did either wish to give up his business to a middleman. So they agreed that each should take his turn on the milk wagon.

The milk accounts are all kept in one book, and the buyers at the village settle their bills by this book, whether it comes by one or another of the members of the company. Each of the three men goes with the wagon every third day in regular order, unless, for accommodation sake, one goes a trip for one of the others. Each uses his own horse and wagon, and each knows the amount of milk that is taken from the different farms every day.

The two trips that each one makes every week enable him to market most of his other produce, such as apples, potatoes, sweet corn, tomatoes, and other garden products, of which each one raises considerable quantities, without making special trips for such purposes. Nor is there any hitching up and going to the store for purchase; all the buying, as well as selling, being done on their regular market days; and they are all in daily communication with the post office, which is no small convenience to farmers.

Under this system of partnership the cost of marketing is reduced to the minimum, while each bears his just proportion of the expenses, and receives equal share in all the advantages of the combination. Since this arrangement has been established, all their farms have been really enhanced in value. The young men have increased their stock, and it is better fed and better housed. Buildings have been repaired and enlarged, more and better tools purchased, and the land is constantly increasing in fertility and productiveness. But little complaint is heard from them about hard times for farmers. They pay their bills, take the papers, and know what is going on in the world outside.

We have been familiar with this company from its organization, and believe the example these men have set is worthy of imitation by many farmers who are now grumbling about the cost of getting their goods to market.—*New England Farmer,*

Patents.---Record of One Week's Issue.

The *Inter-Ocean* of Chicago thus sums up one week's business of the Patent Office, and gives a *resumé* of the subjects patented and the number of patentees from each State. The writer says:

In whatever manner the Cuban difficulty, the President's message, and the assembly of Congress may affect other interests, certain it is that business at the United States Patent Office runs as smoothly as ever, with a fair increase in the number of applications for patents over the average of the past four or five weeks. In case of a war in Spain, there is certain to be a number of applications for patents for new and improved cannon, mitrailleuses, monitors, and like death-dealing appurtenances and appliances; but, as yet, there has been no perceptible increase of applications of this particular kind.

There are at present pending in the Patent Office forty-six applications for the extension of patents about to expire. One of these is for the famous Fairbanks platform scales, granted originally December 20, 1859. Another is one of the Woodruff patents for seats and couches for railway cars, which is to be heard on the 7th of January next. This patent is owned wholly in Chicago. Two extensions were granted during the past week, both controlled by the same parties, and both relating to the manufacture of rubber belting.

Six designs were patented and ten trade marks registered; none of these were furnished by Chicago. A St. Louis manufacturing firm registered the words "Golden Crown" in combination with a crown printed in gold, as a trade mark for agricultural implements.

The number of original patents issued for the week is 229, and 11 reissues. The former, as regards the Western and Northwestern States, are divided as follows: Illinois, 12 (of these the city of Chicago comes in for only one patent this week); Indiana, 9; Wisconsin, 6; California, 6; Michigan, 5; Missouri, 5; Iowa, 3; Minnesota, 1; and Nebraska, 1 Wisconsin and California each claim one reissue.

The solitary Chicago patent is taken out by J. A. Roche and G. V. Orton, and is for an improved band-sawing machine. The saw guide, being attached to one end of a horizontal bar which is made vertically adjustable, constitutes the main feature in the invention.

The other Illinois patents are: Stove damper, patented by H. H. Huntly, of Quincy; harvest rake, patented by E. Lippincott, of Brighton; drawbar in draft equalizers for wagons, and clip for wagon axle skeins, both patented by J. M. Orput, of Malta, one half of each patent by him assigned to D. Safford, of South Grove; corn planter, patented by A. Springsteen, of Oquawka; road scraper, patented by J. W. Weston, of Windsor, assignor to J. M. Jackson, of the same place, tyre tightener, patented by Wm. Bellairs and Wm. Ough, of Atkinson; hay press, patented by H. F. Blank, of Liberty, cotton planter; patented by C. H. Nixon, of Polo; binder attachment for harvesters, patented by H. Porter, Polo; and washing machine, patented by J. Trickett, Quincy.

Indiana's new patents are the following: Hay knife, patented by John S. Ball, Mishawaka; car spring, patented by E. T. Russell, Indianapolis; cotton, harvester, patented by Wm. H. Pedrick, Richmond, car coupling, patented by Wm. A. Cochran, Flat Rock, assignor to himself and James T. Burch, of the same place; hand corn planter, patented by Eli Rogers, Rochester; process of retouching photographic negatives, patented by S. H. Wright, Terre Haute; bed bottom, S. B. Freeman, Fort Wayne; eaves trough, P. F Kiblinger, Millersburgh; and plow, James Oliver, South Bend.

Next in order comes Wisconsin, with the following six patents for new inventions: Carriage top, patented by James N. Gill, of Oshkosh; soda water draft tube, patented by Otto Zwietusch, of Milwaukee; butter worker, patented by D. W. Dake, of Beloit; binder's attachment for harvester, patented by Thomas Urdahl, of Cross Plains, assignor to Simeon Mills, of Madison; rotary grain distributer, patented by A. D. Foote, of Berlin; assignor to M. Helmer, of Milwaukee; and revolving stool or chair, patented by J. J. Vollrath, of Sheboygan. The reissue is for a tag holder (patented August 6, 1867), to Thomas T. Bottomley, of Burlington, assignor to Pratt & Letchworth, of Buffalo, N. Y.

California this week has an equal number of patents, nearly all of which are for ore crushers, ingot molds, and similar appurtenances used in the production and refining of the precious metals, which constitute her chief branches of wealth and industry.

Missouri leads off with a shaving mug, patented by A. J. Furr and W. C. Knaus, of Boonsborough. Their mug is provided with a lamp for heating the water, and the detachable soap dish covers the mug and rests in the water. The water pours through an opening into a cup on the outside of the mug, in which the brush may be dipped. The other four patents are: Ice house, patented by A. Wilbur, of Cedar City; churn patented by John P. Friest, of Chillicothe; wash boiler, patented by William H. Hammond, of Syracuse; and a combined table and secret writing desk, patented by Charles Kade, of Lexington.

Michigan claims the following five patents. Stilt, patented by I. S. Sheears, of Ypsilanti; paper holder shelf, patented by George W. Hawkins, of Clayton; sleigh, patented by A. D. De Laro, of Goodrich. In this sleigh, as represented by the model, the rear end of the tongue is mortised into a cross bar, which is pivoted in front of a front beam, the draft in this manner to be applied directly to the front beam. Valve, patented by Charles F. Murdock, Detroit; and a whiffletree, patented by John Parker, of Pontiac, assignor of one half his right to James A. Hubbs, of Cato, Mich., complete the list for Michigan.

Iowa's three patents are for a kneading board, patented by H. P. Jones, of Davenport; a hub-boring machine, patented by F. Jonas, of Burlington, assignor to himself and George O. Ray, of the same place; and a numerical filing case, patented by George W. Bettesworth, of Cedar Rapids.

Minnesota this week is only represented by the patent of A. G. & H. W. Mowbray, of Stockton, for a middling bolt; and Nebraska by the patent to Tobias Billesbach, of Kearney Junction, for a new method of burning brick.

A party in New York has invented a postal card of peculiar manufacture. It is coated with various chemical salts, and the action between these compounds and the deposit from a metallic pencil renders the writing indelible.

WORCESTER JAPANESE PORCELAIN AT VIENNA.

The English china court at the Vienna Exposition was a department of special attraction. It must have been remarked that public taste, led by the judgment of art connoisseurs in China, has long been directed to the peculiar treatment of ornamental design in Satsuma and Japanese manufacture. The Worcester Works have taken advantage of this taste to design specially for the Vienna Exposition a large collection of ceramic art work, which has gained the attention of illustrious visitors, art connoisseurs, and the public, by its unique style and the perfect taste and refinement in which its design is treated. They brought out a new tint of color for their vases and figures, resembling ivory, but more mellow in depth of color and with a creamy softness that rivals the Satsuma as a ground color for the sober tints and finely chased gold work and bronzing of the Japanese style of decoration. The designs now in question have all the repose of Japanese coloring, combined with the more correct taste in outline of Western art in the forms of the objects. It is apparent that they have all been the subject of careful study; for, while there is no mere imitation of the Japanese, the feeling of that peculiar style has been seized, and thoroughly worked out, with great refinement and with the intelligence of an art student. Not only was every form expressly modeled for these subjects, but the peculiar tints of colors were specially produced by the Worcester color chemists, with the bronzes of various shades. Mr. R. W. Burns, F.S.A., the art director and one of the proprietors of the Worcester Works, has designed and produced all these articles; and he has been ably seconded by his chief modeler, artist, and chemist, Messrs. Hadley, Callowhill, and Bejot, to whom have been awarded medals by the jurors of the Vienna exhibition; while to Mr. Burns and the Worcester Works a diploma of honor has been awarded. We are indebted for the illustration to the London *Illustrated News*.

THE WORCESTER JAPANESE PORCELAIN AT VIENNA.

IMPROVED FURNITURE CASTERS.

We illustrate herewith three new forms of furniture casters, recently patented through the Scientific American Patent Agency by Mr. Cevedra B. Sheldon, of No. 6 State street, New York city. They seem to possess more than an ordinary degree of novelty and utility among this class of inventions.

The arrangement shown in Fig. 1 consists in a metal ball, which is contained in a cup, B, which is stamped from a single piece of metal, and has its lower edge turned inward so as to confine the caster ball and, besides, a number of small friction balls, inclosed as shown above the latter. Outside of B is a casing, and in the annular space between is placed a lining of india rubber, C, or other elastic material. The friction balls are placed in sufficient numbers to cover about two thirds of the surface of the caster ball, and are prevented from reaching the top of the latter by a cavity on the top of the cup, B. The screw, which attaches the device to the leg, is fastened to the shell of the caster by means of a cup-shaped nut, D, which connects with the body of the shell.

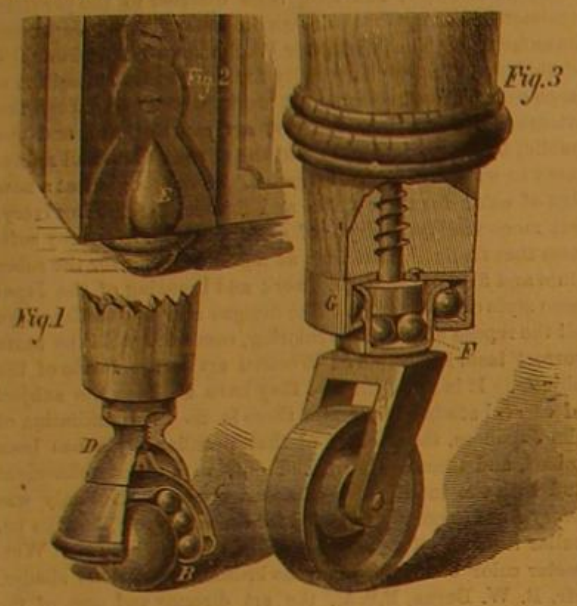


Fig. 2 shows the invention more especially adapted to protecting trunk casters from injury In this case the cup in which the ball revolves is secured in a cavity formed in the bottom of the trunk by means of tongues, E, struck up from the sheet metal lining of said cavity. Thus arranged, it is stated, the caster will sustain severe concussions and great pressure.

Fig. 3 represents the application of the friction ball system to the ordinary wheel caster. In the top of the bracket is a corrugated cup, F, containing a number of the small spheres. G is a cap rigidly attached to the fastening screw, which forms an annular box outside of the cup, F, and also incloses friction balls, as shown. The head of the fastening screw, it will be noticed, rests upon the balls in the cup, F, while the balls outside the latter serve to keep the caster in place. By this means, it is stated, the friction is greatly reduced, and the caster wheel more readily turns and conforms to the motion of the piece of furniture.

AUTOMATIC BRAKE.

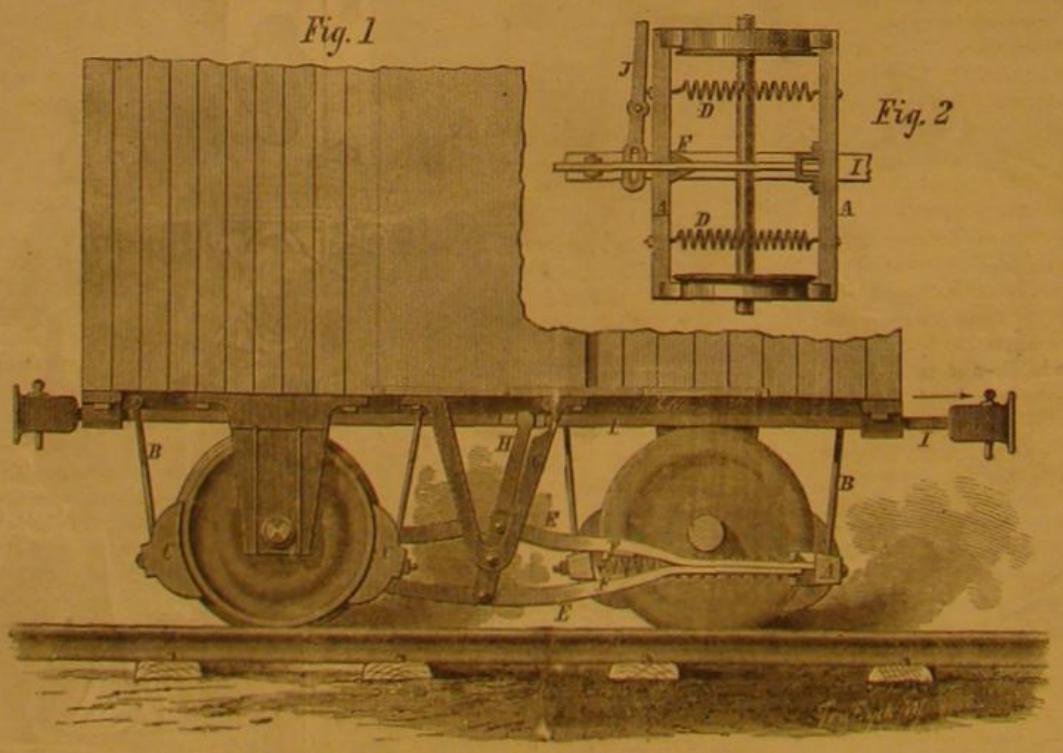
The inventor of the device herewith illustrated has produced a brake which, whether it be employed in its present form or in such modified shape as occasion may require, will, we consider, be found to be based upon a principle of doubtless considerable value. Briefly described, the apparatus is a combination of brake shoes with suitable springs, whereby the friction of the former is constantly maintained against the periphery of the wheels, so long as no pushing or pulling force is applied to the vehicle; but the moment a slight drag is brought to bear upon the drawbar, the brakes are automatically released, leaving the wheels free to rotate. It is not necessary to particularize, in any detail, the very evident uses to which this invention may be applied. On railroad cars it places in the hands of the engineer the immediate control of the train, as he has simply to cause his engine to cease pulling, when every brake is instantly applied. It is believed to have an advantage over the air and other brakes controlled from the locomotive, in that, while it dispenses with the necessity for brakemen, it requires, as will be seen from the following description, no coupling of tubes or other apparatus between the cars, the simple attaching together of the vehicles in the ordinary mode being all-sufficient to render it ready for immediate action. The device will be found of utility in descending grades, in its automatic check upon the momentum of the train. For horse cars, it is perhaps equally as well adapted, as it avoids the use of cranks to govern the brakes, requiring the use of one hand of the driver, or of an extra man when double teams are hitched on during bad weather; and besides, it allows of the car stopping at any point almost immediately.

Our engravings are designed to give a clear idea of the mechanism without referring it to any particular class of vehicle. Fig. 1 is an elevation with portions broken away, and Fig. 2 is a plan view of more important parts. Horizontal brake bars, A, are suspended from the car bed by means of longitudinally vibrating hangers, B, and are provided with brake shoes, C, at their extremities, which are made to fit snugly against the peripheries of the wheels. As shown in Fig. 2, and to the right of Fig. 1, the bars, A, are connected in pairs by helical springs, D, which are of sufficient strength to draw the brake shoes closely against the wheels. E E are two rods, the outer ends of which are supported by guides and abut against the two outer brake bars. These rods are designed to release the brakes from the wheels, and are made in curved shape so as to take the position shown in Fig. 1, that is, one above and the other below the two intermediate brake bars. Shoulders are formed upon them at F, which abut against the intermediate brake bars, and which operate in conjunction with the ends to release the brakes. G is a hanger secured rigidly to the car bed, and pivoted to which is a lever, H, the upper end of which plays loosely in a longitudinally movable drawbar, I, which is attached to the car bed by suitable guides. To the lever, H, the releasing rods, E, are pivoted, as represented, one below and the other above the fulcrum pin. To the extremities of the drawbar, H, are attached drawheads of any desired form, which are backed by the usual supports to take the strain. It is evident, if the drawhead on the right be moved in the direction of the arrow, one of the shoulders and one of the extremities of each releasing rod, E, will press against their respective brake bars, A, and force the brake shoes from the wheels, and a similar effect will take place if the opposite drawhead be pulled upon. Hence, as we noted in the beginning, it is merely necessary to remove the strain to cause the instant application of the brakes by the contraction of the springs, while their removal is effected with equal celerity as soon as even a slight force is re-applied.

If it should be desired to release the wheels of a car from its brakes, this can be readily done by means of a lever, J, Fig. 2, which is pivoted to the car bed and connected by an oblong slot and pin to the drawbar, H. The outer end of the lever may be attached to a suitable winding-up rod by a chain and ratchet mechanism, so that the brakes may be held off for any required time. This contrivance, we learn, may be placed at one or both ends of the car and operated by a person on the platform.

It will be noted that the springs not only serve to apply the brakes, but that they also will operate as buffers to prevent shocks and concussions while a train is being made up or is in motion. The inventor also states that the device is applicable to ordinary wagons, and that he has thus employed it with much success. The draft tongue in such case is attached to the drawbar and a locking device applied to it, for allowing the springs to hold the brakes in contact with the wagon wheels while descending hills.

Patented November 11, 1873. For further particulars address the inventor, Mr. Eliot P. Harrington, Volusia, Chatauqua county, N. Y.



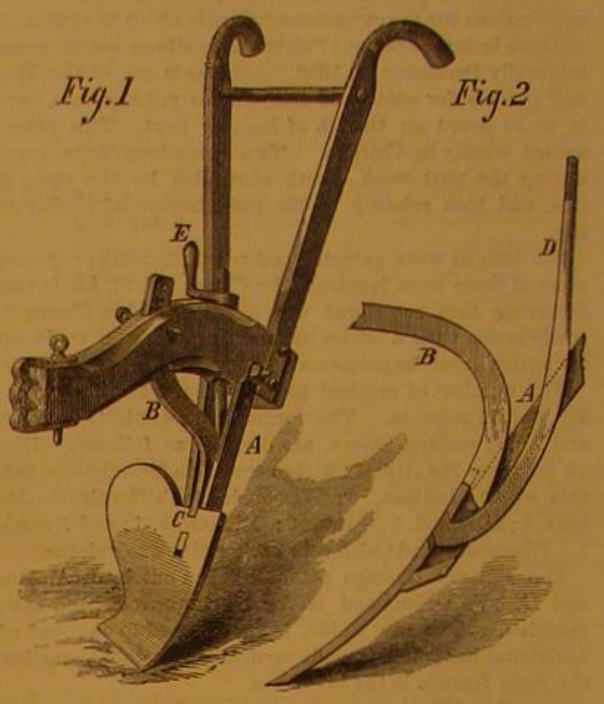
HARRINGTON'S AUTOMATIC BRAKE.

Benefactions of an Inventor.

A few weeks ago we announced the death of Seth Adams, of Boston, an inventor of no small reputation, who had amassed a large fortune out of his patents and the business he had built up under their fostering protection. The following are among the public benefactions, designated in his will, to Boston charitable institutions: $1,000 to the Needle Woman's Friend Society; $30,000 to the Consumptives' Home; $20,000 to the Home for Aged Men; $20,000 to the Association for the Relief of Aged Females; $10,000 to the Baldwin Place Home for Little Wanderers; $5,000 to the Boston Provident Association; $1,000 to the Industrial Society of Boston; $500 to the North End Mission; $1,000 to the Boston Young Women's Christian Association; $500 to the Children's Aid Society; $800 to the Female Orphan Asylum; $500 to the Temporary Home for the Destitute, $500 to the Children's Hospital; and $1,000 to the Society for the Prevention of Cruelty to Animals. A liberal sum is also donated to the town of Rochester, N. H., to be known as the Adams Fund, the income of which is to be paid to poor widows and orphans of that town.

IMPROVED PLOW.

The object of the new form of plow herewith represented is to avoid the use of the heel bolt, and to allow the plowshare to be removed or placed in position with increased facility and celerity, simply by turning a hand screw on top of the beam. It is claimed that there is nothing about the device to wear out, give way, get lost or misplaced, or become out of order. No single portion is detached at any time, and the operator can tighten the fastening apparatus while plowing with perfect ease.



The standard bars, A, are set into recesses of the beam and pivoted thereto by a strong cross bolt. Their lower ends are rigidly connected so as to form a firm support for the under side of the plowshare B is a curved brace, also rigidly attached to bars, A, and extending up through a mortise in the beam. Its upper end is perforated so that the brace may be locked by a crossbar, according to the angle of inclination under which the plowshare is set. A lug, C, formed upon the same brace, projects at its lower end beyond the standard, A, and is applied like a jaw into a recess of the share, as more clearly shown in the perspective view, Fig. 1. D is the adjusting rod, which passes between the standards and up through a conical perforation in the beam. Its upper end is threaded and raised or lowered by a suitable crank, E. The lower extremity curves around the brace, B, and projects beyond the standards into an aperture in the plowshare, as shown in section, Fig. 2. The share is therefore held in a firm and wedge-like gripe between the tapering jaw on the adjusting rod, and that already noted on the brace, B.

Different shares, we are informed, may in this manner be attached to the plow, as necessitated by the various requirements of farming, and their angles of elevation and depression be determined by simply adjusting the fore end of the brace.

The arrangement generally, the inventor states, is such as to offer no resistance to the soil slipping smoothly over, as there are no bolt heads or similar projections to catch. The plow also has a deep evenly curved throat, so that it cannot choke with grass, weeds, etc. We learn that the device obtained the highest premium at the Fair of the Georgia State Agricultural Society, at Macon, Ga.

Patented through the Scientific American Patent Agency, November 11, 1873. For further particulars address the inventor, Mr Andrews Riviere, Barneaville, Pike county, Ga.

J. WRITES to complain of the unnecessary delay of the courts in adjudicating on patent cases; and he thinks that inventors whose rights have been infringed are hardly treated. He states that the equity calendar of the Southern District of the State of New York has on it a long list of cases which have been ready for hearing for a year or more.

Correspondence.

Cheap Telescopes.

To the Editor of the Scientific American:

In your issue of December 13, 1873, W. M. asks How can a mechanic construct a cheap telescope powerful enough to see Jupiter's moons, Saturn's belts, etc.? The following is a plan which I adopted more than twenty years ago.

I called on a dealer in optical lenses and selected a meniscus, one inch in diameter and of 48 inch focus. This was for my object glass. I had already in my possession a two lensed double convex jeweller's eye glass; one of these lenses was used for the eye piece, its focal length being a trifle over one inch. The tube was made of pine wood. A piece of straight evenly grained one inch pine board, two inches wide and eight feet long, was cut in the middle, and the two pieces, after making a tapering semicircular groove in each, well glued together. This done, the next thing was to give it a round, tapering form, two inches in diameter at one end and a trifle over an inch at the other. This was done with a common carpenter's plane. I now had a tube four feet long with a tapering hole through its length, and 1¼ inches in diameter at its largest end. Two wooden cells for the lenses were then turned in a lathe, and were made to go on to the tube, as does the cover of a wooden pill box. A round hole, the size of the lens, was made in each, the meniscus being contracted to ¾ inch, and the eye glass to ¼ inch diameter. The piece carrying the eye glass was made so as to slide some distance on the tube, for adjustment to distinct vision. The tube was painted and varnished, and mounted equatorially; and it proved to be a good instrument, showing Jupiter's moons, their movements and eclipses, handsomely, the ring of Saturn, the horned appearance of Venus, the mountains and craters on the moon, the spots on the sun, etc. Several of the nebulæ were also visible, especially those in *Andromeda*, *Orion*, *Hercules*, and *Sagittarius*. This instrument has been a great pleasure to me and my family of boys and girls, and even my neighbors, and the whole need not cost over two dollars, beside the time in making, provided one is a mechanic.

The meniscus (concave on one side and convex on the other) is the proper form for a single lens object glass, and a plano-convex lens makes the best form for the eye piece. Care must be taken to so set the lenses in their cells that their foci will meet centrally. When this is the case, the lenses are said to be well centered, and in that way we get rid of most of the prismatic color. Another point that wants attention is the mounting. Absolute steadiness is required for close observation. I used to put mine upon a post set firmly in the ground. The equatorial arrangement for mounting is described in nearly every work on telescopes.

I hope not only W. M. but a thousand others will be induced to build themselves telescopes. There is no one thing that can be put into the hands of youth that will enchant them like a telescope. They will leave all other amusements and gather around that marvelous revelator

Alvan Clark, of Cambridgeport, Mass., "the Herschel of America," many years ago might have been seen peering into the heavens with his little home-made tubes. He had asked the question: How can I make a cheap telescope? That question he answered for himself, and now his name and his fame are everywhere connected with his ponderous achromatics. B.

Bellows Falls, Vt.

Keeping Poultry to Enrich Lands.

Colonel Waring, in his "Elements of Agriculture," says: Poultry dung is nearly equal in value to Peruvian guano (except that it contains more water). If granted that a hen will consume, of the different kinds of grain, meat, and vegetables, during the year, the equivalent of two bushels of corn, which weigh 120 pounds, then it is certainly low enough to place the excrement—the result of the digestion of these two bushels—as equivalent to fifteen pounds of guano. As the manure from 100 fowls, during a year, would amount to 1,500 pounds of guano, taking the above supposition as at least safe: and as 300 pounds is ordinarily sufficient for an acre of corn, it will be seen that the manure from 100 fowls will make compost enough for five acres. The experiment has been tried by the writer, of applying, to one acre of corn in the hill, the manure of twenty hens one year, mixed with swamp muck, in the proportion of one part hen manure and three parts muck, and the result was a better crop than upon an adjoining acre enriched, for sake of experiment, with a good fair ordinary dressing of stable manure.

New Bridge over the Hudson.

The corner stone of a new railway bridge, to span the Hudson river at Poughkeepsie, N. Y., was recently laid with masonic ceremonies. In an engineering point of view, the work will be an extensive one. Its object is to connect Boston, Providence, Portland, Worcester, the iron ore regions of Connecticut, Duchess county, and the Hudson river with Scranton, Easton, the Delaware river, the coal and oil fields of Pennsylvania, Harrisburgh, Pittsburgh, Oswego, Buffalo, and the West, by a route in which there will be a gain of some eighty miles in a total of 318 miles, or a saving of some thirty per cent. The structure will be of the truss shape, and the railroad tracks will be on the upper or top chord, at an elevation of 194 feet above the river. By the terms of the charter, the company are empowered to erect four piers in the river, at a distance of not less than 500 feet apart. The entire length of the bridge will be about one mile, of which a trifle less than 2,500 feet is over the channel of the river. The other half will consist of land approaches, mainly on the east or Poughkeepsie side. The land piers will be built of solid granite or blue stone masonry. They will be eight or ten in number, and will vary in hight from 20 to 80 or 90 feet. The piers on the bank will be somewhat similar, but higher, and also more massive and substantial. The piers in the river present the greatest difficulty to the engineer, as they must be sunk about 130 feet below the high water level in order to secure a solid foundation. The cost will be about $2,600,000.

THE LATE PROFESSOR AGASSIZ.—(See page 2.)

SAMUEL NELSON.

Samuel Nelson, ex-associate Justice of the Supreme Court of the United States, whose retirement from the bench took place about a year ago, recently died of apoplexy at his residence in Cooperstown, N. Y. We extract a portrait of this eminent jurist from the *Science Record* for 1873.

JUDGE NELSON, OF THE UNITED STATES SUPREME COURT.

Born in this State, in 1792, he was admitted to the bar in 1817, and six years later began the active judicial career which terminated in his retirement from public life, a step taken not on account of impaired mental vigor or from fear that the great causes which he would be called upon to decide would be beyond his grasp, but because he felt that the weight of eighty years precluded his assuming the physical labor incident to his full share of the work of the high tribunal of which he was so prominent a member. First circuit judge, then associate justice of the New York Supreme Court, and finally Chief Justice, Judge Nelson, perhaps more than any other of his associates, contributed in the production of the decisions which have shed so brilliant a luster upon the past records of the judiciary of New York, and which are received as high authority in every court where the great principles of the common law prevail. In 1844, he was called by President Tyler to the bench of the United States Supreme Court, to occupy the office from which he eventually retired.

In questions of admiralty and international law, Judge Nelson was considered as one of the greatest living masters, but it is probable that his extended knowledge of these important branches of jurisprudence was even exceeded by his vast experience in the varied and complicated causes arising from the litigations appertaining to patents. In this connection, one of the most eminent lawyers of this city says of him that it was his habit "to labor most earnestly during the trial and upon the argument of causes: and again and again would he descend from the bench, especially when complicated machinery or specimens illustrative of science or models of vessels intended to develope the relations of colliding ships have been before him, and by their close and repeated study strive to understand the real points in controversy * * So thoroughly did he investigate questions of science and mechanics, and so sound a judgment was he known to form on these subjects, that his opinions concerning them were by courts and counsel accepted as of greater authority than those of any other judge, until finally, and for many years before the close of his labors at the circuit, patentees felt that, when he had passed judicially on their rights, they were substantially settled; and hence there came before him repeatedly, from distant points, cases involving the validity of the most valuable patents in the country, and to his decisions the parties generally submitted without appeal."

One of his last official acts was participation in the Joint High Commission charged with the settlement of the Alabama claims; and here his unexcelled proficiency in international jurisprudence contributed largely to the speedy and equitable adjustment of that grave question of international difference. His death, though sudden, was a fitting close to the evening of a grand and noble life. A slight illness confined him to his chair, in which, surrounded by his family circle, he peacefully breathed his last without tremor or pang, leaving to posterity the rare example of a magistrate, who for half a century, has preserved his ermine without stain or spot, and whose words will be handed down as the monuments of unvarying justice, stern integrity and profound learning.

SCIENTIFIC AND PRACTICAL INFORMATION.

CHEMICAL SUGAR.

One of the most important of chemical discoveries is that of the artificial creation of alizarine. By reducing natural alizarine by zinc powder, Groebe and Liebermann obtained anthracene, $C_{14} H_{10}$. Then reflecting that coal tar was an inexhaustible source of the latter product, they attempted to obtain, by synthesis, alizarine and even purpurine. But alizarine has for its formula $C_{14} H_8 O_5$, and hence it became necessary to add to anthracene 5 atoms of oxygen, and to subtract 2 atoms of hydrogen. To obtain this result the investigators had recourse to bichromate of potash and sulphuric acid. Then treating the body with a solution of caustic alkali at a temperature above 388° Fah., a blue mass was gained, the aqueous dissolution of which precipitated, by an acid, either artificial alizarin or purpurine, according to the degree of oxidation. This chemical product, now employed in the art of dyeing, has given results even superior to those obtained from madder and its derivatives.

The process briefly reviewed above suggests the idea that sugar might be made by a somewhat similar course. Sugar has for its formula $C_{13} H_{11} O_{11}$, and is resembled by a large number of chemical bodies. Glucose, for example, gives $C_{12} H_{14} O_{14}$; cellulose, $C_{12} H_{10} O_{10}$. Now, supposing that on these bodies a chemical reaction of the same nature as that of bichromate of potash and sulphuric acid on anthracene could be effected, would it not be possible to produce a chemical sugar?

FUSION OF PLATINUM.

The fusion of platinum has been effected by M. Violette. Partly in fragments and partly in a state of sponge, it was placed in a Hessian crucible lined with plumbago, and subjected for one hour to the heat of the furnace. A perfectly fused button of platinum, of the same weight as that of the metal introduced, was found at the bottom of the crucible.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations (which are approximate only) and for the observations in the accompanying notes, I am indebted to students. M.M.

Positions of Planets for January, 1874.

Mercury.

Mercury should be looked for in the morning, in the early part of the month, as it rises before the sun, at 6h. 12m. on the 11th, and sets at 3h. 15m. P. M.

On the 31st it is very near the sun in right ascension, passing the meridian eight minutes after noon, rising at 7h. 23m. A. M., and setting at 4h. 53m. P. M.

Venus.

Venus is not well situated at the beginning of the month, and becomes less so at the end, as it passes the meridian within a few minutes of noon on the 31st.

On the 1st Venus rises at 6h. 38m. A. M., and sets at 3h. 36m. P. M. On the 31st Venus rises at 7h. 7m. A. M., and sets at 4h. 37m. P. M.

Mars.

The apparent diameter of Mars is becoming less. It comes to meridian earlier in the afternoon from the 1st to the last of January; but as it is moving northward in declination, it is longer above our horizon and so sets a little later.

January 1, Mars rises at 10h. 12m. A. M., and sets at 8h. 42m. P. M. January 31, Mars rises at 9h. 5m. A. M., and sets at 8h. 43m. P. M.

Jupiter.

Jupiter is coming to a position more favorable, and rises on the 1st at 11h. 18m. P. M. Its apparent motion among the stars is very slow on the 1st, and on the 16th it seems to be stationary; after this time its motion among the stars is reversed, and it seems to retrograde, or move in a westerly direction, in consequence of the more rapid motion of the earth.

On the 31st Jupiter rises soon after 9 P. M., and is very nearly in the path of the celestial equator, being above the horizon a little more than 12 hours. It comes to the meridian on the 31st at 3h. 26m. in the morning, and is then at an altitude (in this latitude) of 49° 6′.

Saturn.

On the 1st Saturn rises at 8h. 50m. A. M., and sets at 6h. 18m. P. M. On the 31st Saturn rises at 7h. 4m. A. M., and sets at 4h. 38m.

It will be believed that Saturn is not well situated for observation, its daily path being very far south, and its position nearly the same as that of the sun throughout the month.

Uranus.

Uranus rises on the 1st at 6h. 53m. P. M., and sets at 9h. 15m. A. M. On the 31st Uranus rises at 4h. 48m. P. M., and sets at 7h. 13m. A. M. It is among the small stars of *Cancer*

Neptune.

Neptune rises 22m. after noon on the 1st, and sets at 1h. 20m. the next morning. On the 31st it rises at 10h. 26m. A. M., and sets at 11h. 24m. in the morning.

Sun Spots.

Cloudy weather has seriously interrupted the record of sun spots by photography. Since November 14, impressions have been obtained only on the 22d, 25th, 26th, and 29th of November, and on the 6th of December. Three small groups near the western limb appeared on the 22d, none of which could be referred to any group of the 14th. By the 25th they had disappeared and a pair of small spots was found occupying about the same place as those of the 22d. This pair was also seen in photographs of the 26th and 29th, being on the latter day a very short distance from the western limb. The picture of the 26th shows a large spot just at its entrance on the disk. This was also visible on the 29th, the sun's rotation having carried it further toward the center. On December 6 there was a fine cluster approaching the center, and a smaller one below the larger and nearer the eastern limb. A spot near the western limb seemed by its position and shape to be identical with the large one of the 26th and 29th, and, if so, was unusually invariable. Faculæ have been visible in every case, but not of remarkable extent.

Barometer and Thermometer.

The meteorological journal from November 16 to December 13 gives the highest barometer, December 2 and December 7, 30·57; the lowest barometer, November 18, 28·68; the highest thermometer, December 4, at 2 P.M., 55°; the lowest thermometer November 20, at 7 A. M., 6·5°.

Amount of Rain.

The sleet and snow which fell between the evening of November 23 and the morning of November 25 amounted to 2 inches.

The rain which fell between the evening of December 8 and the afternoon of December 9 amounted to 0·75 inches.

The rain which fell between the afternoon of December 11 and the afternoon of December 13 amounted to 1·575 inches.

Old Fruit Cans.

Empty tin fruit cans, like old hoop skirts, are a nuisance when out of place. The question is: What is their place? and I should be willing to answer it a hundred times, if I could banish them from the gutters, the ash heaps, the vacant lots, and, above all, from the hands of the boys. I shudder now at the very suggestion of their ever being used again as music boxes, strung with rosined chords. Did that epidemic visit your locality, my dear reader? If so, you would be in haste to prevent the slighest possibility of its recurrence. But to the remedy.

In the first place, to open the cans properly, put hot coals on and around the little soldered tip on the top, until the solder melts, then scrape off lid and coals together, with a table knife. Be careful, however, not to set the cans on the hot stove before they are opened, by which little neglect steam enough to burst the can might be generated, which would not be a very pleasant or profitable method of opening it. When opened properly, you have a smooth, round orifice through which to remove the fruit.

When the cans are empty and dry, invert them on hot coals in the stove for half a minute, or on a hot stove, until the solder melts and loosens the remaining top of the can; then strike it off, smooth off the bits of solder, and you have a very convenient cooking utensil. For a lid, use a saucer, or the covers to old tin pint cups or pails. Rice, wheat, samp, pearl barley, split peas, and many other dishes for a small family, and small dishes for a large family, can be cooked in them, either standing directly on the stove, or placed in a large boiler or saucepan of water, to prevent the possibility of their burning. It also saves more costly tin utensils; for this method of boiling in water is hard on the tin ware. One can may be kept for onions; others can be used for baking or steaming rye and Indian bread, and some kinds of pudding.

They are also convenient for pantry use, for holding articles to be used in cookery or in the laundry; for garden seeds, for paint pots, and for many other things that will suggest themselves to every housekeeper, and for which indeed they would long ago have been used but for the untidy jagged edge made by the common method of opening them. If covers are wanted for them in these capacities, discarded rims and lids may be put together with a little solder.

If there are tin shears at hand, and any one to use them, the cans may be made into very passable scoops. Take several of them at a time to a tinner, and he will cut them into the shape for a trifle. It saves time to have a scoop in every meal tub, flour barrel, sugar pail, and starch box. In short, old tin cans are far better for many purposes than for street organs, or for ornaments to dogs' tails. Suppose we change the tune, and have better economy, more and a higher grade of music.—*Science of Health.*

What a Scientific Englishman thinks of Scientific Americans.

Mr. R. A. Proctor, the eminent English astronomer, is now in this country, and, in a recent speech before the Lotos Club in this city, made the following interesting remarks:

He had known before he had arrived, and had more clearly recognized since, that American scientists were doing noble work, and that the people of America were in advance of Europe in the general attention given by them to science. He had been amazed by the character of the audiences before whom he had lectured, not solely by their number, though that had surprised him, but by their close attention to the facts presented to them, and by their appreciation of the bearing of those facts. He had visited also American colleges and other institutions, and had been struck by the great advantages which the methods there employed possessed over those adopted in England. He had strongly felt the hope that one day his own children might receive a portion of their education in America. He proceeded to remark that, to every thinking mind, America presents a deeply interesting subject of study. There are being worked out, in this great country, the great problems which occupy the attention, indeed, of statesmen and politicians on the other side of the Atlantic, but the solution of which there, if solution is to be hoped for, is trammeled by the influences of old traditions, by the effects of class distinctions, and by other circumstances not readily classified or analyzed, but operating only too effectually to retard progress. Even in science the difference was to be recognized. He could venture, indeed, to remark that he might to some degree claim the sympathy and support of American thinkers, because of the efforts which he had made to resist the influences which oppress science in England. One of these is "authority"—not authority in its legitimate sense, but authority unduly allowed to affect the freedom of thought. Here in America men of science recognize authority as a form of scientific evidence, because the fact that a great thinker has held such and such a view is *pro tanto* evidence in favor of the justice of the view. But Americans refuse to allow authority to decide scientific questions; and when newly discovered facts show that views firmly held by great authorities should be modified or abandoned, the American student of science is not prevented by undue respect for authority from accepting the new truths thus indicated. In this respect, he had himself thought and acted as an American would. His so doing had, he feared, proved unpleasing to many in England, who preferred to stand on the old ways. Even more unpleasant to many had been his opposition to the old fashioned notion that only the official astronomer can do effective work, either in observation or in the discussion of observations. He mentioned how the Astronomer Royal of England had embodied this feeling in the opening sentences of a well known work on popular astronomy, where he divided astronomical students into those who are "officially connected with Government observatories, and those who are not." Mr. Hind had once rebuked him (Mr. Proctor) for quoting an observation made by an amateur astronomer, not that Mr. Hind denied that the particular fact had been noted, but because the gentleman who had made the observation had not made for himself a great scientific name. This, Mr. Proctor remarked, appeared to him a most mischievous mistake; and he believed that science in any country would never make such progress as it might, so long as considerations such as this were allowed to operate. He quoted another illustration of the tendencies of the official mind. When Miss Mitchell, the distinguished American astronomer, had discovered a certain comet, the Astronomer Royal (one of the council who had to determine whether she should receive a gold medal for that achievement) opposedthe award because, "although Miss Mitchell had certainly discovered the comet, she had not sent news of the discovery by the first mail." [Laughter.] Fortunately the Astronomer Royal was overruled by his colleagues nd the award was made. Mr. Proctor proceeded to remark on two points in connection with American scientific work —first, the effective way in which it was carried on, new and important facts being continually added to our knowledge by American scientific workers; and secondly, the small regard paid by Americans to questions of priority. He remarked that, in two special instances, relating to the work of Professors Cooke and Winlock, of Cambridge, Mass., he had been unwittingly guilty of injustice in assigning the credit to others; and the mistake, though noted long since by those gentlemen, had been allowed to remain uncorrected. It appeared to him, in fact, that American students of science were altogether less disposed to controversy than their European fellow workers.

[Miss Mitchell has since explained that the medal was to be awarded, according to the terms prescribed by its donor, the late king of Denmark, only on condition that the news of the discovery be forwarded by the first mail.—EDS.]

The Automatic Telegraph System.

This system is being tested by the Philadelphia, Reading and Pottsville Telegraph Company, and found to work very satisfactorily between their main offices in Philadelphia, Reading, and Pottsville, upon a line which also has a number of offices using the Morse system.

On Tuesday, the 2d inst., the Automatic Telegraph Company's wire between Washington and Philadelphia was connected at Philadelphia to one of the P., R., and P. Telegraph Company's wires between Philadelphia and Pottsville, and the President's message, containing about 11,500 words, sent direct from Washington to Pottsville, Pa., by the automatic system; and the time occupied in its transmission upon a single line between the points named was 34 minutes, being an average of 337 words per minute. It could, however, have been sent in less time, as no effort was made at the time to obtain speed. The message was perforated at Washington by young ladies, who each averaged about 25 words per minute. The characters recorded on the chemical paper at Pottsville were plain and distinct, and easily read by three operators, who translated the characters to three copyists, each averaging about 35 words a minute.

Upon the same day, the President's message was transmitted over the lines of the Western Union Telegraph Company direct from Washington to Pottsville, by the Morse system; and according to a statement published in the *Pottsville Standard*, it occupied the time of four wires each for nearly two hours and a half.

Had the message been sent by the Morse system upon a single wire between the points named, it would have taken about 10 hours, as there was considerable escape on the wires that day, owing to a damp and drizzling rain.

The Bee Keeper's Convention.

The third annual convention of the North American Bee Keeper's Society, recently held at Louisville, Ky., was very sparsely attended, the delegates present being 18 in all, an unaccountably meager representation, as compared with the large meetings of the two previous years. There was an informal talk of broad comb and its probable formation; one member related his loss of thirty colonies in consequence of the singular disappearance of the queens, owing, it was thought, to a disease generally prevalent during the year, and which proved particularly fatal to the queens, killing them a short time after the attack. A general expression upon the subject showed a unanimity in favor of sugar sirup, or pure white candy, in preference to late fall honey as food for weak swarms in winter, and one member advised that it be prepared by dissolving a quart of "coffee crushed" in a pint of boiling water. Alsike clover was very highly recommended, some deeming it superior to the white or red, not only as bee pasturage but for cattle feed as well. A remark was made to the effect that the consumers may easily be in error when they suppose that the presence of comb in the honey sold in the market is a sufficient guarantee of excellence, and that extracted honey is necessarily adulterated, it being a trick of the trade to place comb in manufactured honey in order to help the sale of the worthless article.

PROFESSOR PROCTOR, the English astronomer, treats largely upon the probabilities of other worlds than this being inhabited, the conclusion being that, of the inner planets, Mercury, Venus, the Earth, and Mars, our planet only was in condition to be inhabited by beings like the dwellers upon the earth. Mercury and Venus must be too hot, and Mars too cold. Of the other planets, their condition was not probably such as to permit of habitation by creatures such as ourselves.

D. K. N. suggests, in the laying of ocean cables, that communication between the deep sea line and floating buoys, all along the route, be arranged. A ship in distress could, by sending a boat and crew to one of the buoys, send word to the shores for help. The idea is practical, and will probably be some day carried out.

J. H. M. writes to point out the fact that an acre is the square of the hypothenuse of a right angled triangle whose sides are, respectively, 66 feet and 198 feet, or 4 rods and 12 rods.

NEW BOOKS AND PUBLICATIONS.

THE ILLUSTRATED ANNUAL REGISTER OF RURAL AFFAIRS and Cultivator Almanac for the Year 1874. With 150 Engravings. Price 30 cents. By J. J. Thomas, Editor of the "American Fruit Culturist," etc. Albany, N. Y.: Luther Tucker & Son, 395 Broadway.

THE FLASH LIGHT TELEGRAPH, or Telegraphing Made Easy. By M. Gustin. Troy, Pa.: Gazette Office.

A code of signals for telegraphing by means of lights!

LECTURE ON PHYSICAL ASTRONOMY. Delivered before the Austin Library Association. By Matthew Hopkins.

Mr Hopkins proposes to war with faith in the hypotheses of Newton and "strikes Baal in his temple, with mailed hand armored in triple steel." We quit reading this pamphlet, which is a miracle of discursiveness and vagary, with wonder as to how long the author could continue in the same style without approaching his subject.

PHARMACOPŒA GERMANICA: The German Pharmacopœia. Translated by C. L. Lochman. With an Appendix explanatory of the French Metrical System, and Tables of Weights and Measures, etc. Philadelphia, Pa.: David D Elder & Co., 430 Market street.

The preparation of a German pharmacopœia, to take the place of the numerous and widely different text books so long used in the different countries of that empire, has recently been completed; and Mr. Lochman publishes a translation of it, believing with reason that its completeness and recent date will make it valuable to the American druggist.

THE SCIENCE OF HEALTH: a new Monthly, devoted to the Restoration and Preservation of Health on Hygienic Principles. Amply Illustrated. Volume III, July to December, 1873. New York: S. R. Wells, 389 Broadway.

Our readers' attention has frequently been called to this useful periodical, not only in this column but by the numerous extracts from its pages, wherein is found much matter of value to the housekeeper, as well as sound information and advice on the specialty to which it is dedicated. We especially commend it to the attention of young people of both sexes, whose carelessness on the subject of hygiene is often fraught with the most dangerous consequences.

THE GALVANOMETER AND ITS USES: a Manual for Electricians and Students. By C. H. Haskins. With Illustrations. New York: D. Van Nostrand, 23 Murray and 27 Warren streets.

This is an exceedingly neat little work, in pocket book form, containing the laws and rules of measurement of the quantity and tension of electric currents together with tables and formulæ. There seems to be nothing omitted from it that a telegraphic engineer, engaged in making measurements and calculations, could possibly need.

THE VIENNA EXPOSITION EXHIBIT OF KRUPP'S STEEL WORKS, Essen Prussia.

Messrs. Thomas Prosser & Son, of 15 Gold Street, in this city, agents for Fried Krupp, have forwarded us a photograph of the world-renowned steel works together with a catalogue of the articles exhibited by the firm at the recent Vienna Exposition. Forty-one different specimens were there shown, ranging from small parts of mechanism to a cast steel block weighing 52½ tuns. The pamphlet also contains a description of the works, calculated to give an idea of their successful administration as well as of their unprecedented extent.

THE AQUATIC MONTHLY has recently changed publishers, and is now issued by August Brentano, the very enterprising dealer and importer of foreign periodicals, No. 33 Union Square, New York. The editorial management remains unaltered, and hence lovers of aquatic sports may rely on their representative journal being conducted with the same ability which has characterized it from the outset. The December number before us is full of fresh and interesting news about boating, yachting and athletic pastimes, together with much entertaining correspondence from the pens of writers evidently *au fait* in all matters concerning our amateur marine. Subscription price, $4.00 a year.

SCRIBNER'S MONTHLY for January contains a ludicrous burlesque scientific story about the great air line to the moon, adapted from the French of Jules Verne. With just enough scientific truth to give the narrative a semblance of fact, and with much detail, the plan for shooting a hollow projectile, out of a gun 900 feet long and six feet thick, sunk in the earth, is described; and a number of engravings, one showing the interior of the shell with the voyagers inside, are added. Huge telescopes, the writer says, are built and at the appointed time, 140,000 pounds of gun cotton are ignited under the projectile; the latter departs, but after several days' waiting, the big telescope observer on the Rocky Mountains discovers that its movement has been changed to a circular motion of great velocity, and it describes an elliptical orbit, distant 2,833 miles from the moon, of which it has become a satellite. The magazine presents its usual varied and excellent table of contents, and offers a rich treat in the way of articles and poems from eminent writers, among whom we note J. A. Froude, R. H. Stoddard, John G Saxe, Bret Harte and others. Published by Scribner & Co., 654 Broadway, New York. Subscription, $4.00 a year.

OUR old friend the ECLECTIC MAGAZINE begins the new year and its nineteenth volume (new series) with a number brimfull of good things, selected with excellent discrimination from foreign and American periodicals. Those interested in Lieutenant Steever's present explorations in Palestine will find, in the paper on the "Land of Moab," some valuable information concerning that famous country. "Spanish Life and Character" is another article of timely interest, and the serial Russian novel, "Spring Floods," is continued. There is a monograph on Lafayette, a few choice poems, and numerous papers of merit on general topics, besides the usual editorial miscellany, and an initial steel engraving. E. R. Pelton, publisher, 108 Fulton Street. Subscription price, $5.00 a year.

ST NICHOLAS is unquestionably the best children's journal that has yet appeared in this country; and we can say so with all the more certainty since it has been consolidated with that standard juvenile periodical OUR YOUNG FOLKS. Messrs. Scribner & Co., of 654 Broadway in this city, conduct the new paper, and if their wish for 100,000 readers among the youngsters is not fulfilled it will be through no fault of theirs. The holiday number is elegantly printed, exquisitely illustrated, and as for the stories—well, Science had to stand aside for a while, until we had read them and enjoyed them ourselves. There is something for everybody: tales of adventure for the boys, fairy yarns, a funny story in easy French, and even a couple of pages of big print and short words which the pet of the household can spell out for "her own self." It will make an admirable Christmas present. The two back numbers for this year and the magazine for 1874 fourteen copies in all, will be sent for $3.00.

THE ATLANTIC MONTHLY has changed publishers, and is now issued by Messrs. H O Houghton & Co., 219 Washington street, Boston. The number for January is remarkably attractive, and will be of especial interest from the fact of its containing the last writing of the late Professor Agassiz—a paper setting forth his convictions on the Darwinian theory, and beginning a series of which his death has prevented the completion. We note poems by Whittier, Holmes, and Bayard Taylor, a thoughtful and able paper on local taxation by the Hon. David A. Wells, and a very curious article on the origin of the $ (dollar mark), which is said to be the oldest symbol known to the human race. Subscription price, $4 a year.

THE GALAXY for January opens with a paper on the Duke of Argyll by Justin Macarthy into which is condensed considerable information regarding apparent anomalies in the English peerage. Call Benson discourses on Physics. Impediments to Social Success,' and Richard Grant White contributes a scholarly paper on 'Linguistic and Literary Notes and Queries.' J. S. Black criticizes Hon. Charles Francis Adams' Seward eulogium with even greater sharpness than is found in the recently published strictures of Gideon Welles. The number contains the usual amount of table talk and entertaining miscellany. Subscription price, $4 a year.

DECISIONS OF THE COURTS.

United States Circuit Court—Northern District of Illinois.

PATENT MACHINE FOR PRESSING AND STAMPING SHEET METAL.—REVOCATION OF PATENT.—FRANK STURGES, OLIVER H. LEE, AND WILLIAM S. POTWIN *vs.* ISAAC VAN HAGEN.

This cause having come on to be heard upon the bill of complaint, answer, and replication herein, and the proofs, documentary and written, taken and filed in said cause, now, therefore, on consideration thereof, and on motion of N. C. Gridley, counsel for complainant, it is ordered, adjudged, and declared, and the Court doth hereby order, adjudge, and decree that the Letters Patent of the United States of America, No. 114,068, bearing date April 25, A. D. 1871, and issued to the said defendant Isaac Van Hagen, be, and the same is hereby revoked, vacated, and declared null and void, and of no effect, and that the said defendant Isaac Van Hagen be, and is hereby, divested of all right and interest he had, under and by virtue of said Letters Patent, in and to the "Improvement in Machines for Punching and Stamping Metal" therein described.

And it appearing to the Court from admissions of the parties made on the hearing, that said defendant is the sole owner of said patent, it is further ordered, adjudged, and decreed that the same defendant, Isaac Van Hagen, do, within sixty days from the date hereof, surrender and deliver up to the clerk of this court, the said Letters Patent No. 114,068. And thereupon the said clerk shall write with ink across the face of said Letters Patent the words "revoked, vacated, and declared null and void by the Circuit Court of the United States of America for the northern district of Illinois," and shall then transmit the said Letters Patent, so canceled, properly enveloped, to the "Secretary of the Interior of the United States of America, Washington D. C." And it is further ordered, adjudged, and decreed, that the record of the said Letters Patent, No. 114,068, be canceled, quashed, and annulled.

And it is further ordered that the clerk of this court, after the expiration of sixty days from the date hereof, do transmit to the Secretary of the Interior, Washington, D. C., a certified copy of this decree.

And it is further ordered, adjudged, and decreed that the said complainants do recover of the defendant their costs and disbursements in this suit to be taxed.

NOTE.—The above decision of the United States Circuit Court appears to be confirmatory of the action of the Commissioner of Patents in 1872 in setting aside the claims of Van Hagen.

This case appears to have been a deliberate attempt, by a party who was not the inventor, to obtain and hold a patent for an invention which rightfully belonged to another. It is rare that such attempts are made, and in general they ignominiously fail, as in this case.

The original decision of the Commissioner, giving the various facts, will be read with interest, and we therefore present it in full.

HUNTINGTON *vs.* VAN HAGEN.—*Interference.*

[*Appeal from the Board of Examiners-in-Chief in the matter of the interference between the application of Frederick M. Huntington, filed June 25, 1872, and Letters Patent No. 114,068, issued to Isaac Van Hagen, April 25, 1871, for* MACHINE FOR PRESSING AND STAMPING SHEET METAL.—*Decided July 25 1872.*

LEGGETT, *Commissioner:*

The invention in controversy is an attachment for a machine used in the manufacture of sheet metal covers for cans, boxes, etc. The question at issue is not which party made the invention first, but which invented the device. There is no pretense that each invented the device independently of the other. Each swears positively that he made the invention and disclosed it to the other. The language of each is so positive, and the detail of each is so minute and particular, yet so directly antagonistic, as to leave no doubt but one or the other of the parties has deliberately committed perjury. As there is no direct attempt to impeach either, the testimony of one offsets the other, and that of neither has any value in the case except so far as it is corroborated by other testimony.

At the time the invention was made, both parties were employed in the shops of Frank Sturges & Co., in Chicago—Van Hagen as general superintendent, and Huntington as foreman of one class of work.

Van Hagen claims to have conceived the invention in May, 1869, and says that he very soon afterward explained it to his attorney. In this statement he is fully corroborated by his attorney, but by no one else—not even by the other witnesses called by himself. The attorney only testifies as to the time that Van Hagen consulted him, and fixes that time in the summer of 1869. He made a record of the matter in his books; but all of his books and records were burned in the Chicago fire last October. He therefore testifies only from memory.

Huntington claims to have had the idea of his invention as early as April or May of 1868, and that in 1869 he explained it to Harding and Wright, two men who worked in the same shop with himself. He also swears that early in the spring of 1870 he took Van Hagen to a Fowler press in the shop and explained to him the invention and how to attach it to the press. Soon after this Huntington commenced the construction of the device. The draftsman, the pattern maker, and several other workmen in the shop testify that they received all their instruction and direction from Huntington, and that Van Hagen gave no directions except in the capacity of general superintendent. He told them to follow the instructions of Huntington in this matter. During the whole of this time the invention was talked of all through the shop as Huntington's. Even Van Hagen spoke of it as Huntington's invention, and advised Frank Sturges & Co. to pay Huntington one hundred dollars, in addition to his regular salary, for making the improvement to the Fowler press, and the money was handed to Van Hagen to pay to Huntington. It seems that Van Hagen never, to any member of the firm or to any one about the shop, spoke of the invention as his, until after he had obtained a patent for it. The only person to whom he ever disclosed the fact that he had made an invention was his attorney. If the conversation with his attorney had been in the summer of 1870, instead of 1869, then Van Hagen's claim to the patent would rest entirely upon his own testimony, contradicted by Huntington, who is abundantly sustained and corroborated. If the invention was Van Hagen's, why did he not claim it when it was being constructed in the shop, and when all the men talked of it as Huntington's? Why did he tell Mr. Sturges and Mr. Potwin, members of the firm, that it was Huntington's invention, and induce them to pay Huntington one hundred dollars for making it? I cannot resist the conclusion that Van Hagen never knew or thought of the invention until Huntington explained it to him early in 1870, and that his talk with his attorney about it was in 1870, instead of 1869. The attorney speaks too positively as to dates. It is one of those things in which a man is most liable to be mistaken. He conversed with this client as one of many, and it is not at all strange that he should be mistaken as to the year. Early in 1870 Huntington explained his invention to Van Hagen. Van Hagen recognized its value, and went to his attorney and represented it as his own. He attempted to explain it, but did not know enough about it to make it intelligible, for the attorney swears that he could not understand it from his first explanation. He then waited until Huntington had finished a working machine, when he was able to comprehend it sufficiently to explain it intelligently to his attorney, and the attorney gave him his opinion that it was patentable.

I am clearly of the opinion that the invention belongs to Huntington. The decision of the Board is therefore affirmed, and priority awarded to Huntington.

COMMISSIONER'S DECISIONS.

INTERESTING DECISION IN RELATION TO ASSIGNMENTS OF PATENTS.—HOLMES AND SPAULDING.—*Reissue.*

[*In the matter of the application of Daniel Holmes and John Spaulding, for reissue of patent No.* 19,465, *dated February* 23, 1858, *reissued May* 13, 1862, *No.* 1,307, *and extended February* 27, 1872. *Subject,* CARPET BEATING MACHINE.—*Decided December* 4, 1873.]

LEGGETT, *Commissioner:*

The question has been raised under Rule 63, in making up the file of his application, whether all the parties in interest have joined in the application. The inventors were Joseph Harris and Daniel Holmes. Previous to the grant of the patent, and on the day of making application therefor—to wit, the 15th day of December, 1857—they executed an assignment of the invention to Holmes, and requested that the patent be issued to him, which was done. The question is whether that assignment conveyed the extended term of the patent, which has recently been obtained. If it did, then this application is concurred in by all the parties in interest; and if it did not, then Harris or his assignees now have an interest, and should be joined.

The Supreme Court of the United States, in *Nicholson Pavement Company vs. Jenkins* (*Official Gazette*, vol. 1, p. 465), said: "An assignment of an interest in an invention secured by Letters Patent is a contract, and, like all other contracts, is to be construed so as to carry out the intention of the parties to it. * * * There is no artificial rule in construing a contract, and effect, if possible, is to be given to every part of it, in order to ascertain the meaning of the parties to it."

A deed assigning in terms all one's right, title, and interest in a *patent*, it is well settled, does not convey the extended term. It must be expressly conveyed; and the intention to convey it must appear from the language of the deed, or it will not pass. But both the legal and equitable interest in the extended term may be conveyed before the extension has been granted. (*R. R. Co. vs. Trimble*, 10 Wallace, 367,) and probably also before the grant of the patent.

I know of no case in which the mere assignment of the *invention* or *improvements*, either before or after the grant of the patent, has been held to convey the extended term. Something more explicit is required. In both the cases before the Supreme Court, above cited, in which it was held that the respective assignments there under consideration conveyed the extension, the language fully and clearly indicates an intention to convey it. The patents had been granted, and the words in the granting clauses, after conveying the patents, expressly conveyed all future interests in them which might accrue to the assignors.

The following sufficiently exhibits the assignment in this case:

"And whereas Daniel Holmes aforesaid has agreed to purchase from us all the right, title, and interest which we have or may have in and to the said Letters Patent to be granted therefor, and has paid to us, etc.

"Now, therefore, this indenture witnesseth that for and in consideration of the said sum to us paid we have assigned and transferred, and do hereby assign and transfer to the said Daniel Holmes, the full and exclusive right to all the improvements made by us, as fully set forth and described in the specification which we have prepared and executed preparatory to obtaining Letters Patent therefor. * * * And we hereby authorize and request the honorable Commissioner of Patents to issue the said Letters Patent to the said Daniel Holmes, as the assignee of our whole right and title thereto."

Taking this whole deed together, in accordance with the rule stated by the Supreme Court, above referred to, so as to give effect, if possible, to every part of it, I think it quite clear that there is no intention exhibited to convey, and therefore that there was no conveyance of, the extended term. The only words which, without qualification, might clearly indicate such an intention are the following in the recital: "And whereas Daniel Holmes aforesaid has *agreed to purchase* from us all the right, title, and interest which *we have or may have* in and to *the said invention, and* in and to *the said Letters Patent* to be granted therefor."

Then follows the granting clause, conveying "all the *improvements* made by us, as fully set forth and described in the specification, preparatory to obtaining Letters Patent therefor."

Were this all, the effect of the instrument might, perhaps, be a matter of doubt; but then follows what was evidently intended as the *habendum*—always of importance in aiding a proper construction of the granting part of a deed—which clearly specifies that Holmes is to hold as assignee the "*patent*" merely. This limitation of his interest is apparently in conflict with the language of the recital; but it may be harmonized with that language by construing the words "*or may have*," in the recital, as referring to the patent which was about to be obtained when the assignment was made. Either that must be done or the *habendum* must be ignored, which must be contrary to both law and reason.

I think Harris or his assignee has an interest in the extended term, and should join in this application for reissue.

Recent American and Foreign Patents.

Improved Ash Sifter.

Levi Marsh, South Adams, Mass.—This invention is an improved ash sifter so constructed that the coal may be sifted without the escape of the fine ashes through the room. The box is provided with a close cover supported upon legs, so that an ashpail may be placed beneath to receive the ashes which are allowed to escape through a hole in the bottom by drawing out a slide. In one end of the box is a spout through which the coal may be allowed to escape by drawing up another slide. In using the sifter, the ashes and coal to be sifted are poured into a sieve within the box, and the handle of a shaking rod is moved back and forth quickly. When the ashes have been all shaken out, the rod is turned slightly, causing the forward end of the sieve to drop, so that a fastening of a door comes in contact with the inner end of the spout. The door thus becomes unfastened, allowing the coal to escape through the spout into the receptacle placed beneath. As soon as the coal has been discharged, the slide is inserted, and the sifter allowed to stand until the ashes have all settled. The slide is then withdrawn and the ashes allowed to escape into the receptacle placed beneath the sifter. The door is then refastened, and the sifter is again ready for use.

Improved Hemmer for Sewing Machines.

William Lee Apthorp, Tallahassee, Fla.—This invention consists of a hem-turning scroll for the edge of the cloth, permanently attached to the ends of a piece of wire, which constitutes the frame by which said scroll is supported and attached to the machine. On this a scroll guide for the fold of the cloth is fixed so as to slide toward and from the edge-turning scroll to suit the width of hem required.

Improved Method of Burning Brick.

Tobias Billesbach, Kearney Junction, Neb.—This invention is a method of burning layers of bricks in a kiln by plastering up successive portions of the sides of the kiln, beginning at the bottom, and continuing it at intervals toward the top as the burning advances. If the kiln is continued to a considerable length, the burning of one part will be completed, the bricks removed, and a new kiln commenced while another part is being finished, thus making the operation continuous.

Improved Adjustable Scaffold.

John Dillon, 424 Fourth avenue, New York city.—The two parts of the extension truss are hinged together near the top so as to fold up and be easily detachable as necessary in the application of the parts. The tops of the halves are united by laterally connecting boards and a hinged board, which fits over the recess formed at the adjoining top ends of the parts. The recess is lined with metal plates, and serves to hold a vertical cross board, passed through the same, which projects at both sides of the truss and supports the boards connecting with the next truss. Strong bolts are inserted through the top boards for retaining the longitudinal pieces on which the framework or platform connecting the trusses is laid. The front and rear parts are inclined toward each other, so as to brace the top, and both parts may be extended to and adjusted at different hights. When the truss is folded up, the boards connecting the trusses may be secured between the steps of the front part, serving thereby as support for paint pots and other implements. In similar manner, either half may be used as a suspended platform for painters, for painting the outside of houses, while the detached front part may be applied as an extension ladder. In its common form it is also used as a step ladder.

Improved Guano and Seed Distributer.

James H. Boyd, Plain, S. C.—A tubular plow stock extends downward from the beam in the ordinary way. Said beam is mounted on a wheel and carries a hopper for the seed, said hopper being mounted in front of the handles, and sufficiently above the beam to admit the shaking and distributing shoe under it. This shoe is arranged to discharge into the stock at the top, and is actuated by a rattle staff and pins on the side of the wheel. The furrow can be made any required depth, so that cotton seed may be planted in the furrow above the fertilizers deposited at the bottoms.

Improved Clock Escapement.

Aloys Platt, New York city.—There is a spring-pressed swinging bar that engages the scape wheels, provided with a side stud, operated by an arm which disengages a pallet for the scape wheels. The bar which carries the arm is pivoted to the frame connected to the pendulum through a slot, and carries a pallet at its lower end, which receives the impulse of the escapement wheel, and transmits it to the pendulum. Immediately after the pallet has received the impulse of the scape wheel, the latter is arrested by the first pallet, and the pendulum bar swings back to the right, the pallet passing over the teeth of the wheel, which are held while the wheel stands, so that they do not cross the path of the pallet. The arm has a pin, going through a vertical slot in the bar, to hold it at the right position for striking the stud, and limiting its rise when it escapes from said stud, which it does by swinging upward, the point being thrown up by the inclined face of the stud upon which it strikes. The hight at which the point of the arm will strike the stud and from which it will escape to regulate the action may be varied.

Improved Cultivator Plow.

William Bagnall, Otsego, Ohio.—To the foot, a little in the rear of its middle point, is secured, or upon it is formed, the lower end of the forward standard, the upper end of which is secured to the beam. In the upper side of the forward part of the foot is formed a shoulder for the forward end of the plow plate to abut against. From the shoulder the upper side of the foot curves slightly upward, said curve being continued upon the lower part of the standard to form a seat for a smaller or weed-cutting plow. The standard is made with an offset to form a seat for the upper part of the larger or dirt-throwing plow, the lower end of said plow fitting and resting against the shoulder of the foot. The plows are secured to their seats upon standards. One plow is thus low, so as to pass beneath the soil, cutting off the weeds and grass, but leaving the surface of the ground almost entirely undisturbed, and throwing no soil around the plants. The other plow, from the greater hight of its rear end and the greater flare of its wings, throws the soil around the plants. By this construction, the plows being made wide, a single plow is enabled to do the work of two or more small plows.

Improved Locomotive Smoke Stack.

John V. Bishop, Atlanta, Ga.—The ordinary funnel-shaped stack is reenforced in the upper portion with a lining to sustain the wear of the hard particles of coal which are projected against it in being deflected from the direct escape. It is made removable. The cover has the ordinary short discharge tube extending below to conduct the smoke from the interior to the holes in its sides, with which are arranged short tubes to receive the cinders rounding off from the top of the stack toward the discharge passages, and prevent them from being carried through the holes with the currents of smoke and steam. By this means the holes may be made much larger than they otherwise could be, and the escape of the cinders is prevented. In the space between the top and the upper end of pipe are vertical curved tangential plates for imparting a spiral motion to the escaping vapors which tends to increase the draft by preventing them from being thrown directly against the wall of the stack, by which they are abruptly stopped.

Improved Railway Joint Stiffener.

Horace Harding, Tuscaloosa, Ala.—This invention relates to means whereby the rails may be held down securely at the ends, and consists in a bar held to the tie that supports rail joint, parallel to the rail and at same distance from it. It is cheap, easily applied, and thoroughly effective for the purpose intended.

Improved Fiber Disintegrator.

A. Berthet and P. Laberie, New Orleans, La.—This invention consists of a platform having two horizontal rollers, arranged one obliquely above the other and each carrying upon its surface oblique sectional blades. A double grooved wheel of perpendicular axis presents its periphery close to the point of contact of the wheels at each end. A belt passing around both wheels has intermediate regulating pulleys. The plant is fed into the groove and held by the band, then drawn by the roller blades and finally dropped on the side of the wheel opposite the feeder.

Improved Stuff Regulator for Paper Machines.

David Hamel, Holyoke, Mass.—This invention consists of a tank, a float, and valves or gates, so contrived that, by passing the stuff of which paper is made through it, as said stuff goes from the main holding tank or reservoir to the moving screen upon which it is spread for forming it into sheets, the flow will be regulated according to the proportion of pulp to water, so that the sheets will be uniform in thickness throughout their length. As the stream thrown by the pump is constantly the same, the variations in the hight of the float are caused by the variations in the thickness or consistency of the stuff; and said float being connected to the valves the latter self-actingly regulates the quantity spread upon the screen with great uniformity. They are used to shut off all the flow to the apron, and cause it all to go back to the tank, or to shut off the return to the tank entirely and cause it all to flow to the apron. For allowing the stuff to flow both ways, they are adjusted on the half stroke.

Improved Automatic Lubricator for Car Axle Journals.

Joseph G. Johnson, Elkton, Md.—This invention consists in an open-ended oiler frame arranged to slide and be supported on shelves in axle box and over an oil reservoir forming part of axle box. The oiler can thus be examined and supplied easily with wick without removing the reservoir.

Improved Automatic Water Meter.

Francisco De Paula Bellido, New York city.—The body of the meter is divided into two compartments, the upper being the smaller. The water enters the latter division; and to the valve plug of the pipe is connected a faucet, the handle of which communicates with a float. By this construction, as the water rises in the chamber, it raises the float, and this closes the faucet, stopping the inflow of water. A fine wire gauze screen shuts off a part of the chamber, in the bottom of which is formed the discharge orifice through which the liquid escapes from the chamber and flows into the lower compartment. The bucket that receives the water has its ends made in the form of isosceles triangles, with the third sides longer than the others. The side edges of the bottom plate of the bucket are bent upward a little, and to the outer sides of the flanges thus formed are attached small boxes into which water is admitted from the bucket through slots. The bucket is divided into two compartments, and to the bottom is attached a shaft, the ends of which work in bearings in the lower ends of bars. The bucket is provided with supports so that when either compartment is turned downward, the bucket will remain in that position until the upper compartment has been filled with water, the weight of which will tilt the bucket and discharge the said water into the compartment. By suitable construction, by adjusting the set screws, the amount of water required to tilt the bucket may be regulated with the greatest accuracy. The inflow of water into the boxes insures the prompt tilting of the bucket when the exact amount of water has been received. To one end of the bucket, a little at one side of its pivoting point, is pivoted the lower end of a connecting rod, the upper end of which is connected with the operating mechanism of an ordinary register, attached so that it can be conveniently seen; and it is covered with a case, so that it cannot be tampered with. By this arrangement each movement of the bucket, and consequently, the exact amount of water passing through the meter, will be accurately measured and registered. When the water in the lower chamber has reached the depth for which a float therein has been adjusted, the said float rises, which forces the plug into a connecting pipe, preventing the flow of any more water from the upper into the lower chamber until the water has been drawn out of the latter.

Improved Pantaloons Stretcher.

John D. Ryan, New York city.—This invention has for its object to furnish a device for stretching pantaloons to remove the bagging at the knees and the wrinkles in the other parts caused by wear, so that the pantaloons may be made perfectly smooth. There are two rods, of a length about equal to the length of the legs of the pantaloons to be operated upon, the upper ends of which are secured to the ends of two lower arms of a three-armed block. Spring rings are passed through slots in the lower part of the rods, several slots being formed in said rods, so that the rings may be adjusted according to the length of the legs of the pantaloons. The rings are held in place by spring catches, similar to the spring catch of an umbrella runner. In the upper arm of the three-armed block is formed a screw hole to receive the screw, which is made with a cross head for convenience in operating it, and the upper end of which is swivelled to a nut which receives the lower end of a rod, which carries an open spring ring, which is made of such a size as to fit the waist of the pantaloons. The rings are designed to be covered with cloth, so that the bottoms of the pantaloon legs and the waistband may be conveniently pinned to them; then, by turning out the swiveled screw, the pantaloons may be stretched.

Improved Loom Shuttle.

Nathan D. Chapman, Rollingsford, N. H., assignor to himself and Horatio H. Warren, of same place.—This invention relates to split shuttle spindles, and it consists of a twist of about half a turn in the two parts to the left near the point, by which the pressure of the cap on said parts along the middle portion swells them out at the twist, so as to bind the cap at the point to effectually prevent it from being thrown off by the shocks to which it is subject in the loom. When the point of the cap has been woven off the reaction of the two parts of the spindle along the middle is sufficient to hold the remaining portion.

Improved Apparatus for Burning Hydrocarbons.

Charles H. Cushing, Tidioute, Pa.—A heavy circular iron pan has a raised outer rim, and a less raised inner rim, around a small central orifice through which the steam or air blast is admitted from a suitable conduit pipe. The oil or other fluid is admitted through an orifice in the outer rim, and its supply regulated by means of a stopcock of the oil conducting pipe. The oil will flow from the orifice over the pan and fill the same to the hight of the inner rim over which the surplus will flow, to be thence carried up by the steam or air blast coming through the orifice. The fluid is thereby divided into fine particles and thrown, intermixed with steam or air, against the top and bottom of the boiler, ready for almost instantaneous combustion.

Combined Carpet Bag Looper and Button Hole Cutter.

George W. Morris and William Lenhart, Corry, Pa.—This invention relates to the manufacture of rag carpets, clothing, etc., and consists of a device for looping the strips of rags together in the process of preparing the rags for the loom, and for cutting button holes. The knife is pointed and double edged at the top, and an adjusting bar is jointed thereto near the upper end. An arm is attached to and extends laterally from the blade, curved to correspond with the arc of a circle, and having a series of holes therein. By a pin which enters these holes, the bar may be adjusted and confined near to or at a distance from the blade. The operator (with a strip of rag in each hand) laps the end of the left hand rag over the end of the right hand rag, and then forces the looper through them. He next puts the back end of the under or right hand rag through the eye. The rags are then detached from the looper with the left hand, and with the right hand he pulls the end of the under or right hand rag through the slits made, which completes the operation.

Improved Beer and Ale Faucet.

John Deasey, Fall River, Mass.—A tube has a screw thread on one end to screw into the tap hole in the barrel, and also a packing cap on the other end, and a cock attached to one side near the end having the cap. A wooden rod in said tube extends from the inner end through the cap. A collar on this rod bears against a ring of packing to prevent leaking at the hole in the cap. A spring inside of the tube bears against the inner end of the collar to press it against the packing. To apply this faucet, the plug with which the tap hole is closed is first driven by a rod and hammer about as far as it can be without letting the beer escape. The faucet is then screwed in up to the plug, and the plug is driven entirely in by a blow on the projection of the rod, and the faucet is screwed up tight.

Improved Manufacture of Sulphuric Acid.

Joseph Saunders, Brooklyn, N. Y.—This invention consists of hollow glass balls, of about 6 inches diameter, for sulphuric acid condensing towers, known as "Gay-Lussac's towers," to be used in substitution of the coke earthen balls, and other like substances, which are objectionable, because they become disintegrated and crumble to pieces in a short time, whereas glass is indestructible by the acid.

Improved Churn.

George G. Buchanan, Cotton Plant, Miss.—The upper end of the dasher shaft is secured to the lower end of a short metallic tube, into the upper end of which is detachably secured a metallic shaft which revolves in bearings in a cross bar attached to the middle horizontal bars of the churn frame. The shaft is supported by a collar which rests upon the upper side of the bar. The upper end of the shaft revolves in bearings. A small gear wheel is attached to this part of the shaft, and engages with a large gear wheel, to which is attached a horizontal shaft which is rotated by a hand crank attached to a cross bar secured to the frame, and to its outer end is secured the crank by means of which the apparatus is operated.

Improved Sash Fastener.

Orvellas H. Gilbert, Darien, Wis.—The lock consists of an inner and an outer plate, which inclose the operating parts, the bolt being shot through openings in the front and back edges. A spring is confined between the plates of the lock, the outer end of which enters a slot in the bolt. The finger piece is pivoted in the lock. Its long arm extends through the edge, and its short arm enters a recess in the lower edge of the bolt. A spring pawl enters a recess in the bolt and prevents its back motion. When the sash is locked, the bolt is shot into a recess of the casing, in which position it will remain until the pawl is raised out of the recess. To raise the pawl, a key is used, so that the bolt can be withdrawn by a down pressure on the long arm of the finger piece. When the bolt is withdrawn, the sash may be raised to any recess in the casing which will receive the bolt. Any upper recess will be so constructed that the bolt will not throw a full stroke, and consequently will not lock, as it is unnecessary to lock the sash, except when it is down or very near down. It may be locked so as to leave an opening to admit air but exclude burglars.

Improved Fire Escape for Safe.

Charles Morgan, Philadelphia, Pa., assignor to himself and Frank Manning, of same place.—This invention is a device by means of which a safe may be automatically made to descend into a well upon the breaking out of a fire in any store of the building. The safe is placed between two or more guide posts between which it slides up and down, which posts lead down through the various stories of the building to a well in the ground below all draft. To the sides of the posts in the story where the safe is to be located, are attached ratchet bars, and to the sides of the safe are pivoted spring pawls in such positions that their engaging ends may take hold of the teeth of the ratchet bars and support the safe. Spring hammers are attached to the sides of the safe in such positions that when released they may strike against the free ends of the pawls and withdraw their engaging ends from the ratchet bars. Lever catches are also arranged in connection with buttons, which may be turned down upon them and thus prevent the hammers from being accidentally released. Connected with the catch levers is a yoke to which is attached a cord, which passes over guide pulleys attached to the ceiling, and passes through the various stories of the building to the lower one, where its end is secured. If, now, a fire should break out in any story through which the cord passes, the said cord will be quickly burned off, releasing the catches and hammers which strike the pawls, withdrawing the engaging ends of said pawls from the ratchet bars, and allowing the safe to drop. The safe may be provided with a fire brick cover which when the safe has dropped to a place beneath the draft, will protect it from any fire even should the said safe be made of wood.

Improved Shank Laster.

William Hamilton Hanna, Chico, Cal.—This invention consists of a pair of nipper jaws, a screw-threaded shank, nut-bearing piece, and a strap, all so combined and arranged that, the bearing piece being placed against the sides of the last, the jaws engaged with the edge of the upper and the strap wound partly round the shank and fastened at the center of the heel or thereabout, the shank of the upper can be stretched up very powerfully to the last by turning the nut. The nut has a crank for the purpose, and the jaws can be shifted along the upper, and from side to side readily to stretch the upper in all parts without disconnecting the strap from the last.

Improved Testing Plug.

John Allin, Philadelphia, Pa.—The object of this invention is to furnish to coopers and others an improved plug for testing barrels and other air-tight cooper work or packages, by which the compressed air is automatically retained in the barrels, leaving both hands of the operator free to handle the barrel, examine it closely, and stop the leaks without allowing the air to escape. The invention consists of a conical tester, with a central hole provided with a check valve, by which the air remains compressed in the barrel until all the leaks are plugged. The valve seat is screwed to the end of the plug, and admits the free passage of the air to the barrel. The blowing of the air into the barrel is rendered less fatiguing by the immediate closing of the valve.

Improved Hasp for Butter Tubs, etc.

Henry C. Carter, New York city.—The ordinary fastenings of hasps consist of a stick or wire passed through a fixed staple, and such fastenings, in the process of transportation, become unlocked. This improvement is claimed to overcome this difficulty, as the weight of the metal in the staple below the pivot constantly tends to keep the staple in the locked position. As a further security against the unlocking of the hasp, the plate of the latter is made with a slight convexity, so that it will form a spring, and thus tend to press outward against the contiguous surface of the staple, and prevent the latter from displacement. The hasp plate has also a slight recess, and the lower extremity of the pivoted staple has a projection which falls into the depression when the staple is turned into the locked position.

Improved Car Coupling.

William A. Cochran, Flat Rock, Ind., assignor to himself and James T. Burch, same place.—The coupling pins are pivoted in mortises in the drawheads so that they can turn to a position parallel with the latter, but hang vertically when in their normal position. The link is of the common old-fashioned kind, and passes into the drawheads in recesses, which are at right angles with the mortises, but also parallel with the drawheads. The draft of the link is on the pivots and against the ends of the mortises. A block, of either wood or metal, is made to fit into the mortises, and to fill the space between the pin and the end of the mortise and hold the pin in a vertical position. A notch in the block, which receives the end of the link serves to hold the link in a horizontal position in the drawhead, which is at rest, so that it will readily enter the approaching drawhead. In coupling, the end of the link strikes the loose pin, and pushes it back to nearly a horizontal position, when it drops into the link by its own gravity, and the cars are coupled.

Improved Billiard Table.

Samuel H. Waldie, Belmont, Tex.—The object of this invention is to construct a billiard table, in combination with a Jenny Lind table, so that either game may be played thereon, to the great convenience of parties in smaller places, without additional expense. It consists in providing the billiard tables with a false bar at one end, which covers the apertures for the balls used in the so called Jenny Lind table, which bar can be taken up and arranged as the head board, having the requisite numbers painted on the under side.

Improved Combined Picture Frame and Exhibiter.

Benjamin Anyan, Fitchville, Ohio.—The object of this invention is to construct a picture frame in such a manner that a series of pictures may be combined and exhibited consecutively therein to be used as a cheap and convenient method of framing lithographs, photographs, etc., which combines the advantages of a picture frame with a photograph album or other collection. The invention consists in providing the back of the frame with brackets, between which rollers are supported, on which the pictures, mounted and stitched in the shape of a long strip, are rolled up and carried by suitable guide rollers along the glass of the frame for exhibition, by turning the cranks of the picture rollers.

Improved Railroad Switch.

Charles W. Spayd, Wilkesbarre, Pa.—In this case, the lantern-carrying rod, which is arranged between two parallel rods or bars that form the switch lever and revolves on its own axis, has an arm or finger for holding it in a position to exhibit the signal. The signal cannot be displayed if the switch rails are not in proper position, which tends to prevent accidents. The invention also consists in the use of a locking key with the two-part switch lever for locking it in the vertical or inclined position and preventing rotation of the signal rod except when the lever is moved.

C. H. G. should use the best glue and make it as thick as possible.—J. E. H. Jr. will find instructions on the subject of the engineer's trade on p. 393, vol. 29.—J. H. P. can solder brass to iron with the preparation described on p. 251, vol. 28.—J. F. A. will find a recipe for harness dressing on p. 82, vol. 28.—J. N. F. can combine caoutchouc with glue by dissolving both in ether, free from alcohol. Bichromate of potash can be combined with glue by dissolving both in water.—J. S. T. does not give sufficient data to explain his meaning.—S. A. B. will find full particulars as to the canal boat reward on pp. 96 and 400, vol. 28.—W. T. C. can make a book slate with the blackboard composition described on p. 299, vol. 28.—N. M. should harden his reamers by the process described on p. 315, vol. 29.—S. can waterproof his leather by using a drying oil.

C. W. asks what we mean by the lap and lead of an engine. A. The lap of a valve is the amount the face of the valve is widened beyond what is necessary to cover the port. The lead is the amount the steam or exhaust port is open when the piston is at the end of the stroke.

M. S. asks: 1. What kind of packing is best for the cylinder of a 10 horse portable engine, speed 160 per minute, using very bad water at times? What is the best for the piston rod? 2. What kind of paint will stand the heat of the engine? A. 1. The simplest form of metallic packing will answer, if your cylinder is smooth and truly bored. For the piston rod, if it is round and smooth, any of the various kinds of packing in common use will answer well. 2. There is a black varnish, made from petroleum, that is frequently used for iron work exposed to high temperatures.

W. I. B. asks: 1 What is the analysis of Turkey umber? 2. What is the analysis of *terra di Siena*? 3. On page 324 of your volume XXIX, I find an article on wooden railroads. Is there any such road now in use? If so, where? A. 1. It is an argillaceous brown hematite, containing sesquioxide of iron, silica, water, alumina, and manganic oxide. 2. It contains sesquioxide of iron, alumina, silica, water, lime, and magnesia. 3. There are quite a number of wooden railroads in Canada. You will find details of their descriptions and localities on p. 34, vol. 27.

L. B. asks: How large a boiler is necessary to run a one horse steam pump one hour, by compressing the air at once; and how large a cylinder is necessary to supply the above boiler, the engine running at fifty revolutions per minute? Is there any better way of running a momentum power than this? A. In the use of compressed air in the manner proposed, the pressure would be constantly diminishing, and there would be much difficulty in equalizing the power developed. We think such machines have been devised, however, and, if so, a notice in our "Business and Personal" columns would bring you into communication with the inventors.

J. S. D. asks: If the crown sheet of a boiler is 9 feet long, 4½ feet wide, and 1½ feet high between crown sheet and wagon top, how many square inches are there, and how many tuns pressure are there on the crown sheet at 130 lbs. to the square inch? A. As we understand your question, the crown sheet is curved. Measure its width in inches by a tape line following the curve; multiply this by the length in inches, and by 130, and divide by 2,0 0, which will give you the pressure in tuns.

J. P. asks: 1. How can I make a porous cup for a galvanic battery? Will plaster of Paris be suitable? 2. How can I make a plug of carbon? 3. Is iron wire suitable for the poles of a battery? If not, what kind should I use? 4. What sized wire is best for the above battery? 5. What proportion of acid and water should I use for the exciting fluid? 6. How long will the exciting fluid last before it must be renewed? 7. What is the best mode of cleaning the carbon and zinc, and how often should they be cleaned? 8. How many cells 10 inches high x 6 diameter, with zinc cylinders and carbon plugs, will it take to make a good electrical light? 9. What is the most suitable way of fastening carbon points on the poles of batteries? 10. Is nitric acid the best to fill the porous cup with, and how long will it last before it must be renewed? A. 1. The cup may be made of any porous earthenware. 2. The carbon is generally prepared from coke and soft coal, mixed together and heated in a finely powdered state, being made compact by a concentrated solution of sugar. 3. Yes. 4. This you can only tell by experiment. It should be so large that it does not become excessively heated. 5. This also will be best determined by experiment. 6. It depends entirely upon the work the battery has to perform. 7. The zinc should be covered with an amalgam of mercury. 8. From forty to fifty. 9. Force them into a socket. We advise you to get some good work on the subject of electricity, such as Noad's "Text Book."

J. F. McE. asks: What are the merits of an inverted direct-acting vertical engine, and in what points is it superior to a common horizontal engine? A. Its advantage consists in the small horizontal space occupied. Where space is not a matter of importance, a horizontal engine is ordinarily quite as good.

J. A. asks: Is there any preparation for smoking meat without fire? A. The peculiar compound which gives meat its flavor when smoked is creosote. The flavor imparted by smoking can be imitated by immersing the meat, for a longer or shorter time, in water, brine or vinegar containing creosote in solution. This was probably the secret you mention.

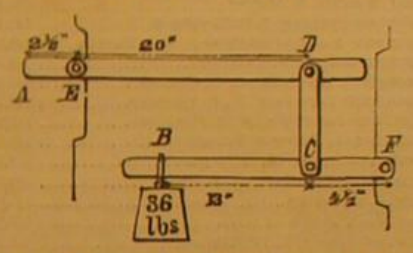
V. S. asks: Which city has the largest population in the world? A. London, England.

E. H. B. asks: Are there not more explosions of upright boilers than horizontal ones? Are not upright boilers made stronger, in proportion to their size, than any other kind? Are there not fewer explosions, proportionally, in locomotives than other boilers? A. We think we can answer yes, in general, to all these questions.

F. E. W. says. 1. I have a boiler which was blown off as usual, when the steam was up, of course, and nothing more was done to it. To preserve it, I have been told to get up steam with the boiler full of water and about a gallon of oil, and then blow it off. Is this necessary, or is there a better way? 2. What will renew the color of blue woolen cloth that has been damaged by strong saleratus water? A. We do not think this plan will be very efficacious. If the boiler can be kept dry, that will be the best way to preserve it. 2. Possibly you can restore the color by the use of lemon juice.

F. W. C. says: I would like an answer to the following questions, that is, if your journal is to be continued, a point on which I feel dubious, as you have incurred the wrath of J. O'K. Murray. I have a stream furnishing 400 cubic feet of water per minute, and a fall of 100 feet in a fourth of a mile. I am using 42 feet of this fall on a turbine but I want more power. Will it be safe and practicable to use 100 feet head on a turbine, or would a water engine be better? I never knew a wheel to have so great a head, and am fearful that the strain would be too great on its bearings. Can you tell me whether water engines are used in this country? A. We think you can use all the head of water with perfect safety. By inserting a notice in our "Business and Personal" columns, you will hear of a number of water engines.

W. McL. asks: What power will the weight (36 lbs.) in the accompanying engraving exert at A? E and F are the fulcra of the compound lever. A. The solution is as follows: $36 \times 13 \times 20 =$ weight balanced at $A \times 4{\cdot}5 \times 2{\cdot}5$; hence weight balanced at A = 832 pounds. It may simplify the question to look at it in another way.



If the point B falls one foot, the point C will fall $4{\cdot}5 \div 13 = \frac{5}{13}$ of a foot, and in so doing will raise the point A $(2{\cdot}5 + 20) \times \frac{5}{13} = \frac{115}{13}$ of a foot. But by the principle of virtual velocities, the power and weight are inversely proportional to the distance moved; hence one pound at B will balance $1 + \frac{115}{13} = \frac{128}{13}$ pounds at A, and 36 pounds at B will balance $36 \times \frac{128}{13} = 832$ pounds at A.

L. W. says: 1. Please give a formula for determining time from an observed altitude of the sun. 2. What is the best practical mode of polishing a set of drawing instruments by hand? A. 1. The apparent time = sun's the hour angle, and the error of the watch or clock = sun's the hour angle + the equation of time − the indication of the watch at the time of observation. The true altitude of the sun = the observed altitude of the lower limb − correction for refraction + apparent semidiameter of the sun + the sun's parallax in altitude. The hour angle is thus calculated: Make S = [270° − (true altitude + sun's declination + latitude)] ÷ 2. Then the hour angle = twice the arc whose sine is $\left[\pm\sqrt{\frac{\cos.(S + \text{latitude}) \times \cos.(S + \text{sun's declination})}{+(\cos.\text{ latitude} \times \cos.\text{ sun's declination})}}\right]$. 2. Use rottenstone and oil.

G. H. B. asks: Will you give me the correct mode of a fire test for coal oil? A. There are instruments made in this city, for the purpose of testing oil. They consist essentially of copper vessels containing thermometers, so that the oil can be heated to the desired temperature, and the test for ignition be applied. You will find a description of a method lately invented in France, on page 358, vol. 29.

C. B. asks: Will you please tell me how many grains of coal it will require, burned in an ordinary locomotive boiler, to melt one pound of snow or ice? It is proposed to melt the snow in streets by superheated steam to be discharged upon the snow. I want to make approximate estimate of the cost of the fuel necessary to do the work. A. This question can only be determined theoretically. The latent heat of liquefaction of ice is about 144° Fah.; and one pound of coal, burned in an ordinary boiler, will develope about 10,657 units of heat. Hence, if the steam acts with perfect efficiency, to melt one pound of ice will require the consumption of about 98 grains of coal.

S. S. C. asks: 1. Is the oxyhydrogen light expensive, difficult or dangerous to produce and manage for magic lantern exhibitions? 2. How does the oxy-calcium light compare with it in these particulars? 3. What has been the usual method of preparing the lime for the oxycalcium light? 4. Would the ingredients for lime cylinders, mentioned in the SCIENTIFIC AMERICAN, for oxyhydrogen lights, answer for oxycalcium as well? A. The two lights are the same. The light is quite suitable for the purpose you mention. Ordinary chalk will answer very well.

G. L. C. says: 1. I propose propelling by steam a boat 16 feet long x 5⅝ feet beam, and intend to use a propelling and steering oar fastened to stern of boat by a clamp hinged as a universal joint. The engine and boiler attached to said oar or propeller are to be made very light. The engine is to be connected by a rubber eduction pipe. Will this be feasible? 2. What style of engine is best for lightness? 3. Is there any flexible material better for this purpose than rubber? 4. About how large should I make the boiler? How thick should copper be to stand 100 lbs. pressure? 5. Is the three cylinder engine patented? If not, would it be right for me to make one for my own use without consulting the builder? 6. Has the moon any influence on the earth's vegetation or animal creation, such as planting corn and other produce, cutting the hair, weaning children, etc.? A. 1. Your plan is probably feasible, but not a very good one. 2. An upright engine will answer your purpose very well. 3. We think not. 4. Your cheapest and most satisfactory plan will be to buy the machinery from a reputable dealer. 5. It is patented. You can build one, if it is not patented in this country. 6. We think not.

W. F. asks: 1 How can I make a simple battery for use in plating jewelry, spoons, etc. either with gold or silver? 2. Can a person get a patent on the emblem of a secret society, to be used on the death of a member? Will the Office recognize such a thing? A. 1. Read description of the Tom Thumb battery in SCIENTIFIC AMERICAN of December 6 1873. 2. You can patent any new ornamental design or emblem See our advertisement about patents in another column.

A. C. M asks. How can I best make gas for working an engine? What is the maximum pressure per square inch that I can obtain? A. There are several machines in the market for the manufacture of gas from naphtha and other light hydrocarbons without the aid of fire. By the use of a pump you could compress the gas until it attained any desired tension.

J. S. M. asks: 1. Would it damage the plates of a boiler to open the blow-off cock before hauling the fire, and let the water be going out while the fires were being hauled, getting the fire all out before the crown sheet became bare? 2. Would it do any harm then to pump in cold water in a half an hour afterwards? 3. When the throttle is closed and the steam is allowed to go down, is it the best plan, when steam is again being raised, to let the throttle be open until the steam works the water out of the pipe? If this is not done, and steam is raised, when the throttle is opened, there is almost always a cracking and shaking of the pipe. I suppose the condensed water is the cause of this; but I should think that, when the water finds an opening it would pass out easily without any noise. Why is it that it does not? 4. Would it be a good plan, when a boiler foams badly, to lead a pipe from the delivery of the pump to the top of the boiler, so as to pump some water to quiet it? A. 1. This is not advisable. 2. It is best to let the boiler become quite cool before pumping in water. 3. Yes. The noise in the pipes is caused by the water striking against them, the steam having first condensed and formed a vacuum. 4. The objection to this plan is that the water would strike against the braces, and might break or strain them.

G. C. J. asks: Would it not be handy if the makers of metal-turning lathes would try a lathe before they send it out of the shop; and when it turns accurately straight, mark the tail stock, and have a scale say 2 inches, 1 inch on each side of the mark? I think it would save time and trouble in a shop. The scale would be handy in turning tapers. A. We have seen lathes marked in this manner. It is hardly necessary however, as any good mechanic can readily adjust the tool.

C. W. M. asks why it is that the frame of a building, or rather the shape of the frame can be plainly discovered through weatherboarding. A building has had three coats of paint, and the weatherboarding is half inch thick. At a distance of twenty-five yards I can easily count every post in the building. A. It is probably owing to the unequal transmission of heat through the different parts of the building, so that some portions are drier than others.

E. D. P. asks: Is there any better substance for cores than common sand? I want something that will dissolve or burn up, and leave the hole in the casting perfect. A. This would be a great desideratum if it could be discovered. Anything that would burn up, however, would prevent the formation of a perfect casting. The only plan would be to use some substance that could be dissolved by a liquid, after the casting was made. We need hardly say that the discovery of such a material seems to be very doubtful.

J. F. W. asks: How can I straighten vulcanite set squares, which have become warped and twisted by exposure to the sun or fire? A. We think your best plan will be to get new ones.

W. C. L. asks: Of what is red shellac varnish made? Will it do for outdoor work, such as wagons and other vehicles? A. Red shellac varnish may be made by dissolving 8 ozs. of the common red lac in 1 quart of alcohol. The best shellac is of a pale color Shellac varnish is used for pictures, metal, wood, etc. and particularly for toys. Copal varnish is the kind used for carriages, wagons, etc.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated.

M. V. M.—Two of your specimens are galena sulphide of lead. The others are sandstone, more or less impregnated with oxide of iron. Galena is often argentiferous or contains sufficient silver to make its extraction profitable. The presence of silver in these ores however can only be accurately determined by a chemical analysis.

R. W. S.—No. 1, galena and iron pyrites 2, argentiferous galena. 3, galena and pyrites. 4, argentiferous galena. 5, pyrites and galena.

H. B.—The specimen you send is bituminous shale It very frequently accompanies coal, and is considered, when found alone, a strong indication of the existence of coal in the vicinity. It often contains mica and iron pyrites.

C. H. D.—Your specimen is iron pyrites, a sulphide of iron, a very common and abundant mineral.

R. W. B. sends a specimen of a fiber, which he states is the product of an insect resembling a spider. He asks as to its value for manufacturing purposes. A. Efforts have frequently been made to utilize material like sample enclosed, but generally without success.

F. C. K.—The water from a coal mine shows the presence of oxides of iron in suspension, and the sulphate of iron and a little free sulphuric acid in solution. The scale is chiefly oxide of iron, containing some sulphate hardened by heat. The presence of these substances shows that the coal contains iron pyrites from the decomposition of which they have been produced. Iron pyrites, or sulphide of iron, when exposed to air and moisture is apt to decompose, the sulphur oxydizing to sulphuric acid, which combines with the oxide of iron, also forming, producing sulphate of iron. This salt contains generally a little free acid, which has evidently been the chief cause of the corrosion of the iron pumps. Pumps made of brass, or better, a composition of copper and tin, will obviate this difficulty. To fit this water for boiler use, the acid must be neutralized, the iron precipitated, and the water filtered. To effect this, the cheapest way is to add a solution of common carbonate of soda, which will precipitate the iron in the state of carbonate. The water must then be filtered. It will then be free from suspended oxide of iron, free acid, and sulphate of iron in solution, but will contain, instead sulphate of soda in solution which, being quite soluble, will not be so liable to form scale as the ordinary salts contained in water. We would advise condensing the escaping steam to avoid the expense of purifying every charge of water to the boiler.

W. J. F. asks what is the composition of the brass used in the government engine work.—C. P. C. asks for a description of a ditching machine suitable for cutting trenches for irrigation.—L. Z. asks how to destroy slugs. Salt will not do it.—W. H. C asks whether the structure of our bodies is such as to render natural the choice of one hand or foot over the other.—G. P. T. asks how snapping gum (a species of candy) is made.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a Telescope of Unlimited Power. By J. L. and by J. T.

On Engines and Boilers. By H. McM.

On Pisciculture. By C.

On the Canal Navigation Problem. By W. B. D.

On an Accidental Discovery. By W. H. R.

On Adjusting Journal Boxes. By W. L. C.

On Dreams. By J. L. W.

On Left Handed People. By G. W. C.

On Mental Arithmetic. By F. H. R.

On the Prismoidal Railway. By G. W. G.

On a Figure Exercise. By A. F.

On Magic Squares. By E. B., and by J. E. W.

On the Nebular Hypothesis. By J. S. L.

On Trees as Historians. By G. P.

On Antiquity of the Earth. By H. V. M.

On a Theory of the Tides. By J. N. V.

Also enquiries from the following:

M. F.—L. F.—E. C. H.—J. McI.—A.—S. W. C.

Correspondents in different parts of the country ask: Who makes small hay presses? Who sells stoves that burn naphtha as fuel? Who makes bars of steel to be used instead of bells? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal" which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

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December 2, 1873,

AND EACH BEARING THAT DATE.

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

27,357.—TABLE CUTLERY.—J. W. Gardner. Feb. 18.
27,392.—FOLDING AND PASTING MACHINE.—G. K. Snow. February 18.
27,405.—STEAM & FIRE REGULATOR.—J. Woodruff. Feb. 18.

EXTENSION GRANTED.

26,339.—WATER WHEEL.—J. P. Collins.

DISCLAIMER.

143,201.—SEAL LOCK.—J. E. Thomas, Buffalo, N. Y.

DESIGNS PATENTED.

7,005.—BUCKLE.—J. R. Smith, Waterbury, Conn.
7,006.—PENCIL CASE.—E. Todd, Brooklyn, N. Y.
7,007 to 7,014.—STOVES.—N. S. Vedder *et al.*, Troy, N. Y.
7,015.—CLOCK CASE.—G. H. Blakesley, Bristol, Conn.
7,016.—STATUARY.—J. Rogers, New York city.
7,017.—FAN.—W. A. Smith, Niagara Falls, N. Y.

TRADE MARKS REGISTERED.

1,545.—DRY GOODS.—Emery & Co., New York city.
1,546.—HARDWARE, ETC.—T. Hessenbruch, Phila., Pa.
1,547 to 1,562.—WATCHES.—National Watch Co., Elgin, Ill.
1,563.—LINIMENT.—I. Vallier, New York city.
1,564.—MEDICAL COMPOUND.—Moyer & Co., Phila., Pa.

SCHEDULE OF PATENT FEES.

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[Specially reported for the Scientific American.]

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA ON DECEMBER 10, 1873.

2,921.—W. A. Gibbs, Gilwell Park, Essex county, Eng., and A. Borwick, Lloyd's, London, Eng. Improvement on apparatus and arrangements for drying, called "Gibbs & Borwick's Improvement on Apparatus for Drying." Dec. 10, 1873.

2,922.—M. A. Wigle, Kingsville, Essex county, Ontario. Composition of matter to be used for blacking and giving a polish to and softening and rendering impervious to wet the leather of boots and shoes, called "Wigle's Improved Boot Blacking." Dec. 10, 1873.

2,923.—H. P. Huntoon, Cambridge, Mass., U. S., assignee of J. R. Brown, Cambridge, Mass., U. S. Improvement on pipe tongs, called "The Brown Pipe Tongs." Dec. 10, 1873.

2,924.—A. Wood, Worcester, Mass., U. S. Improvement on bolt cutting machines, called "Wood's Bolt Cutter." Dec. 10, 1873.

2,925.—A. A. Wilder, Detroit, Wayne county, Mich. Improvements on machine for forging and slotting track bolts, called "Wilder's Track Bolt Forging and Slotting Machine." Dec. 10, 1873.

2,926.—S. Switzer, Sydenham, Frontenac county, Ontario, and S. O. McGuin. Improvement on rail car axle oilers, called "Switzer's & McGuin's Axle Oiler." Dec. 10, 1873.

2,927.—C. Burgess, Portsmouth, Scioto county, O., U. S. Improvement on the manufacture of iron and steel, called "Burgess' Manufacture of Iron and Steel." Dec. 10, 1873.

2,928.—G. B. Izzard, Hamilton, Ontario. Improvement on bed bottoms, called "Izzard's Adjustable Bed Bottom." Dec. 10, 1873.

2,929.—E. C. Fales, Foxborough, Norfolk county, Mass., U. S. Improved machine for blocking hats, bonnets, etc., called "Fales' Hat Blocking Machine." Dec. 10, 1873.

2,930.—H. Hebert, Montreal, P. Q. Improvement on boilers for locomotive and stationary engines, called "Hebert's Improved Engine Boiler." Dec. 10, 1873.

2,931.—G. Hibberd, Wheeling, Ohio county, W. Va., U. S. Improvement on pumps, called "Hibberd's Pump." Dec. 10, 1873.

2,932.—D. Maxell, Paris, Brant county, Ontario. Improvement on straw cutting machines for reversing, stopping, and reducing the motion of the feed rollers, called "Maxwell's Change, Stop, and Reverse Motion Straw Cutter." Dec. 10, 1873.

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Patents and Caveats
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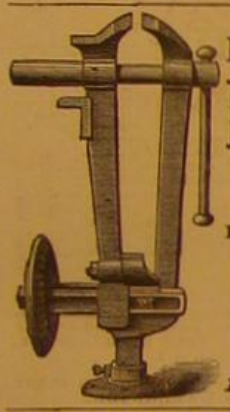

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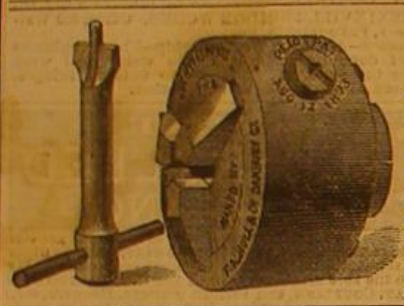

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