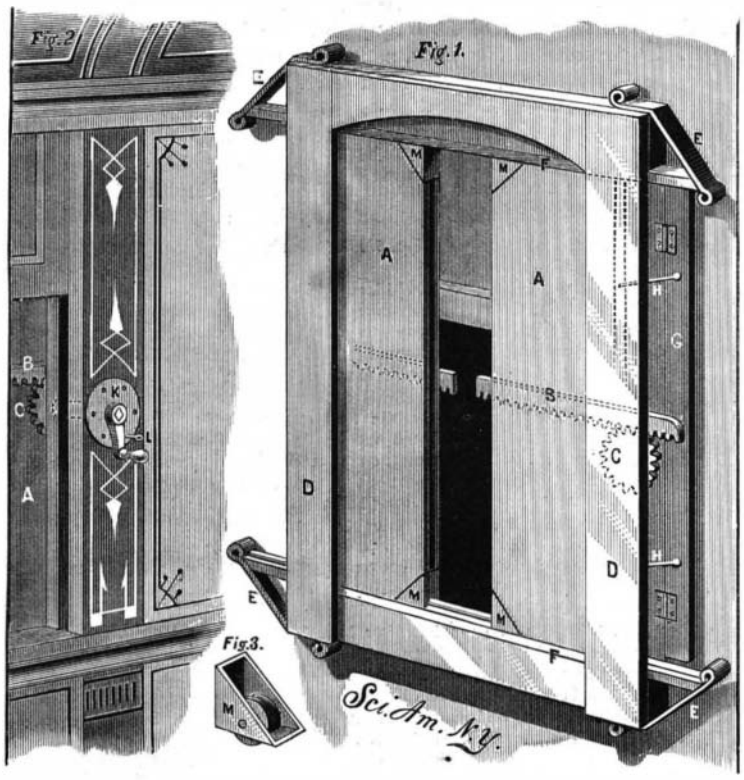
SLIDING WINDOW SHUTTER.

The invention herewith illustrated relates to shutters and blinds for the windows of houses, railroad cars, steam boats, etc. Fig. 1 represents the outside and Fig. 2 the inside of a window furnished with this device. The corners of the shutters are provided with corner castings, M, which serve to protect the corners and which carry friction rollers. Those on the lower corners are grooved so as to fit over a guide cleat on the lower ledge of the window, and those on the upper corners run in a groove in the top ledge. The shutters are thus held securely in place, and the lower ledge is free from any groove in which obstruction might accumulate. Shafts are journaled in the sides of the window frame, and are furnished with cranks at their inner ends by which they may be easily turned. The outer ends of the shafts carry pinions which engage rack bars secured horizontally about the center of the shutters. The bars can be extended beyond the sides of the shutter, in order to increase the distance to which they may be operated. The inner ends of the bars are secured so as to be jointed together when the shutters are closed. The bearings of the inner ends of the shafts are surrounded by plates, K, having perforations in which a pin may be inserted, thereby preventing the crank from being turned.

By this simple mechanism the shutters may be securely locked in either an open or closed position. At the outer ends of the top and bottom ledges of the window are ornamental brackets, E, connecting the ends of the ledges with the ends of the window cap and sill. These brackets form braces, and their ends project so as to form stops which prevent the shutters from sliding off the guide ledges. Plates, D, are secured to the cap and sill outside the sides of the frame, so as to partly cover the shutters and protect the operating mechanism. To the sides of the frame a hinged narrow door, G, reaching to the edges of the plates and forming guards which prevent snow and the like from being blown in. These doors are moved simultaneously with the shutters by cords connecting their outer edges with the outer edges of the shutters. As the shutters are opened the ends of the rack bars push the doors open, and when they are closed the cords draw them shut. As will be seen from the foregoing, all hinges, catches, etc., are dispensed with. The device also permits of the use of iron shutters, which have found favor because of their durability and the protection they afford.

This invention has been patented by Mr. C. T. Cochel, of Uniontown, Md.



COCHEL'S SLIDING WINDOW SHUTTER.

LAPORTE'S HYDRAULIC HAY PRESS.

We have several times taken occasion to remark on the interest that attaches to the compressing of hay and straw as regards reduction in the expense of freight and storage. The constant increase in the production, and the distance from the centers of consumption, fully justify the devising of special apparatus for treating compressible materials, like straw, hay, cotton, alfa, etc., which, instead of being delivered on the spot without profit, can thus be sent to a distance and bring a more remunerative price. Several presses that have been invented in recent years are already rendering great services to agriculture and the industries; yet there still remains a place for new apparatus, as is proved by the hydraulic press constructed by Mr. Laporte and shown in the annexed figure. This machine consists of a large case of wood and iron plate mounted upon two iron wheels and opening at the top by two leaves, while its two extremities are provided with hinged doors that are fastened by bolts, as are also the movable leaves at the top. Upon each side of the compressing case there is placed horizontally a cylinder, throughout the whole length of which there passes a long rod which carries a piston in the middle, and which terminates at cross bars fixed upon two parallel bars of I-iron. These latter have guides connected with the bottom of the cylinder, and support at each extremity two bars which enter the chest through longitudinal openings. These bars thrust the movable plate against the material to be compressed, and are fixed upon the prolongation of the parallel bars at the other end of the apparatus. Each cylinder is served by a double-acting hydraulic pump, which is arranged so as to be maneuvered by means of a double lever or by a motor which actuates a simple lever. In both cases the bearing point of the lever beam is movable in such a way as to permit of the automatic shortening of the smaller lever arm in measure as the piston advances. It follows that the stress to be exerted in order to overcome the increasing resistance of the material submitted to pressure remains nearly the same during the whole time the bale is being compressed.

Each of the pumps is surmounted with a box that contains valves which have plain seats that are made perfectly tight by means of leather washers fitted into circular grooves. On each side there are likewise leather packed cocks, which are actuated simultaneously by a single key, a turn of which, by a few degrees, to the right or left causes the machine to act in the desired direction. Finally, a small reservoir, which is connected with the corresponding pump and is arranged so as to be on a level with the valve box, communicates constantly with the suction pipe of the cylinder, and compensates, through the few liters of water that it contains, for the losses due to evaporation and to the slight leakages that may chance to occur through the packings of the rods.

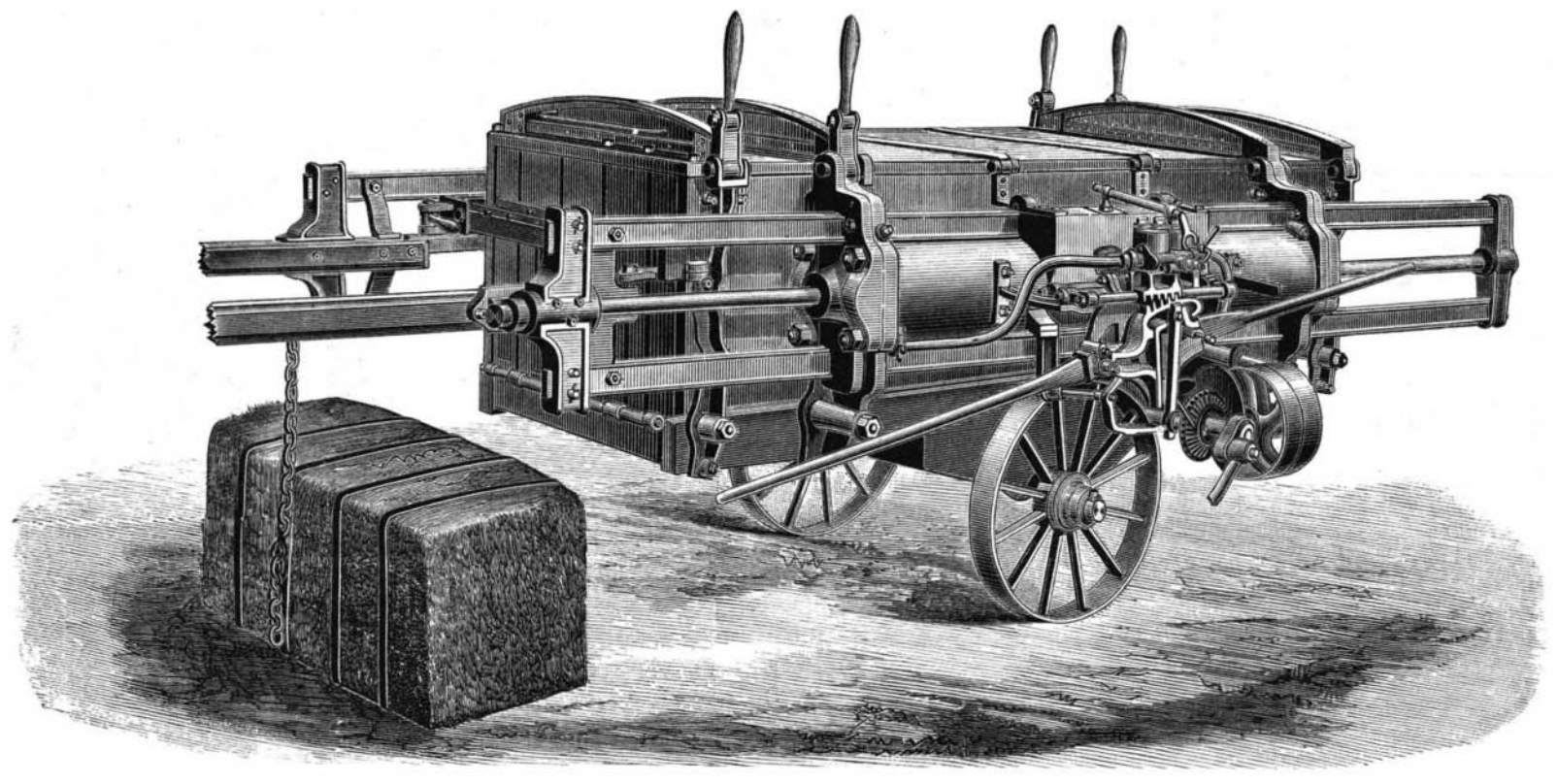
To operate this press without a motor requires the services of six men, who can produce with it from 70 to 80 bales per day, or nearly one every eight minutes. It takes three minutes to compress the bale, and after this the two leaves of the compression case are opened and three of the workmen insert boop irons. In order to facilitate this operation the extremities of each strap are pierced with holes, so that they can be brought into juxtaposition by means of a special tool, after which the two ends are united by means of an ordinary tack, which is driven into the bale. It now only remains to ungear the pumps by turning the cocks in the contrary direction, and to open the hinged doors in order to remove the finished bale.

During this operation the other workmen have filled the other side of the press, and the work thus continues from one extremity to the other without intermission.

By the action of the hydraulic pumps there may easily be obtained a power of 40,000 kilogrammes, so as to permit of furnishing cubical bales of hay weighing from 90 to 100 kilogrammes, and having a density of over 300 kilogrammes to the cubic meter.

All the parts of this apparatus are so constructed as to reduce wear and facilitate its being kept in repair. Being mounted upon two strong wheels, it can be moved to any locality by harnessing an animal to either end. The water in the pumps, being mixed with glycerine, is protected against freezing, and gives excellent results, both as regards the preservation of the parts and diminution of friction.

In cases where two of the presses are employed, the use of a special motor permits of actuating the two apparatus alternately. Each of them is then provided with a mechanism beneath for transmitting motion to the simple levers, and with a safety device for limiting the pressure exerted by the pistons.—*Revue Industrielle.*



LAPORTE'S HYDRAULIC HAY PRESS.

Straw and Wood Pulp.

G. Archbold macerates wood or straw, cut into suitable pieces, in dilute milk of lime, after twelve hours introduces them into a suitable digester, and saturates with sulphurous acid, the pressure amounting to four or five atmospheres.

In two hours the material is so loosened up, that after washing with water and further treatment under pressure with 3 per cent chloride of calcium and half per cent aluminum sulphate dissolved in a little water, the stuff obtained without any further operation has the appearance of cotton, and can serve for the manufacture of fine qualities of paper.

Physical Training in Schools.

Excellence in the gymnasium at Amherst counts in the student's record as does his excellence in mathematics. President Seelye says that this required physical discipline has had the happiest results. "By close statistics, carefully kept, for twenty years, it appears that the health of an Amherst College student is likely to grow better with each year of his college course. The average health of the sophomore class is better than that of the freshmen, and of the junior better than that of the sophomore, and of the senior best of all. This average is shown to come from an improvement in the physical condition of the individual student, and not from the dropping out of the course of those who might be too weak to complete it."

A Most Extraordinary Railway Accident.

One of the most terrible disasters in the history of the oil country occurred to-day in the burning and total destruction of a train that was crowded with passengers. The most remarkable thing about the accident was the wonderful escape from death by fire and wreck of all but three of the passengers.

The morning train on the Bradford, Richburg, and Cuba narrow gauge railroad left Wellesville, N. Y., at 6 o'clock A.M., on Tuesday, January 15, 1884. When about two and a half miles from Bradford the train ran through a river of oil which had coursed down the steep hillside from an overflowing tank that was being steamed preparatory to being run into the pipe lines. At this spot there is a steep grade. The oil ran down the road bed for a distance of at least 900 feet. In several places it was over the rails.

Engineer Patrick Sexton did not notice the dangerous ground his train was traversing. There was a sudden and deafening report, and in an instant the locomotive and the train, consisting of a baggage car and passenger coach, were wrapped in a sheet of flame. The gas in the oil had come in contact with the fire box of the engine, firing the oil.

The driving wheels scattered the burning fluid in every direction. Down the grade thundered the train, surrounded on all sides by walls of hissing fire. In less than a minute after the river of oil was ignited the heat was so fierce that the windows in the engine cab and passenger coach were cracked. Long tongues of flame jumped out of the dense black smoke and licked the interior woodwork of the car. The revolving wheels threw showers of burning oil upon the bottom of the cars.

Engineer Sexton retained his presence of mind, and instantly reversed his machine, which brought the train to a brief standstill in the midst of the conflagration. The burning oil jumped 400 feet ahead of the engine, licking up everything before it. There was fire on all sides. The situation was an awful one. The engineer saw that to remain in that river of fire meant death to all. He opened wide the throttle, and the locomotive shot forward at a terrible rate of speed. The run was made through the fire, but the end was not yet.

Ahead was a sharp curve. The engineer, who was badly burned about the face, head, and hands, reversed his engine and threw himself into the deep snow bank which lined both sides of the road. Fireman Michael Walsh, who was fearfully burned, followed him. The engine left the track at the curve, and was thrown squarely upon its back. The baggage car was also derailed, as was the passenger coach, which had broken its coupling and was a rod or two behind the train. The passenger car had run down that awful grade fully a mile at a great rate of speed before it left the track. The furious speed fanned the flames to a fiercer intensity.

The train was filled with passengers. Every seat in the coach was taken. The baggage car also held several passengers. When the windows in the narrow cars began to burst, the passengers were seized with a panic. There was a rush for the doors. The platforms and tops of the cars were in flames. Those who jumped from the platforms into the snow were more or less burned. Strong men threw or forced women and children through the narrow windows, regardless of the flames that leaped up on the sides of the car.

It seemed that all the inmates of the car must meet a living death, yet, strange to say, only three persons were burned to death. The victims were women.

Bradford, January 15.

Towage by Endless Chains.

An interesting experiment in the towage of vessels by means of endless chains has been made on the Rhone by M. Dupuy de Lome. That river is troubled with rapid currents and stony shallows, hence navigation is troublesome on it, and it has not, therefore, been utilized to its utmost. The state of the bed is improving every day, however, owing to the dredging and other engineering operations now carried out; but after these are executed the Rhone will still remain too swift at several parts for ordinary sailing. Towage by means of ordinary chains is also open to several objections which do not hold in the case of towage by endless chains worked in the following manner: A tug boat is provided fore and aft on each side with an endless chain, sufficiently heavy and plunging into the water so as to rest on the bottom for a space, the part on board being sustained by pulleys. These pulleys being turned by hand or by an engine, the chain moves with them, propelling the boat against the stream. The chain on each side is actuated by a separate motor; the craft is steered by making one chain move faster or slower than the other. The chains are disposed in such a way that, for the greatest depths, the weights resting on the bottom produce an adhesion to the latter still greater than the drag of the tug and its convoy.

The experiment of M. Dupuy de Lome was made at the instance of the Minister of Marine, M. Zede, director of naval constructions in France, and took place at the Port-de-Bouc. The tug was a vessel 33 meters long by 7·50 meters wide and 2·10 meters deep. The two strong chains employed weighed 46 kilogrammes per running meter. Each was worked by an engine of 15 horse power, and the two machines were completely independent, but the valves and starting gear were under the control of one man.

The trials showed that the barge could be properly steered and propelled in this manner in varying depths. The proper length of chain for the depth was regulated by increasing or diminishing the distance between the front and rear pulleys. The depth varied from 1 to 6½ meters, and provision was made accordingly. The coefficient of friction of the chain on the bottom was found to vary with the nature of the bottom from 80 to 120 per cent of the weight of the chain in air. It was thus possible to calculate what the current should be in order that the chains should not slip on the bottom. Currents of 3 meters per second were successfully encountered and overcome, and the vessel could be properly manipulated in these rapids with a safety unknown to other methods of navigation.

The new plan of M. Dupuy de Lome is, in fact, highly interesting and ingenious, and may be useful in mounting rapid rivers in many other countries.

Proposed Patent and Copyright Legislation.

For the short time the present Congress has been in session, an unusually large number of bills affecting the rights of patentees has been introduced as follows:

H. R. 311.—Introduced by Hon. W. H. Calkins, of Indiana. To regulate practice in patent suits.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in any suit hereafter brought, in any court having jurisdiction in patent cases, for an alleged use or infringement of any patented article, device, process, invention, or discovery, where it shall appear that the defendant in such suit purchased the same in good faith for his own personal use from the manufacturer thereof, or from a person or firm engaged in the open sale or practical application thereof, and applied the same for and to his own use, and not for sale, and not in any manufacturing process, if the plaintiff shall not recover the sum of twenty dollars or over, the defendant shall recover costs, unless it shall also appear that the defendant, at the time of such purchase or practical application, had actual knowledge or notice of the existence of such patent, or unless the defendant puts in issue the plaintiff's right to recover anything in the suit: *Provided*, That nothing herein contained shall apply to articles manufactured outside of the United States.

SEC. 2. That in all suits hereafter brought as aforesaid against a defendant other than a manufacturer or seller of such patented article, device, process, invention, or discovery, the plaintiff shall, at the commencement of such suit, give a bond, to the approval of the clerk, with sufficient surety, to be conditioned that the plaintiff will pay all costs and attorneys' fees that may be adjudged against him: and if the defendant shall finally prevail in such suit, the court shall allow costs, and a reasonable sum, not exceeding fifty dollars, for counsel fees, to the defendant, which shall be recoverable by suit, in the name of the clerk, upon said bond, or by fee bill on execution. A failure by the plaintiff to give such bond shall, on motion, be ground for the dismissal of the suit.

H. R. 419.—Introduced by Hon. J. E. Lamb, of Indiana. To regulate practice in suits brought to recover damages for infringement of patents.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter in any suit brought in any court having jurisdiction in patent cases for an alleged use or infringement of any patented article, device, process, invention, or discovery, where it shall appear that the defendant in such suit purchased the same in good faith for his own personal use from the manufacturer thereof, or from a person or firm engaged in the open sale or practical application thereof, and applied the same for and to his own use, and not for sale, if the plaintiff shall recover a judgment for five dollars or less as damages, the court shall adjudge that he pay all costs of suit; and if the plaintiff shall not recover the sum of twenty dollars or over, the court shall adjudge him to pay all his own costs, unless it shall also appear that the defendant at the time of such purchase or practical application had knowledge or actual notice of the existence of such patent: *Provided*, That nothing contained herein shall apply to articles manufactured outside of the United States.

H. R. 1956.—Introduced by Hon. T. J. Wood, of Indiana. To limit the jurisdiction of United States courts and to protect innocent purchasers of patent rights.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter the United States district and circuit courts shall have no jurisdiction to hear or try any case arising from the actual use of any patent right, or its infringement by such use, by any person in or citizen of the United States or the Territories, wherein the amount in controversy does not exceed two hundred dollars against one person or citizen.

SEC. 2. That purchasers of any patent right for actual use shall not be liable to damages, royalty, or for the value of the same, or for infringing the same in any manner, who at the date of such purchase had no knowledge of the claims of any third person, or that the inventor of the same has an interest therein adverse to the seller thereof.

H. R. 1081.—Introduced by Hon. George W. Ray, of New York. To provide for the protection of *bona fide* manufacturers, purchasers, venders, and users of articles, machines, machinery, and other things for the exclusive use, manufacture, or sale of which a patent has been or hereafter may be granted.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That no person, corporation, or joint stock association who shall in good faith purchase, use, manufacture, or sell any article, machine, machinery, or other thing for the exclusive use, sale, or manufacture of which any patent has been or hereafter may be granted to any person, persons, or corporation whatever, shall be liable, in damages or otherwise, for an infringement of such patent until after written notice of the existence thereof shall have been personally served on such person or persons or corporation, as the case may be, and such infringement shall be thereafter continued.

SEC. 2. That all laws or parts of laws inconsistent herewith are hereby repealed.

SEC. 3. That nothing herein contained shall affect any pending suit or proceeding in any of the courts of the United States or in any court of any of the several States.

H. R. 3036.—Introduced by Hon. R. B. Vance, of North Carolina. To enable the courts of the United States, in the case of the improper grant of letters patent by reason of fraud and misrepresentation, to declare a patent void on application of the Attorney-General.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That whenever it shall be made to appear to the satisfaction of the Attorney-General that there is probable cause for impeaching the validity of any unexpired patent, whether original, reissued, or extended, which may have been or shall hereafter be granted, on the ground that the same has been procured by fraud and misrepresentation, it shall be his duty to take due proceedings, by a bill in equity in the United States circuit court for the district in which the said patentee resides, or in the case of his death or the assignment of his entire interest in said patent, then in the district in which his legal representatives or assigns reside, to have the said patent vacated and annulled; and the court, on notice to said adverse parties, and in pursuance of such proceedings, shall have the power to adjudge and declare said patent void in whole or in part, and to annul and vacate the same.

SEC. 2. That if the party at whose complaint the Attorney-General shall take the proceedings provided for in this act shall fail to establish the invalidity of the patent, then the costs incurred by the Attorney-General in such litigation shall be chargeable to and be collected from such party complainant; otherwise said costs shall be chargeable to and collected from the defendant.

SEC. 3. That from the judgment and decree of any court rendered in the premises appeal shall lie, at the instance of either party, to the Supreme Court of the United States, in the same manner and under the same circumstances as is now provided by law in other judgments and decrees of circuit courts in causes arising on letters patent relating to inventions.

H. R. 1134.—Introduced by Hon. R. B. Vance, of North Carolina. To amend section forty-eight hundred and eighty-seven of the Revised Statutes, in relation to patents.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section forty-eight hundred and eighty-seven of the Revised Statutes shall be, and hereby is, amended so as to read as follows:

"SEC. 4857. No person shall be debarred from receiving a patent for his invention or discovery, nor shall any patent hereafter granted be declared invalid, by reason of its having been first patented or caused to be patented in a foreign country, unless the same has been introduced into public use in the United States for more than two years prior to the application; but every patent hereafter granted for an invention which has, prior to the filing of the application for said patent, been patented in a foreign country, shall expire seventeen years from the date of the foreign patent, or if there be more than one, seventeen years from the date of the earliest foreign patent, and in no case shall it remain in force more than seventeen years; but all applications hereafter made for patents for inventions previously patented in a foreign country, upon the invention of the same person, shall be made within two years from and after the date of such foreign patent, or if there be more than one, from the date of the earliest foreign patent. No patent granted for an invention which had, prior to the grant of such patent, been first patented in a foreign country, and which has not expired at the date of the passage of this act, shall be declared to be invalid by reason of its not being so limited on its face or in its grant as to expire at the same time with the foreign patent, or if there be more than one at the same time with the one having the shortest term; but this act shall in no wise renew, revive, prolong, or extend any patent heretofore granted."

[This bill has been reported back to the House and its passage recommended by the Committee on Patents.]

H. R. 62.—Introduced by Hon. W. S. Rosecrans, of California. Giving copyright under certain conditions to journalistic articles:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter any writer, correspondent, or other contributor to the daily or periodical press who shall publish any articles, or series of articles, unprotected by a copyright, and who shall subsequently take out a copyright on the same, and republish the same under said copyright, shall thereafter possess an exclusive property in said articles, or series of articles, the same as though he had originally published the same under copyright protection: *Provided*, That he shall cause to be published six times, in the journal or periodical in which said articles originally appeared, or in some other journal or periodical issued in the same city or county, a notice that he has acquired such copyright protection, and at the time of furnishing shall notify the first publisher thereof of his intention to avail of the privilege hereby conceded.

Brazilian Pebble Eye Glasses.

The transparent and colorless rock crystal used instead of glass in eye glasses and spectacles, and which comes principally from Brazil, is held in high repute where the best glasses are wanted. It comes in rough looking lumps, but each has one section of the surface cleaned and polished so the purchaser can see what he buys. These lumps are cut up by fine rotary saws, running at a high speed, and most of such work is done in Scotland, where pebbles of this kind were first obtained and the machinery for manufacturing them contrived. A great deal of the finishing of the rough lenses, for oculists in all parts of the world, is done in Paris. They are ground down to the requisite dimensions by steel disks, and then polished by means of sand, diamond dust, and a substance called rouge; that is, the lenses for ordinary use. There are cases of defective sight where, in fitting with glass spectacles, several layers of glass have to be melted together and ground down again and again to produce the exact focus for the particular case. Lenses of that kind are very expensive, but then they are actually invaluable to the wearer, who positively could not do without them.

Any peddler of an average intelligence can sell you a pair of spectacles which, upon the first instance, would suit your eyes well; but it takes a good knowledge of the eye and its defects to fit you with a pair of glasses that will really benefit you, and, what is more, do you no harm. There is a good deal of harm done by the injudicious wearing of glasses. Then, of course, there are people who don't know what they want, or have no use for glasses, like that fellow in the old German story who could not be suited by any optician, because—he couldn't read at all.

Units for Measurements.

The metrical unit for *length* is the meter; the ten-millionth part of the distance from the earth's equator to the pole.

The unit of *bulk* is the liter; it is the cube of a decimeter side.

The unit of *weight* is the gramme; the weight of a cubic centimeter of distilled water at 40° Fahrenheit.

The unit of *force* is the kilogrammeter, being the force required to raise one kilogramme weight one meter high.

The unit of *electric resistance* is the *ohm;* it is the resistance which a current undergoes when passing through a column of mercury one meter long and one square millimeter in section at the freezing point of water.

The unit of *electromotive force* is the *volt;* it is the amount of electromotive force produced by one Daniell cell.

The unit of *electrical intensity* is the *ampere;* it is the current produced by one volt through a resistance of one ohm.

The unit of *quantity of current* is the *coulomb;* it is the quantity of electricity given by one ampere in one second.
—*Review of Telegraph and Telephone.*

Correspondence.

Plowing by Wind Power.

Rufus Porter, whom the early readers of THE SCIENTIFIC AMERICAN will remember for his quaint writings and the extraordinary results he always anticipated from his wonderful inventions, still lives, and at the age of 92 years he sends us in his own clear handwriting from New Haven, Conn., the following communication:

"The Planet wind wheel has four square sails, one of which is always square before the wind, while two others are filled obliquely on an angle of forty-five degrees with the direction of the wind, the motion being horizontal; so that the action of the wind upon the two oblique sails is equal to that on the one before the wind. The average size of the sails is twenty feet square, so that if the force of wind is equal to one pound per square foot, its force upon the sails will be 800 lb. Such a breeze travels 15 miles an hour 22 or feet per second. A breeze that travels 26 miles an hour exerts a force of 4 pounds per square foot, which would be 3,200 lb. upon the wind wheel sails. If the sails move half as fast as the wind, the force of the wind upon the sails will be only one-fourth, or 1 lb. per foot, and the sails will move only 20 feet per second. The force of 800 lb. moving 20 feet per second, or 1,200 feet per minute, works 30 horse power, equal to the common labor of 60 horses. This wind wheel may be erected upon the center of a triangular or narrow-shaped frame, 35 feet long by 30 feet wide, mounted upon three wheels, each being 5 feet in diameter, with rims 15 inches wide, the front being mounted in a circular horizontal ring or annular platform, with a tiller extending rearward, whereby the machine is steered. The other two wheels are mounted upon the two ends of a 30-foot axle. The main central shaft of the wind wheel is connected to an equalizer, from which two shafts extend to the two driving wheels, applying equal force to each, whether running in a straight line or in curves. The center post is 25 feet high, and the sails receive the wind from all directions equally; but when required to stop, the sails are all pointed to the wind by a lever, so the wind has no power on them. This machine will travel with a gang of ten plows 4 miles an hour, thus plowing four acres an hour with the attendance of only one man. It will run against the wind, but not quite so fast as before the wind; and will ascend hills wherever horses can work. It will harrow, sow, reap and mow, thrash grain, shell and grind corn, carry loads, irrigate lands at the rate of 100 acres a day, or will travel 10 miles an hour in any direction, with 20 passengers. But all these things require a good breeze. The cost of the machines of medium size will be $250, not including plows, mowers, reapers, etc.

"A larger machine will furnish 100 horse power. Small wind wheels, with sails only 4 feet square, may be made for $10 each. They are useful for raising water, washing, etc.

"The medium size will work with a very light breeze, in which they will do good service in various kinds of work. In cases in which a steady, uniform motion is required, they may be regulated by a small and cheap wooden brake-governor. The gang plows to be used are rotaries, which require less power than the common mould-board. One machine will answer for several farms."

Accompanying the above communication, we find a printed circular without date, but bearing the signature of Mr. Porter, which reads as follows:

"I have recently perfected three wonderful inventions, the first of which may be put forward to general use for fifty dollars, and in three months will produce a net income of a hundred dollars a day.

"The next will within six months produce an income of a thousand dollars a day. The third will cost two thousand dollars, and within two years will produce the immense income of twenty thousand dollars a day. These inventions have all been proved by successful operation, and have been examined and commended by many scientific men, whose certificates I now have, and no man can show a reason why they should not accomplish all that is represented; and any man who duly examines the explanation of the utility of the inventions, and the mode of managing the business, cannot fail to be convinced that a great income must accrue, and that immediately."

To the Editor of the Scientific American:

Having occasionally brazed band saws for one of our large brush factories in the village, my attention was called the other day, while visiting the factory, to a new method of joining broken saws—simply lengthening the lap a little, and soft soldering instead of brazing. The saw I examined had three mends in it—all done so; and I was told that in no case had the soldering given way. To Mr. Brooks is due all credit for the above discovery; and I send this to you for publication, if you think it will be a benefit to others, with Mr. Brooks' consent. He cautions, where soft soldier is used, not hanging the saw from nails by or where the joint is made.

Very respectfully,

LANSINBURGER.

Lansingburg, N. Y.

[Band saws are frequently joined by ordinary soldering. A scarf joint is made, and the laps brightened by a file and moistened with a saturated solution of muriatic acid and zinc. Then ordinary solder and powdered resin are applied with a soldering iron.]—ED.

Locomotive Traction.

To the Editor of the Scientific American:

In a late number of the *American Journal of Railway Appliances*, I notice a criticism of an answer you made to an inquiry concerning the tractive force of locomotives. The query was: "If there is any difference, which would start and draw the heavier load—a locomotive with seven foot drivers or one with three foot drivers, both to be of the same heft, and engines supposed to be strong enough to slip the drivers?" To this you answer, "Theoretically, no difference." To this the editor of the paper referred to says: "We think that it is hardly necessary for us to say that the first answer is wrong all the way through, as neither by theory nor in practice does the greater driving power belong to the engine having the least leverage in its power, etc." It seems to me that it is hardly necessary for the paper referred to to say anything on the subject, as what it does say shows plainly that it does not comprehend the question as asked. Your answer was right, as a few figures will show. Neglecting fractions to simplify the matter, I will suppose the engine having 36 inch drivers to have cylinders 16x24 and using 100 pounds effective steam pressure per square inch. The ordinary formula for the tractive force where D is the diameter of the cylinder in inches, S the stroke in inches, P the effective steam pressure in pounds per square inch, and W the diameter of the drivers in inches, is: Traction $= \frac{D^2 \times S \times P}{W}$; apply this to the case supposed, and we have $\frac{16^2 \times 24'' \times 100 \text{ lb.}}{36''} = 17{,}066$ lb. tractive force. If it be assumed that to prevent the drivers slipping we require four times the tractive force in weight on them, we have $17{,}066 \times 4 = 68{,}264$ pounds, or a trifle over 34 tons, as the weight necessary to place on the drivers. The query now compares an engine having 7 foot drivers with the same weight on them and *powerful* enough to slip or nearly slip the drivers.

It is evident that the engine with 7 foot drivers must have proportionally larger cylinders to be powerful enough (as the query supposes) to accomplish this. Taking the area of a 16 inch cylinder as 201 square inches, and we have 36 is to 201 as 84 is to 469, the area of cylinder necessary to slip the 7 foot drivers with the same weight on them. The diameter of a cylinder whose area is 469 square inches is a little over 24·4 inches, and applying the same formulæ as before for the tractive force, we have $\frac{24{\cdot}4^2 \times 24 \times 100}{84} = 17{,}059$ lb. as the tractive force, or practically the same as the engine with 36 inch drivers, which proves your answer to be correct. It will at once be evident however, that while the tractive force of the two engines is the same, the horse power of the latter engine is much larger, and the steam generating power must be proportionately larger also, as, if we suppose each engine to be making 100 revolutions per minute, the 36 inch driver will cover 941·66 feet per minute. If the engine is exerting a force of 17,060 pounds, we have:

$$\frac{941{\cdot}66 \times 17{,}060}{33{,}000} = 486{\cdot}8$$

as the horse power, neglecting the friction of the engine. The 7 foot driver engine making 100 revolutions per minute advances 2,200 feet per minute, when if as supposed the engine is exerting the same force, we have:

$$\frac{2{,}200 \times 17{,}060}{33{,}000} = 1137{\cdot}3 \text{ H. P.}$$

If we assume each engine to be using 40 pounds of water per horse power per hour, we have 19,472 pounds for the 36 inch driver engine and 45,492 pounds for the 84 inch driver.

As to the second question, "Which would draw more—a locomotive with six drivers or one with four drivers, both to have the same amount of weight on the drivers?" you answer, "The engine with six drivers," and the *Am. Jour. of R. R. Appliances* says, "Tests show both ways." As the question puts no limits on the weight of the engine, the only correct answer under the circumstances is yours, as it is easy to suppose a weight of engine on four drivers which would destroy the rail, but which if distributed over six drivers would allow of a practical use of the engine. The friction of the six wheel engine on curves would naturally be supposed to be greater, but a test showed it to be less. The friction of an eight wheel or four driver engine pushed around a given curve at ten miles per hour was 1,963 pounds, while that of a mogul or six driver engine under the same circumstances was but 1,750 pounds.

While not connected with this subject, I want to make a few observations on Dr. Grimshaw's proposed engine to make 900 miles in 18 hours. The design of the engine is practically the same as the design patented quite recently by M. N. Forney, save the framing of the engine. Any man who has ever run a passenger engine will at once perceive the utter futility of accomplishing with any engine what the Doctor sets forth. If the road were perfectly level and straight and clear of all trains, it is a question to which even under these circumstances a practical man would say no. But as all roads have grades, curves, trains to meet and pass, coal to take as well as water, and as a stop must be made for coal and a slowing up to take water by the scoop up plan, together with the fact that owing to grades, curves, passing trains, etc., at least one-quarter of their time, a distance of over 30 miles in an hour cannot be accomplished.

This means that for every hour in which but 30 miles is made some other hour must show a distance of 70 miles; and most engineers and railroad men would be pleased to see the stretch of track and the engine with its train in which 70 miles for several hours can be covered. Performances which to a theoretical and non-practical railroad man like the Doctor appear easy, is a horse of another color to the man who finds it all he can do to pound out a continuous speed of 35 miles per hour with the best of engines.

GOTHAM.

"Brandy Bread!"

To the Editor of the Scientific American:

Your correspondent N. D., in your paper of to-day, January 12, must brush up his chemistry or he will scarcely prevent our getting "alcohol from bread." He says, "The dough should always be put into the oven before it passes through the first fermentation; the bread in that case will be good, having the sugar in it."

Perhaps so, but we trust N. D. will not invite us to partake if that is the way he bakes things. We showed in an article on "Raising Bread," October 20, that the agent in making the dough light, so that it could be palatable, spongy bread, was an elastic gas—carbonic acid—and that this gas was generated by the process of fermentation. The fermentation caused the carbon, oxygen, and hydrogen which had previously been sugar to split up into two new substances, which had not been there before—alcohol and carbonic acid—so that the sugar had disappeared and the new comers remained.

If N. D. puts his dough into the oven before the sugar has felt the fermentation, he will have a solid mass, almost like a brick; he may eat it if he chooses. But if he lets his dough "rise," his sugar will have gone and he will have alcohol, but he will have wonderfully good bread. If he objects to saving his alcohol, very well, he can let it go as it is in the habit of doing, but it is there all the same.

A.

Movement of the Magnetic Pole.

To the Editor of the Scientific American:

The note on the "Movement of the Magnetic Pole," by J. W. Van Sickle, published in your issue of January 5, 1884, seems to me likely to produce erroneous impressions. In the first place, when he affirms that the magnetic pole was due north in 1657, he does not state from what place it was due north. It is always due north from places on its own meridian, and, therefore, it is necessary to know *on what meridian* it was due north at that time.

Again, your correspondent seems to imply that the magnetic needle always points toward the magnetic pole of the earth. Observations do not show this to be the case. Neither did the last western movement of the needle begin in North America in 1657, but it commenced at Portland, Me., about the year 1765, where up to that time the movement had been to the east. The same westerly movement did not reach New York until very near 1800, and as late as 1870 on the Pacific coast the needle was still moving eastward. It has not yet reached its maximum western declination in New England, but the increase is much slower than it was thirty years ago. From the present indications we may guess that it will begin to turn eastward at Portland, Me., between 1890 and 1900, which would give a period for the swing in one direction of about one hundred and thirty years. But this is only a guess, and it will doubtless be a long time before "A. W.'s" question will be answered.

Allow me to ask who discovered the fact (?) that the magnetic pole has a movement around a circle? This should be pretty well established before we undertake to find out its period.

Respectfully,

E. T. QUIMBY.

Hanover, N. H., January 10, 1884.

Large Wheels.

When 42-inch wheels were first used in this country under passenger cars, there was a good deal of fruitless discussion about their utility as compared with that of smaller wheels. What discussion failed to make clear, however, has been determined by use and the knowledge thereby obtained. Much can now be said in favor of large wheels, showing their superiority to small ones for passenger service, that could not have been said with the same confidence a few years ago. English practice could, of course, be referred to as being conclusive, so far as the style of "carriages" on English roads was concerned. But our cars are altogether different in size, weight, and construction. Probably no road in this country has given 42-inch wheels a more thorough trial than the Boston & Albany, and we are informed that with these wheels such a thing as hot journals is practically unknown on that road, none having been reported for a long time. This is attributed to the fact that the journals revolve slower, their surface speed with the 42-inch wheels at forty miles an hour being no greater than that of journals with 33-inch wheels at thirty-one miles an hour. This is a moderate speed if the journals are well packed, and they ought therefore to run cool. It is also asserted that passengers perceive a difference in the riding of cars having the larger or smaller wheels, and that they prefer those with the large ones. This is significant if not conclusive. But there is still another thing that many observing people have noticed, and that is, that large-wheel trains appear to move at a comparatively moderate speed, when the distance covered shows a speed of forty and forty-five miles an hour.—*Nat. Car Builder.*