

at equidistant points, and a brass spider, to which all the parts of the pendulum are attached, has a knife edge which rests in the groove in the support projecting from the back plate, G. The knife edge and its support are hardened in cooled mercury, thus rendering them practically indestructible by wear. To the arms of the spider are attached four curved bars of soft iron, which in the regular operation of the clock are drawn into the magnetic spool and released once every second. To the front of the spider is secured a frame, F, from which is suspended the pendulum weight. The weight in this case consists of a rod and two cross-arms, and two tubes filled with mercury which rest on the lower cross-arms, the upper ends of the tubes being supported by screws passing through the upper cross-arms into the tubes.

The frame, F, has an arm which extends upwardly and carries two screws, the one on the left being platinum-pointed. The arm of the hard rubber hammer, D, is pivoted to the frame, F, at the center of oscillation and carries a platinum point capable of making an electrical connection as the hammer, D, swings over and carries it against the platinum-pointed screw. The magnetizing coils are connected in series and the terminal wires are connected one with the arm of the hammer, the other with the platinum-pointed screw.

Above the pendulum, and behind the dial, is supported a train of gears which moves the hands and is moved by the large pin wheel, which takes its motion from a pawl vibrated by the pendulum. A second pawl prevents the pin wheel from moving when the actuating pawl is drawn down for a new movement.

The clock receives its current from an earth battery consisting of ten pairs of zinc and copper plates, each twelve by eighteen inches, buried in earth at a sufficient depth to be kept constantly moist, and connected with the clock by rubber-covered wires. With a battery of this kind the clock will run until the plates are destroyed. If desired, it may be operated with four to six cells of gravity battery.

The various parts of this clock must be perfectly balanced, and the regulation by changing the length of the pendulum must be done with considerable care.

Notes on the National Academy of Sciences Meeting.
BY WILLIAM H. HALE.

Many pictures were shown of the forms of cephalopods from their first appearance, which was probably in the Potsdam, certainly in the Quebec group, below the Chazy, which is the base of the Ordovician, down to the present time. Also pictures of the development of individuals from embryonic to senile stages.

Also the development of many morphological characters was shown in a sequence of formulas as a mathematical statement. The development of these animals, both secular and individual, was shown to be a harmonious chapter of the grand evolution of life, precisely parallel to what Cope has shown for vertebrates and Beecher for branchiostomidæ. Space limits me to mention a single cycle, the change of form. Beginning with straight shell, curled forms follow. Very late, they straighten out again. This connects ammonites with the young of orthoceras. Every bilateral part of the shell is affected by this coiling and uncoiling, whereas the median line is not.

Forms acquired late in life appear earlier and earlier in the embryo, till finally they disappear, owing to the superior power of the embryo. This is called tachygenesis.

The embryo of straight form is coiled, recalling the adult form of its ancestors. In old age there is a gradual decrease of acquired characteristics.

When a new form is developed late in life, it goes through the same series of changes as the embryo.

It is not till many phases of evolution have occurred that old age shows any distinctive characteristics. Thus in the Silurian it is difficult to find any animal which shows any effect of old age.

After certain forms have developed there is a reversion to simpler forms. Just as old age becomes a second childhood, so forms of earlier geologic age reappear today. The life cycle of the middle group corresponds to the secular cycle of the entire group.

It seems impossible, when electric traction has so firmly established its superiority over any other means

of power for the propulsion of street cars and light railways, that the obsolete cable system should be decided upon in a large city like Edinburgh (Scotland). At a recent meeting of the Municipal Council of that city the question of erecting a new cable power station for a section of the tramway was discussed. One councilor, who is a firm advocate of the cable system, emphatically averred that Edinburgh possessed the finest tramway system in the world, and by dint of persuasive eloquence succeeded in carrying the vote favoring the erection of the cable station. This will involve an outlay of \$100,000, a sum sufficient, as another councilor remarked; to convert the whole section for which the station is being erected to the overhead trolley system.

The Current Supplement.

The current SUPPLEMENT is No. 1300, the first number having been issued January 1, 1876, and as the paging has been consecutive throughout this long period, the last one bears the number 20846. The front-page engraving is an excellent portrait of Giuseppe Verdi. "High Water Protection Methods of the Lower Mississippi River" is by William Joseph Hardee. "A Graphic Description of the Efficiency of Naval Guns" is a most important technical article. "Salt Water Aquarium at the Paris Exposition" illustrates the most modern type of aquarium. "An 'Electric Earth Clock' and Its Construction" is by N. Monroe Hopkins, and is accompanied by working drawings.

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RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

CULTIVATOR.—FERGUSON G. BRIGHT, Commerce, Mo. The cultivator has two shovel-beams sustained at their front ends. A rod extends rigidly between the rear portions of the shovel-beams. On the front portions of the shovel-beams a foot lever is mounted, each having a return bend permitting the rod to pass beyond each side of the longitudinal line of the foot-lever. Chains or other flexible connections pass between the foot-lever and the shovel-beams and run over the axle of the machine. The chains serve to limit the downward movement of the beams, and consequently the depth at which the shovels enter the ground. The foot-levers, when pressed down, will throw the beam up and disengage the shovels from the ground.

HORSE-HOE AND CULTIVATOR.—EDWARD J. BRYAN, 1504 Twentieth Street, South Highlands, Birmingham, Ala. The inventor provides an improved mechanism by the use of which he is able to bar off or scrape to narrow ridges the beds forming the row; to chop or hoe the desired space out of the row of plants; to dirt the plant after hoeing, means being provided to prevent the covering of the plant; and to plow, pulverize, cultivate, or rake the full width of the row.

PROCESS OF AN APPARATUS FOR PROTECTING TREES OR VEGETATION AGAINST COLD.—JAMES F. TUCKER, United States Department of Labor, Washington, D. C. The inventor has observed that tender vegetation on the south shore of a body of water usually escapes the blighting effect of frost. In Florida the deep-water rivers and lakes are fed by springs which contribute to the heat treasured up from the long summer months, so that during a cold spell, the air is brought in contact with a body of water at a relatively high temperature. A cloud of fog or vapor is thus produced, completely enveloping the locality to the south and east and protecting the vegetation. The present invention comprises means for making an artificial fog in the orchard or over the ground to be protected. The essentials are heat and moisture applied in such a way as to make sensible the latent heat as an adjunct to the heat actually supplied.

Electrical Apparatus.

BARBER'S ELECTRICAL APPLIANCE.—MARTIN SCHUPNER, Nyack, N. Y. Mr. Schupner has devised an improved electrical apparatus arranged to permit a barber or other operator to apply a current of electricity of desired intensity to the human body, mainly, however, to treat the scalp for strengthening, drying, or assisting the growth of the hair.

Engineering Improvements.

STEAM-TRAP.—GEORGE H. GROTE, St. Louis, Mo. The object of the invention is to provide a steam-trap with a simple means for regulating the tension-spring, whereby it is made unnecessary to shut off or take the trap apart to adjust the spring, thus saving time and expense. A diaphragm divides the trap-casing into upper and lower chambers. The inflow of water acts upon the diaphragm in order to operate a valve, so that the proper level may be attained. The action is entirely automatic.

Mechanical Devices.

GAS-PRESSURE REGULATOR.—THEODORE HAEN, Kötzenbroda, Saxony, Germany. The use of gas-engines with an intermittent gas-supply is accompanied by the disadvantage that in the gas-main variations in pressure are perceptible. Ordinary gas-governors imperfectly overcome the difficulty, for the reason that only

a single gasometer-hood is employed. According to the present invention the gas, before passing into the gasometer-hood which controls a gas-supply valve, passes through a special pressure-regulator loaded in conformity with the friction of the gasometer-hood and in such a manner that the gas can pass into the gasometer-hood without perceptible impulses occurring in the regulator and gas-main.

ROLLER-BEARING.—JOHN S. GODFREY, Harrington, Wash. A casing has the ends of its inner wall curved inwardly. Guide-rollers extended through the casing are supported by a cage. The ends of the guide-rollers are rounded. Antifriction-rollers are supported by the guide-rollers and have rounded ends. The rounded ends cause very little friction.

TYPE-WRITER.—MANUEL S. CARMONA, Mexico, Mexico. The type-writer is an improvement on Mr. Carmona's previous inventions in machines in which a small number of keys is employed which either singly or in combination govern the action of a type-locating mechanism and of a printing device. The present invention provides means for locating the type, which means are positive in action and are not liable to deteriorate by wear. The arrangement of parts is so simplified that the movement of the carriage will be relatively slight. An improved mechanism is furnished for effecting the impression.

SAW-FILING MACHINE.—GRANVILLE BARTLETT, 347 Trumbull Avenue, Detroit, Mich. The machine is of that form in which a pair of clamp-bars hold the saw-blade with its teeth uppermost and a sliding carriage or guide frame for the file-holder is arranged to be moved longitudinally along the clamp-bars and has guide-seats to receive the file-holder in its reciprocating movement across the saw. The present invention consists in the peculiar construction of the saw-clamp; the peculiar construction of the file-holder guide or carriage; and in the peculiar means for adjusting the angular position of the file in regulating the inclination of the teeth to be cut.

PHOTOGRAPHIC SHUTTER.—JOHN V. COATS, Saratoga Springs, N. Y. This spring actuated shutter can be regulated for time and instantaneous exposures. The winding mechanism is so controlled that the spring will be equal in action at all times and at no time fully exhausted. The camera-shutter is turned by the spring. Check-arms are carried by a trip-lever for engaging and stopping the shutter at the proper point in its revolution and for releasing the shutter.

MACHINE FOR MAKING SHOVEL-HANDLES.—AUGUSTUS R. FEISTEL, Philadelphus, Penn. This invention is a machine for cutting the D-holes in the blanks of shovel and fork handles. A handle-blank is clamped in a vertically tiltable holder pivoted in a horizontally-slidable carrier, by which it is fed to a rotatable cutter-head. The holder is tilted in vertical position while the cutter is forming the D-hole and is thrown back to a horizontal position as the carriage recedes. The blank is then reversed in the holder and the operation is repeated. The inventor assures us that a machine has been constructed and is now in successful operation.

DRAG-SAW.—JAMES H. PERKINS, Seattle, Wash. A very compact and serviceable machine is provided by the present invention. All the parts are carried snugly on the bed or framing in position to be easily reached for operation. On a framing a bracket is mounted to move, carrying a wrist-pin to which a connecting-rod is attached as well as a saw-beam. A tower is mounted on the frame. In the tower a movable sling is carried, which sustains the free end of the saw-beam. The sling is moved by winding devices at the top of the tower.

Railway Appliances.

VEGETATION-BURNER FOR RAILROAD-TRACKS.—CORNELIUS BURKE and JOHN TOOLE, Monroe, La. The invention provides a new and improved vegetation-burner for railroad-tracks, which burner is especially designed for use on a push or flat car. On a truck, levers are fulcrumed, extending rearwardly beyond the truck. These levers are provided with nuts between their ends, which nuts engage screw-rods on the truck. The outer ends of the levers carry a tube from which burner-pipes depend. A transverse sheet of flame is produced, which can be raised or lowered so that high or low weeds or grass can be readily destroyed.

Miscellaneous Inventions.

SAD-IRON.—IVER WICKLAND, South Superior, Wis. The sad-iron is heated by gas or vapor supplied from oil in a tank carried by the sad-iron. A box is fitted in the front portion of the sad-iron body and forms an oil-cup, the box being in communication with the oil-supply. A retort communicates with the box and a burner is situated rearwardly of the box.

BRIDLE BLIND.—FRANK MACK, Manhattan, New York city. Mr. Mack has devised blinkers or blinders which can be made completely to blind a horse and thereby to stop him. Each blinker comprises a pivotally-mounted shade movable on its pivot to cover or uncover the eyes of the horse, and a wheel with two cams to actuate the shade.

FOLDING FLASH-LIGHT BRACKET.—OTTO C. BOTZ, Sedalia, Mo. The bracket has a supporting-bar for attachment to a socket in the camera. An extension-rod is fulcrumed on the supporting-bar. Pivotaly connected with the extension-rod is an extension-rod consisting of telescopic sections for carrying the flash-light material. A spring holds the sections as adjusted.

MAIL-BOX.—WILLIAM J. WEAVER, Leetonia, Ohio. This invention relates to mail boxes particularly adapted for use on railroad mail-routes. The box is of simple construction and may be opened by a man riding on a horse or sitting in a carriage. A signal is provided for the box, which signal indicates whether the box contains mail for collection.

BRUSH.—MAURICE ROSENTHAL, Manhattan, New York city. Paint, varnish and calcimining brushes require bridling to enable the bristles to be properly controlled. This is generally done by tying a string around the bristles just below the ferrule. Brushes are best when the bristles are long, thus giving elasticity, or, as painters call it, "life," to the brush. The inventor attains these ends by fastening a flexible center-piece to the brush within the mass of bristles and tying the bristles snugly around the center-piece.

BEDSTEAD FASTENING.—FRED C. F. PETERS, Monroe, La. The purpose of the invention is to provide a bedstead-fastening which will securely bind the parts of a bed together and prevent them from becoming detached by breakage or movement. The fastening comprises two sections, the first of which has a flat outstanding part and the second of which has two flat outstanding parts lying in parallel planes and receiving the outstanding part of the first section between them. A pin is carried by the first section and is disposed transversely to the corresponding outstanding part. The second section has a recess in one of its outstanding parts to receive the pin.

FITTING.—JOHN R. MOODY, Perry, Iowa. The fitting is designed for repairing broken pipes, and for connecting pipes with one another, with elbows, reducers, tees, valves, without the necessity of threading the pipe or the device with which the pipe is connected. The pipe-fitting has external threads and is adapted to receive the

ends of a pipe. A collar is fitted on the pipe end, is removably secured, but is held against longitudinal movement. The collar abuts on the end of the fitting. A coupling is slipped over the pipe and screws on the threads of the fitting. A packing in the coupling is adapted to be compressed against the collar.

WASHBOILER.—HIRAM H. TUTTLE, 1210 Vine Street, Philadelphia, Penn. When heat is applied to the boiler, the water begins to boil; and a circulation is established downward along the sides and ends of the boiler. The water is forced up through lines of tubes from the bottom with a direct force and discharged by such direct force below the clothing to be washed. The clothing is thereby opened up and subjected to the action of the circulating water.

STAGE-ILLUSION APPARATUS.—MORGAN A. SHERWOOD, National Theater, Washington, D. C. The invention provides an apparatus for producing a scenic representation of the burning of a person at the stake, with wonderfully realistic and startling effect, and also means for producing fire and flame effects in connection with representation in general.

METALLIC PACKING.—WILLIAM H. PRENDERGAST, Savannah, Ga. The packing is designed to be used on piston-rods and in air-pumps and is composed of packing ring sections over which lies an equalizing plate having pocket-like seats at its ends. A spring fits over the equalizing-plate and is engaged at its ends.

MOTOR-VEHICLE.—AVON M. COBURN, Daunt, Cal. The inventor mounts his engine horizontally and causes it to drive a power-shaft journaled in the middle of the vehicle below the seat. The power is transmitted by a friction-pulley to an intermediate shaft and then by sprocket and chain to the rear axle. By this arrangement power is transmitted without jerk or jar to the driving-wheel.

Designs.

BARREL.—GORDON D. CANFIELD, Washington, N. C. The barrel has a central row of diamond-shaped openings which alternate in the direction of length of the barrel with tapered openings lying nearer the ends of the barrel and giving the latter a novel appearance.

NOTE.—Copies of any of these patents can be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC.

MOTOR VEHICLES AND MOTORS: THEIR DESIGN, CONSTRUCTION AND WORKING BY STEAM, OIL AND ELECTRICITY. By W. Woleley Beaumont. London: Archibald Constable & Company. Philadelphia: J. B. Lippincott Company. 1900. 4to. Pp. 636. Price \$10.

Mr. Beaumont has the unique distinction of furnishing to the automobile world the most important contribution ever made to the subject. We cannot speak in too high terms of the style in which the work is gotten up; it is splendidly printed, with rubricated paragraph indexes on the margin. The illustrations, which number 450, are well executed and are on a liberal scale, there being many folding plates. On the whole the book may be regarded as a model piece of technical bookmaking. The subject is treated in a remarkably thorough manner, and no phase of it seems to have been neglected. About the only criticism which can be made is that American practice is not as well represented as it should be. It is an indispensable book for every constructing engineer.