remain on the plate in the form of a thin skin or film. This film is easily removed with a horn spatula, and then dried and weighed. If it is desired to determine the fats alone, this film may be extracted with ether, and thus the two most important constituents of milk very quickly determined. In many cases it is sufficient to know the total weight of the principal solid constituents of the milk, hence also the amount of water, for which scarcely two hours are required. —*Public Health.*

The Hoosac Tunnel.

This tunnel, near North Adams, Mass., which was completed some time ago so far as to admit the passage of trains, was found to need an extension at the east end in order to prevent the downfall of the rocks upon the track from the cliff at that end of the tunnel. This facade and buttress have just been completed, and the tunnel and track are pronounced in prime order, and ready for all the business which may seek to pass through the great bore. The artificial façade is constructed of granite, some of the blocks weighing from four to five tons each. The arch extension is about 25 feet, and the façade about 60 feet long by 40 feet high.

The Springfield *Republican* says: "Only one track is laid at present in the tunnel. The trains are run by telegraph, passenger trains being allowed ten and freight twenty minutes to pass. Three lights, equidistant, are affixed to the sides of the tunnel, dividing the distance into four sections. The lights are for the purpose of enabling the engineers to regulate their speed, and they are required to maintain a uniform gait the whole distance. At the central shaft two lights are displayed, to indicate when the summit is reached and the grade declines—which it does each way to afford drainage, being sixty feet lower at each portal than at the central shaft. As the trains plunge into the impenetrable darkness the time is recorded, and again when they emerge, by operators situated at either end of the tunnel, and forwarded to the general dispatcher at North Adams. The passage seldom varies a minute. The tunnel is never occupied by two trains at the same time, and no train is allowed to enter until the preceding train has made the exit. No equal distance of the road outside is traversed with so uniform speed, nor with so much safety, the track, which cannot be excelled, being perfectly straight. The roof of the tunnel is considered perfectly safe, not a piece the size of a walnut having been detached for a year, and about a mile and one third of brick arching having been built to sustain all doubtful localities, in sections from ten feet upward. Still, the roof is under constant examination by men on top of an elevated carriage, which is propelled along the road. Admittance to visitors is strictly denied. Occasionally the tunnel is so free from fog and smoke that, standing at the central shaft, daylight can be discerned at both portals, showing about ten feet in diameter, but usually light can be discovered in only one direction, that from which the wind comes, the current driving the smoke before it up the shaft, and leaving the other half of the tunnel motionless and usually dense with smoke and fog. A floor composed of oak, fourteen inches thick, let into grooves cut into the rock on a steep incline, prevents any pieces detached from the sides of the shaft from falling on to the track. At the summit of the mountain the opening of the shaft is inclosed by a stone wall twenty-feet high."

Subsidiary to the great Hoosac Tunnel is that of North Adams, nearly two miles west of the former. This work, too, has just been completed. This is described as a skew arch, and the work is spiral; the abutments are parallel, but not at right angles, crossing the road diagonally. The stones are dressed spirally, and three or four patterns to each individual block had to be furnished the cutters, and no two stones are alike. The continuation of the tunnel is 65 feet in diameter, 26 feet inside of the completed work, with a plain façade of 40 feet high and 50 feet long, and immense wing walls; the coping is surmounted with an iron sidewalk and fence 75 feet long. This structure is a substitute for the dangerous old Furnace Hill bridge.

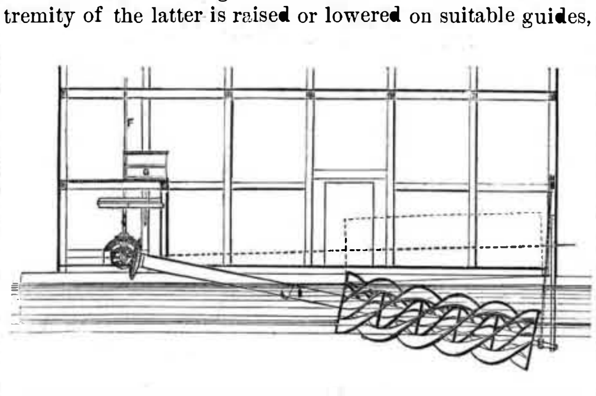
Progress of the Metric System.

At a late meeting of the American Metrological Society Prof. J. E. Hilgard, of Washington, in an address on the "Progress of the Metric System," stated that the United States had not yet been formally constituted a member of the International Bureau of Weights and Measures. The preliminary steps had been taken toward this end, and the matter now rested at the disposal of the Senate Committee on Foreign Relations. The French Commission is busy in preparing the new standards of weight and measure. This is a work requiring extreme accuracy to obtain uniform results. The manipulations are of extreme delicacy. Special apparatus and tools have to be invented and made, and months elapse in their construction. These difficulties will be eventually overcome, and the progress already made is a guarantee that standards of uniformity and accuracy will be made for distribution among the nations which take part in the convention.

In regard to metric standards for the United States, Professor Hilgard said that the standards for separate States had been tendered to each, and were very generally accepted. About thirty States have received their standards and placed them on exhibition in public places where they will be accessible for reference. These standards consist of two metres, a kilogramme, a half kilogramme, a litre and a half-litre. Professor Hilgard mentioned that, when the original iron metre, now eighty years old, was compared with the modern standard, it was found that its difference was less than a thousandth of a millimetre. The trial was made when the iron metre was sixty-seven years old, and it is conclusive in favor of iron for this use, as its changes are so exceedingly small. But a comparison between our standards was less favorable. The iron metre was compared with the standard yard, the latter being of bronze, made to be used at a temperature of 62° Fahr. These differed by the 4000th of an inch, which is a very sensible alteration. Several new methods of making quick approximate comparisons between yards and metres have been considered by Professor Hilgard. Two of these he mentioned. Divide a yard into four equal parts by bisections. Then put together three of the four parts and divide that length into eight parts by bisections. The addition of one of the eight parts to the yard will give a metre within a fraction. Another method, which is preferable on many accounts, is to divide 45 inches into eight parts, seven of which will be a metre very nearly; the 45 inches can be easily obtained by adding a fourth to the yard. It is designed to make the old standards useful by inserting little silver plugs which mark upon them the metrical divisions.

A NEW TIDE MILL.

The annexed engraving exhibits a novel form of ship-mill designed to be driven by tide or current power. It consists simply of a series of spiral wings arranged near the end of, and at an angle of 45° to, a shaft. The outer extremity of the latter is raised or lowered on suitable guides,

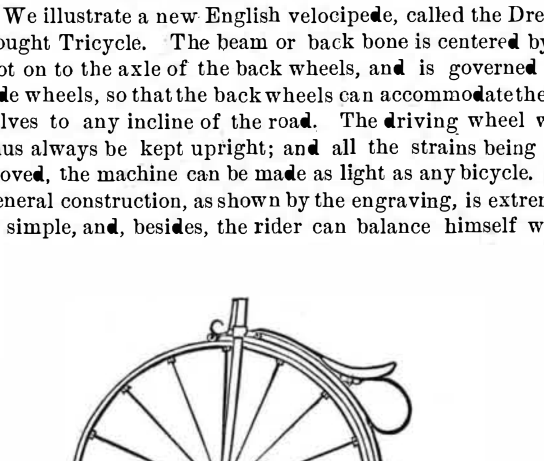


and from the inner one the rotary motion of the shaft is imparted to suitable bevel gearing. The outer end of the shaft is lowered so that an angle of 45° is formed, this being considered as best adapted to allow the screw most advantageously to intercept the passing water.

It will be noted that a second tank or ship for storage of water is here dispensed with, and that by raising or lowering the wheel to a less or greater depth in the water the motion of the driven mechanism can be regulated.

THE DREADNOUGHT TRICYCLE.

We illustrate a new English velocipede, called the Dreadnought Tricycle. The beam or back bone is centered by a slot on to the axle of the back wheels, and is governed by side wheels, so that the back wheels can accommodate themselves to any incline of the road. The driving wheel will thus always be kept upright; and all the strains being removed, the machine can be made as light as any bicycle. Its general construction, as shown by the engraving, is extremely simple, and, besides, the rider can balance himself with



scarcely any difficulty whatever. The English still seem to be much interested in velocipedes, and the improvements in their construction are very numerous. The excitement quickly died out in this country, though it will probably, before long, be again brought over from England. The illustration is from the *English Mechanic.*

Fish Culture.

There are now twenty-seven States whose Commissioners of Fisheries receive, hatch and distribute the eggs of fishes furnished by the United States Fish Commission. About 4,000,000 eggs of California salmon were thus distributed in October. Congress has appropriated $5,000 toward preparing ponds near the Washington Monument for breeding the carp, a European species being regarded as desirable for introduction here. The Wisconsin Fish Commissioners report a large amount of work, having hatched and distributed 1,736,000 lake trout, 6,295,000 whitefish, and smaller amounts of brook trout and California salmon. The question whether our lakes will prove fitted for California salmon will soon be determined. The hatching has been successful with about 90 per cent of the eggs. The Fish Commissioners of Maine report an unusually large quantity of salmon, principally due to the efforts at fish culture, in most of the rivers of the State. Several ponds have been stocked with black bass, as an antidote to pickerel. In the Mattawamkeag River, 80,000 shad fry have been placed.—*Tribune.*

Anti-Fire Construction.*

One of the indispensable requirements of architecture is stability—permanence. And yet of all the buildings ever erected, how few still remain! Even that achievement of engineering skill, the Eddystone Lighthouse, which has bravely resisted the power of the Atlantic for one hundred and twenty years, is at last undermined and must fall. The elements in their unceasing action sooner or later triumph over the proudest works of man. Of the elements at work in this destruction, there is none so active, so successful, as fire. With what fiendish relish does it lick up the combustible, and ruthlessly tumble the residue in shapeless ruin! History teems with its work of desolation. The cities of the Old World have all sadly suffered by its ravages: I will refer to some of them.

GREAT FIRES OF THE WORLD.

The great fire of London, in 1666, burnt for three days, destroying 13,200 houses, including many fine public buildings. The loss by this fire, if computed by present values, would amount to at least $100,000,000.

The city of New York has suffered by at least three great fires. One in 1835 destroyed 600 warehouses, which together with contents were worth $20,000,000. Another in 1839 destroyed property to the amount of $10,000,000; and a third in 1845 destroyed 300 stores and dwellings, valued at $6,000,000. Charleston in 1838 suffered by a fire which destroyed 1,158 buildings, covering 145 acres. Pittsburgh, in 1845, lost by fire 1,000 buildings, valued at $6,000,000. Albany, N. Y., some years since lost in steamboats and buildings $3,000,000. St. Louis, in 1849, lost $3,000,000 in steamboats and buildings. Philadelphia, in 1858, lost 300 houses. In 1845 two thirds of the city of Quebec, comprising 2,800 houses, were swept away by fire. The city of St. John's, Newfoundland, repeatedly damaged by fire, was nearly all destroyed in 1846, when 6,000 people were rendered homeless. Troy suffered severely in 1862. Portland, in 1866, lost $9,000,000, including the loss of 1,600 buildings. Chicago, in 1871, and Boston, in 1872, were devastated to the extent of more than $200,000,000; and quite recently a devastating fire has almost entirely destroyed the city of St. John, N. B. But these marked fires do not alone measure the work of destruction; much is due to the smaller fires, which make up by their frequency what they lack in proportions. Constantly at work, little by little, year by year, the aggregate of ruin they accomplish is fearful.

ANNUAL LOSSES BY FIRES.

A record kept by the New York *Insurance Chronicle* shows that the loss by fire in the United States and Canada in 1876 was $75,000,000, and in the previous year it was $86,000,000. This record is trustworthy, as far as it goes; but I am assured by competent authority that the loss during the last ten years has not been less than $100,000,000 per annum, not including the two extraordinary fires of Chicago and Boston. What a fearful havoc! Is there no remedy?

The losses in the United States and Canada during the last twenty-five years aggregate an amount which would have sufficed to have rendered all the buildings approximately fireproof. A few figures will show this. The United States census for 1870 gives the value of the real estate of the country, but not the value of the buildings alone. This, however, may be approximated. From an estimate made upon the property within certain limits of the city of New York, the value of the buildings was found to exceed considerably the value of the ground built upon. The buildings in the rural districts, however, are of much less value than the land, perhaps not half. A fair average for the two—city and country—would perhaps be one third the value of the real estate. The census for 1876 puts the value of the real estate at about $9,900,000,000, one third of which, $3,300,000,000, then, is the value of the buildings.

This result may be tested by estimates upon another basis. It is shown in the last report of the National Board of Fire Underwriters, page 27, that the insurance effected during the last five years averages about $5,170,000,000 per annum; and it is shown by the records of the New York *Chronicle* that not more than half of the losses by fire are covered by insurance: hence the $5,170,000,000 insured is only half of the insurable property of the country; or, the value of the property of the United States and Canada, liable to loss by fire, is not less than $10,340,000,000. This is the value, not of the buildings alone, but of the buildings and their contents. To ascertain what portion of this is invested in buildings, it is shown by the New York Board of Fire Underwriters in their last report, page 23, that in an average of the losses for the past eighteen years, the portion on buildings was about one third of the whole. Taking this as authority in the matter, one third of $10,340,000,000 is $3,447,000,000 for the value of the buildings in the United States and Canada, which cannot be far from $3,300,000,000 for the United States alone, as before shown.

Of the $100,000,000 annual loss, one third may be taken as that which was invested in buildings; and, had the buildings been of a character to resist the flames, a large part,

* A paper read at the recent Convention of the American Institute of Architects by R. G. Hatfield, F.A.I.A.

perhaps two thirds, of the loss upon their contents would have been saved: thus $\frac{1}{3}$ in buildings and $\frac{2}{3}$ of $\frac{2}{3}$, or $\frac{4}{9}$ of the the contents, or together $\frac{7}{9}$ of the whole loss, could have been avoided by having more perfect buildings; or, of the $3,447,000,000 invested in buildings, there is an annual loss of nearly $78,000,000 due to deficiencies in buildings. This is more than two per cent of the value of the buildings, an amount which would in twenty or twenty-five years be ample to render all our buildings approximately fireproof. and would not only save more than three fourths of the present loss in material, but that also which is caused by interruption to business; and, in many instances, avoid the loss of life, and consequent distress to survivors.

LOSS OF LIFE BY FIRES.

Painful instances of loss of life by fire through deficient buildings are still fresh in our memories. The Brooklyn theater and the St. Louis hotel cry aloud for reform in building. Whatever may be said of the inexpediency of expending money upon ordinary buildings to avoid damage by fire, there certainly is no good reason why, at whatever cost, places of public resort should not be made safe. As life is more precious than money, so no money should be considered wasted which is required to protect life. It was lately shown in the Chicago *Investigator*, that no less than 156 theaters have been burned in the United States since the year 1800; and of these 119 were burned since 1850. Similar statements, though perhaps not quite so disastrous, might be made of hotels and other public buildings. The government of a country should be held responsible for life sacrificed in this manner, as well as for that of those who die by neglect of sanitary precautions. The owners of buildings of public resort should be compelled by rigid law to render their property secure from destruction by fire.

COMPARATIVE FIRE-RESISTING QUALITIES OF ORDINARY BUILDING MATERIALS.

In the construction of buildings, the materials most in use are brick, stone, iron, and wood. Brick above all the others is that which possesses fire-resisting qualities in the largest degree. It has been in use from the earliest ages; it is prominent among the materials of ancient buildings. The Pantheon, the only entire ancient building of Rome, is of brick. The marble with which the brick walls were incrusted has long since disappeared. The metal which covered the roof was stripped off for other use. The only opening for light, the eye of the dome, near thirty feet in diameter, has been uncovered, exposing the interior to every storm; and during the nineteen centuries of its existence, it has been subject to repeated conflagrations resulting from the wars which so often desolated Rome; and yet, through all these vicissitudes, the Pantheon still remains in such good condition that it serves as one of the churches of the city. Its durability, however, is due not alone to the character of the material of which it is constructed, but also to its form, the strongest known, a cylinder.

Stone, though inferior to brick, is far superior to iron in its fire-resisting qualities. Granite when exposed to intense heat will crack and splinter freely; marble is quickly reduced to lime; sandstones disintegrate: only those stones which are of volcanic origin may be safely trusted in the fire.

The extensive use of iron as a material of construction is of recent date. Fifty years ago it was but little used. One of the principal reasons for introducing it was its fire-resisting character. Gwilt, in his Encyclopædia, p. 494, art. 1767, edition of 1842, in speaking of iron says, "The security afforded, not only for supporting weight, but against fire, has of late years very much increased the use of it, and may in many cases entirely supersede the use of timber." The experience of recent years, however, especially at Chicago and Boston, has materially lessened confidence in its fire-resisting character. Indeed, its power to sustain weight when subjected to great heat has been shown to be quite limited. It is capable of sustaining, in an intense fire, neither compressive, tensile, nor transverse strain, to any useful degree. Its untrustworthiness was shown at least two hundred years ago; for Evelyn says of the great fire of London in 1666: "The vast yron chaines of the Cittie streetes, hinges, bars and gates of prisons, were many of them mealted and reduced to cinders by ye vehement heate."

To protect hollow iron columns it has been proposed to secure the passage of a current of air through them. An experiment to test this was made upon a $1\frac{1}{2}$ inch pipe which was subjected to heat at the middle while a strong current of air was maintained through it. It was pulled apart by hand in four minutes after the fire was applied.

All metals transmit heat rapidly—a fact which may account for the rapid loss of strength in iron when subjected to fire. If iron be used for floor beams, arch ties, or for posts, or for any purpose which exposes it to strain of any kind, it should be protected by an incasement of some slow-conducting material, such, for example, as brick, terra-cotta, or gypsum; although this latter material is active in rusting iron, and therefore should not be allowed to come in contact with it. Where gypsum is to be used, a good coat of lime-whiting previously applied to the iron will protect it from the action of the plaster. Mr. Hornblower, architect, of Liverpool, has patented a system of protection to iron beams by means of earthenware jackets and concrete; add Mr. P. B. Wight of Chicago, Fellow of the Institute, has patented a system of protection to iron columns by an enclosure of plaster and other fire-resisting material. These and other systems of protection are just so many concessions to the now well-established fact, the non-fire-resisting character of iron.

PROTECTION OF WOOD FROM FIRE.

Of the four principal materials used in construction, wood is generally supposed to be that which has the least power to resist fire. This idea in general is correct, and yet under certain circumstances wood will resist fire longer than iron. Firemen are reluctant to enter a building on fire when it is known that the supports are of iron, yet do not hesitate where they are of wood. This apprehension of danger from iron supports, the growth of experience, plainly proves the superiority of wood over iron as to a fire-resisting quality.

A floor of wooden beams placed apart in the usual way has but little fire-resisting quality. The fire, aided by a free current of air between the beams, rapidly consumes them as so many pieces of well-placed kindlings. This defect in the construction of wooden floors has led to various devices, one of which is the use of plaster or gypsum, which is thickly spread upon the lathing at the bottom of the opening between the beams, and also extended up on each side. This forms a good filling, effectual in preventing the draught of air: but it has been found to induce rapid decay of the timber, and is therefore a failure.

In the use of ordinary deafening, concrete, plaster, or any similar filling, it is requisite to increase the size of the floor-timbers sufficiently to sustain safely the weight of this filling. The fillings above named are a dead weight upon the floor. If some filling be used which would sustain itself, such, for example, as wood, or if the intervening spaces be filled with so many additional floor-beams, these would not only sustain themselves but would contribute to the general strength of the floor; or, the floor not needing additional strength, the beams could all be reduced in depth to the required limit of strength. An arrangement of this kind produces what is termed a solid timber floor, upon which, there being no interstices for the passage of air, the fire, retarded, acts only in slowly charring the surface. Such a floor would resist the action of fire for many hours, and would be effectual in preventing the spread of it.

But wood is subject to decay; and for this reason is inferior to iron, which is deteriorated by rust generally in a very small degree. Where iron can be protected from injury by fire, it is far superior to wood. For general building purposes, however, wood, if protected from decay, is superior to iron. Our want now is some effectual ready method of preventing decay in wood. Until something better is offered, floor-beams and posts may be subjected to the Kyanizing or to the Burnetizing process, which are claimed to be effectual. It has been proposed, after wood is Kyanized, to coat it with silicate of soda as a protection from fire. Experiments on a large scale in this direction are desirable, and might well be undertaken by the general government at Washington.

Investigations lately made show that the archives of the War Department are exposed to destruction by fire, being lodged in buildings of a frail nature. Self-protection may possibly inspire the authorities to make the indicated tests of wood, from which results may flow of great importance to the country at large.

PRACTICAL SUGGESTIONS IN BUILDING.

In planning buildings to endure, it is required that the walls and partitions, of ample thickness, be made of well-burned brick put together with the best of mortar, and that the floors, as far as practicable, be also made of brick, vaulted. Where this is not practicable, owing to the lateral thrust of the vaulting, then the floors should be of prepared timber laid together solid, and coated beneath with an inch of plastering on wooden lath coated with the silicate of soda; the plaster largely composed of plaster or gypsum. The floor timbers should be attached to each other by spikes or dowels, and lodged at the ends on brick ledges, corbelled out from a good depth below, and secured to the walls with iron anchors. The ends of the beams should be cut inclining, so that while of full length at the lower edge, they will be an inch distant from each wall at the top edge; and this space between the wall and the beams should be kept open for ventilation. The floors at or below the level of the street should always be vaulted with brick: for here it will not be difficult to secure sufficient buttressing to the arches, and here, where the furnaces for heating are located, there is more need of protection. All flues for heating should be of ample size and lined with earthenware pipe. Stairways, usually of wood, afford means for the rapid spread of fire from the lower to the upper stories. Where practicable these should be of brick and stone; and the stairway of each story should be provided with doors by which to isolate it from the other stairways. All partitions should be of brick, especially those about a stairway or an elevator. All shafts for elevators or for light or air should be provided with doors at each floor, in order to cut off when required all opportunity for a current of air. Wooden furring on walls is highly dangerous. Where used it should be provided with bars of filling at proper intervals to prevent draught, and, incidentally, the circulation of vermin. Partition walls of brick should, when possible, take the place of lines of posts and girders, that the apartments may be reduced in size; and the openings in the walls should be provided with doors and shutters by which to isolate the departments.

If buildings were constructed in this manner, a fire would seldom extend beyond the apartment in which it originated.

To protect the exterior, all wooden cornices, dormer windows, and the like should be avoided. Roofs should be of slate or metal laid upon a good bed of cement or concrete. The walls should be extended well above the roof, and coped with stone or iron. The exterior walls should all be of good solid brickwork. If, however, there be iron posts, as those of a store front, they should be filled in solid with brickwork of ample size to carry alone the weight of the upper walls.

Buildings of the character here indicated could be erected at a cost not to exceed fifty per cent additional to that of the average city building, and in a city of such buildings damage by fire would be reduced to a minimum.

New Agricultural Inventions.

Stephen Townsend and John Vickers, of Guysville, Ohio, have patented a Gate Hinge, which is adapted for farm gates which open by first sliding back half their length and then swinging around into a position parallel with the roadway. The pivot and socket portions of the hinge are constructed in such a manner that the former may be detached from the latter when adjusted in a certain position, this position being, however, one which the parts cannot assume so long as the hinge is in use for supporting the gate.

An Apparatus for Applying Poison to Plants, invented by James L. Goodin, of Montgomery, Texas, consists of a tank to receive the poisoned water, and which has a discharge pipe, the inner end of which is provided with a valve. The stem of the valve passes up through a hole in the tank and is pivoted to a lever, which is itself pivoted to a short standard. Three nozzles connected with the discharge pipe distribute the water.

Thomas H. Parvin, of Chicago, Ill., has patented a Lever Take-up for Grain Binders. The invention consists in a lever carrying a sheave, which acts upon the wire or cord, the said lever being connected with another lever that is moved by a cam on the main or other shaft of the binding apparatus. A varied or uniform tension of the wire may thus be secured.

In a Rotary Churn, patented by John W. Hazelrigg, of El Dara, Ill., the upper end of the churn shaft, above the top board, is surrounded by a ring groove, to receive the forked end of a lever, which is slightly bent, and is pivoted at its bend to the top board. By pressing down the rear end, the shaft will be raised and disconnected from the dasher shaft, allowing the hub and the upper end of the dasher shaft to be disconnected and the churn and dashers to be removed.

A Plow, patented by William W. Dawson, of Madisonville, Texas, has the point made with a landside, fitting into a rabbet in the landside of the standard, and made thicker and deeper than the rabbet, so as to project beyond and below the landside to receive the wear. It may be kept in repair at small expense.

A simple improvement on Side Spring Wagons has been invented by Hervey S. Marvin, of Nunda Station, N. Y. The motion of the team and running gear is, by means of two sets of spring bars, not transmitted directly to the driver. but taken up by the lower spring bars and then neutralized by the upper spring bars, so as to give an easy riding motion in passing over obstructions.

A Heel Spur, the invention of George W. Elliott, of Boonsborough, Md. has a reversible rowel, in combination with a shank, which is pivoted to spring jaws, and grooved to receive a tenon formed on the jaws. The spurs can thus be used as blunt or sharp ones.

A Swing invented by Joseph H. Fisher, of Chicago, Ill., has two oppositely arranged half pulleys, over which are placed straps by which the seat and footboard are suspended. The forward oscillation of the swing slightly raises the footboard and lowers the seat, and the backward oscillation produces the opposite effect, the object being to keep the footboard always under the feet.

A Whip Socket patented by George E. Hendey of Waterbury, Conn., is attached to the dasher by lugs which are secured by tapering screws having screw threads upon their smaller ends. The screws secure the socket securely in place and act as wedge keys.

The Philadelphia *Public Ledger Almanac* has made its ninth annual reappearance, and is brighter and better than ever. Over a hundred thousand are issued.

Inventions Patented in England by Americans.

From November 20 to December 7, inclusive.

BALING COTTON.—Leslie Belden.
BRICK KILNS.—Wm. T. Christy, St. Louis, Mo.
BROAD CAST SOWERS.—David Buist *et al.*, Philadelphia, Pa.
CIGAR LIGHTER.—J. A. Chandor, New York city.
CIGARS AND CIGARETTES.—T. H. Babcock *et al.*, Brooklyn, N. Y.
COMBINED TAP AND FAUCET.—Amasa Mason, New York city.
DENTAL CHAIRS.—Basil M. Wilkerson, Baltimore, Md.
EDUCATIONAL APPLIANCES.—W. W. Rose, New York city.
FLOWER VASES AND BOXES.—C. H. Crater, Oswego, N. Y.
GYMNASIUM APPARATUS.—J. A. Chandor, New York city.
LAMP BURNERS.—Francis Holt, Newark, N. J.
METAL-REDUCING MACHINE.—G. J. Capewell, Chesire, Conn.
MOWING AND REAPING MACHINES.—W. A. Wood, Hoosick Falls, N. Y.
MUSICAL INSTRUMENTS.—E. P. Needham, New York city.
PAPER BAG MACHINE.—G. H. Mallary, New York city.
PEN RULING MACHINE.—W. U. Hickok, Harrisburg, Pa.
PIPE JOINTS.—William Painter, Baltimore, Md.
POTATO DIGGER.—Lewis A. Aspinwall, Albany, N. Y.
RAILROAD AIR BRAKE.—William Stevens, New York city.
SAFETY PINS.—Purches Miles, Brooklyn, N. Y.
SCOURING AND POLISHING GRAIN.—J. M. Galt, Sterling, Ill.
SEWING MACHINE ATTACHMENT.—D. M. Somers, New York city.
SHARPENING FILES.—B. C. Tilghman, Philadelphia, Pa.
TELEPHONE WIRES.—Alexander Graham Bell, Boston, Mass.
VENTILATING GLASS SHADES.—S. J. Pardassus, New York city.
WEARING APPAREL, LEATHER.—Richard Lazenby, New York city.