

The Teredo Navalis in Boston Harbor.

At the meeting of the Boston Society of Civil Engineers, reported in the Journal of the Association of Engineering Societies, Mr. Henry Manley said: The Eastern Dredging Company had two large scows built last season in Bath, Me., of pine, which were brought to Boston, where they were measured. They were taken down to the mouth of the harbor, beyond Boston Light, on or about May 27, for dredging, and were used there during the summer. In October, or early in November, they began to leak; but by that time the owners had begun to suspect that something serious was the matter, and the one in the worst condition was brought up the harbor. It was found pretty thoroughly bored through by teredo navalis, and had to be practically replanked. Another scow was then brought up, and was found riddled through, though not so badly, by the teredo. The teredo has for a long time existed on the southern coast of New England; but our harbor, on account of the difference in the temperature of the water, was supposed to be exempt. This case is almost the first in which they have been found so far north, and is the first in which they have done any appreciable harm. There are some curious features in the life and nature of the teredo. The full grown animal sometimes attains a length of two or three feet. It enters the wood through a very small hole, and after that passes its life inside, penetrating the wood as it grows; but living, in one sense, a solitary life, as the openings never communicate with each other. The eggs are formed in the interior of the animal in position, and are fertilized there. They are hatched in the water. While the animal is in the water it passes through two or three different stages of growth, in each of which it assumes a different form. In one stage it is able to swim. In a later stage it has a foot that enables it to cling to any object and to move about to a limited extent. It enters the wood when about as large as the head of a pin. After it makes its entrance into the wood its progress is quite rapid. The four or five inch plank shown has been torn to pieces during one summer. The teredo does not eat the wood, but simply bores it out for a habitation. It has two flues or passages running the whole length of its body and opening out into the salt water. Through one passage it takes in the salt water with the infusoria, etc., which constitute its food, and through the other tube the chips, its own excreta, and everything else it wishes to get rid of, are passed out into the water. The animal is technically a bivalvular mollusk. Its boring apparatus is a very

curious one. The two large shells are not firmly hinged together. Indeed, in the specimen shown they seem to be quite loose from each other; but judging from the amount of work it can do in one season they must, in the living animal, be connected by very powerful muscles. The instance recorded may be an isolated one, or it may be the beginning of a terrible pest that will cause great trouble for all time to come to those who have charge of submarine woodwork in this harbor. Among the preventives in common use, covering with copper and creosoting are the most effectual. Creosoting is valuable only for a certain number of years.

Navy Steam Launches.

In the report made upon the 39 foot Herreshoff steam barge belonging to the Chicago, by Captain A. S. Barker, U. S. N., commanding the U. S. S. Philadelphia, it is stated that "The steam turnabout launch, which is a lifeboat, is an excellent, buoyant, and seaworthy boat, her maneuvering qualities being exceptionally good, excelling in this respect all the steam launches in the fleet, for which reason alone she commends herself to the service. The boat has been in constant use since we have had her, and has done excellent work. . . . Where two steam launches are supplied to a man-of-war, I would recommend that one of them be of this type, on account of her safety and maneuvering qualities."

In the tests made by the Board in November, 1892, with a crew of eight men, and allowance of coal and water (making a total weight of 1,673 pounds) this boat showed a freeboard of 45 inches forward, 28 inches aft, and 22 inches amidships. With 35 men seated and supplementing the above weight, a freeboard of 44 inches forward, 21 inches aft, and 19 inches amidships was maintained; and with 50 men in addition to the above 1,673 pounds, the steamer turned and speeded in the East River (wind and water moderate), preserving a freeboard of 36½ inches forward, 22 inches aft, and 17 inches amidships.

So far as seaworthiness goes, three members of the board who have tried her under conditions which tested this quality fairly have no hesitation in declaring she is far more seaworthy than any other steamer of her length they have ever seen. In these trials she was run at a high speed through the most confused sea (made both by wind and the tumbled crosswakes of passing ferryboats) which could be found in the East River, and at no time did she ship the least water. All these tests were made under circumstances when

every other steamer of her length known to them would have become so wet and so much in danger of shipping water as to have necessitated an immediate and large reduction of speed.

Under a test for life-saving qualities, very satisfactory and unusual results were secured. The machinery and passenger spaces were filled with fresh water up to the level of the rail, so high indeed that it flowed with force through the scuppers in the wash strake, and then as an appreciable freeboard still existed, over 2,200 pounds of weight (15 men) were added without submerging the boat.

These results have been partly secured by making her not a nominal, but an actual lifeboat. Under the rail, on each side, two cylindrical air tanks extend for a distance of 13 feet, and in the bow and stern two airtight compartments are disposed. The square shape given to the stern affords room for one of these airtight chambers, and thus utilizes space which generally is wasted upon a mistaken theory as to what is good appearance. Three complete water-tight bulkheads subdivide the boat and add large margin to an already secured factor of safety.

An Aluminum War Boat.

An aluminum boat, the Jules Davoust, which has been sent out to the Niger by the French government for hydrographic purposes, is reported to be an entirely successful experiment. It weighs about 4,400 pounds, and has a capacity of 11 tons, with a draught of about 15 inches. It is about 40 feet long, 6 feet wide, and 2½ feet deep. There are three masts and a deck cabin, as well as a movable deck tent, or pavilion. The sails are of the lateen order and easily managed. Two Hotchkiss quick-firing guns are mounted amidships. The vessel was built by Lefebvre, of Paris, who has already furnished several dismountable vehicles of this metal for the use of the French troops in the Soudan and Tonquin. The lightness of the material makes it valuable for such uses in wild and unexplored countries, as boats or vehicles made of it can be easily carried through the bush. Word comes, also, from France of the use of aluminum for cabs in Paris, where the company L'Urbaine, who own the largest number of hacks in the French capital, are about to use the metal in their construction. The company are now using tin plate for the bodies of their cabs. It is reckoned that an ordinary coupe weighs about 1,000 pounds. This weight, it is expected, will be greatly reduced if it is found that the aluminum cabs are a practical success.

RECENTLY PATENTED INVENTIONS.**Engineering.**

BOILER FURNACE.—Zenas E. Moon, Schuyler, Neb. This invention provides a furnace and attachments, applicable to any ordinary horizontal boilers, of such construction that the atmospheric air may be taken from the ash pit and delivered in a heated condition into the fire box, and also into the furnace behind the bridge wall, the air mingling with the unconsumed gases to promote more complete combustion. It is also provided that the heat may be more evenly distributed upon the heating surface of the boiler, for the quick generation of steam and prolonging the life of the boiler.

DREDGER.—Samuel P. Hedges, Greenport, N. Y. This is an improvement upon a formerly patented invention of the same inventor, providing a simple device for holding back, lowering and controlling the outward movement of the clipper handle. The clipper is allowed to enter the soil without a sudden jar or drop, and the position of the lower end of the clipper arm may be controlled, to fall either perpendicularly or with any desired inward inclination, the manipulation of the clipper being under the complete control of the operator.

CENTRIFUGAL BLOWER.—William H. Harrison, Newark, N. J. This blower provides an outlet for the air from the fan wheel that is designed to prevent undue compression of the air in the wheel, and consequent friction and loss of power. The invention consists of a fan wheel having a series of plane radial main vanes forming a passage for the air from the central opening of the wheel to its periphery, while a set of parallel auxiliary vanes is arranged for each main vane, extending from the periphery of the wheel to within a short distance of the next following main vane.

Electrical.

BUSHING FOR ARC LAMPS.—Thomas J. Houck, Baltimore, Md. This is a detachable and adjustable bushing for carbon holder guides, and one which may be tightened or adjusted from time to time to take up wear and always hold the upper carbon holder and its carbon in true vertical alignment, at the same time avoiding the necessity and expense of throwing away the old guides and replacing them with new ones. The improved bushing has longitudinal slits forming spring tongues, and has on its exterior a tapering screw thread adapted to compress the spring tongues when screwed into a socket.

AUTOMATIC LINE DISCHARGER.—Jacinto P. Ganduxer, Gracia, Spain. According to this invention an electro-magnet, an armature lever carrying an armature and prolonged between a pair of electrical contacts, a retractile spring for holding the armature lever normally against the back contact spring, and line and ground connections, are combined in an automatic device for insertion in electrical lines, to discharge the lines when an abnormal current passes, as when lightning strikes a telegraph, telephone, or electric light wire, or

when a conductor carrying a heavy current crosses a telephone or telegraph line.

GALVANIC ELEMENT.—Albrecht Heil, Crumbach, Germany. A silver electrode attached to a lead support is sealed through the cover and embedded in a mixture of carbon and peroxide of manganese, enclosed in a linen bag, a felt cylinder or diaphragm surrounding the same, and adapted to be saturated with a suitable liquid. It is designed to render the element proof against oxidation of the binding screws, small and convenient in shape, with relatively powerful action, hermetically closed to prevent evaporation, cleanly and nice in appearance, and easy to make.

Mechanical.

SAND BLAST MACHINE.—John A. Shoemaker, Rochester, N. Y. This inventor has devised improvements in machines adapted to produce non-lustrous surfaces on previously polished buttons and other small articles, or for general use. Means are afforded to rapidly and perfectly sand blast a considerable number of buttons at one time, the machine being adapted for continuous operation, the articles operated upon being readily placed and removed, while the operator is enabled to gauge the force of impact of the sand blast and graduate the amount of sand pervading the air current used to effect the blast.

NUT LOCK.—Elmer J. Bickell, Jersey Shore, Pa. Combined with a longitudinally grooved bolt, and a nut having a circumferential groove near its lower side, is a locking piece comprising an annular plate having an integral key formed at the edge of its center hole, and fitting in the groove of the bolt, in connection with two sets of inclined spring fingers, one set projecting up to interlock key notches at corners of the nut and the other set extending down to be seated on material penetrated by the bolt.

LIFTING JACK.—Allan A. Smith, Grand Island, Neb. This jack has an elongated body or base, with which is connected a lifting device, while a ring slidable vertically on the base has a lateral flange adapted to engage the rim of a car wheel, the jack being designed particularly for railroad use in lifting the journal boxes of cars to enable the brasses to be removed, although it may be used for ordinary lifting purposes.

Miscellaneous.

SEWING MACHINE ATTACHMENT.—Ferdinand B. Almy, Providence, R. I. This invention relates to a presser foot attachment similar to a former patented invention of the same inventor. The improved attachment is capable of being secured to presser feet of various widths and thicknesses. The invention consists principally of an adjustable clamping device whereby the attachment may be secured to a presser foot, and a toe which is adjustably connected with the clamping device.

PROPELLING CAROUSELS, ETC.—Charles Braaf, New York City. This inventor has devised a propelling mechanism for each car, of such con-

struction that the occupant or occupants cause the supports from which the carriages are suspended to revolve, thus dispensing with the usual motor. There is also provided a wind motor for each carriage, in the shape of a series of sails or a winged wheel, the sails opening and closing of themselves at proper intervals. The carousel may also be used for exercising purposes.

CHAIR COT.—Colin C. McPhee and Ivor E. Brock, Chatham, Canada. This is a simple and durable construction which may be quickly changed into a comfortable and portable cot, with pillow attachment, or into a reclining chair having a back adjustable to any desired angle, and a leg rest that adapts itself simultaneously to the changed position of the chair. The covering material, of any approved character, is conveniently attached to the chair frame.

LEVEL.—Harry Hughes, Alliance, Neb. This invention consists principally of a balance lever, fulcrumed at its middle in the stock and having at its ends adjustable weights, the fulcrum pin of the lever being provided with pointers indicating on dials fixed on the stock. The balance lever is locked in position when desired, and the friction between the lever and the stock may be regulated to take up wear, the implement quickly indicating an angle when placed in an inclined position, and being of very simple and durable construction.

DRAWING INSTRUMENT.—Edmund L. Sanderson, Waltham, Mass. This is a new and improved adjustable triangle, comprising a straight edge and a blade pivoted thereon. It is of simple and durable construction, and arranged to permit of conveniently drawing lines at angle to the T-square, and also lines perpendicular to each other.

TOBACCO CASING MACHINE.—David R. Fraley, Winston, N. C. This is a machine designed to facilitate the moistening or flavoring of tobacco preparatory to its being made into plugs, more thoroughly atomizing the flavoring, and more thoroughly and uniformly agitating and distributing the leaves to receive the flavoring liquid. The machine also cleans the tobacco of all trash and dirt, and is economical of the flavoring, the sprayer having an atomizer which can be readily adjusted in relation to the character of the tobacco. The tobacco, as it is agitated and fed forward to receive the spray, is first wound in one direction, then unwound at the spraying point and rewound in a reverse direction, whereby both sides of the leaves receive the spraying uniformly.

SHELL FUSE.—Dawson Conekin, Charleston, S. C. For exploding shells in pneumatic guns, and also for exploding torpedoes, this inventor has devised a simple and economic fuse to be fired by impact at its forward end with any object it may strike, or with the water. The fuse has a spring-controlled hammer, a sectional firing shaft whose sections are separable by concussion, and a trigger connection between the firing shaft and the hammer. A safety latch provides against premature explosion, but it is so constructed that after the shell leaves the mortar or gun the rotary movement of the shell causes the latch to be automatically carried out of the way of the firing hammer.

ANIMAL CLIP OR SHEARER.—Charles and Harry Burgon, Malin Bridge, near Sheffield, England. In this implement it is the design of the inventors to relieve the part of the mechanism by which reciprocating motion is imparted to the cutters of the duty of giving to the cutters the necessary cutting pressure, thus improving the work and requiring less strength. Combined with the oscillating cutter-driving lever is a pressure lever, loosely connected to the cutter-driving lever and oscillating with it about the same axis, while having an upward bearing against an abutment, a downward bearing upon the cutter, and a downward moving bearing at its rear end upon the machine frame.

CIGAR HOLDER.—Frederick D. Van Wickel, Corona, N. Y. The drawing tube of this holder is smaller externally than usual, and extends a little distance under the end of the cigar, to which it is attached by a hinged band, the cigar also resting in a forward semicircular supporting band on the holder. A hollow point or pin projects upward from the drawing tube, upon which is pressed the end of the cigar as it is placed in the holder, and just beneath this point is a small cup-like offset to receive nicotine, and adapted to be closed by a screw cap.

HAIR PIN.—Louisa Ousey, South Wimbledon, England. This pin is formed of thin, flexible wire, with serrated edges, the parallel wires of the body of the pin being slightly curved in the form of an arc, to better fit the shape of the head than the ordinary straight pins, while the points and the loop end are each slightly bent outward, or in a reverse direction.

BOTTLE NECK.—Leonard A. Pells and Louis Steiner, Brooklyn, N. Y. According to this invention a collar held in the neck of the bottle has a seat on its outer side on which is supported a flap valve adapted to close against the seat, there being in the outer end of the neck a stopper plug having a central bore extending partially through it, side ports connecting with the bore. The arrangement is such that liquid can be poured freely from the bottle, but no liquid can be forced into it, thus preventing the fraudulent refilling of labeled bottles.

AWNING WORKER.—John A. Gillin, Chicago, Ill. This inventor has designed a cheap and simple working mechanism whereby the awning may be instantly collapsed and thrown up out of the way, or as easily lowered into position for use. The mechanism is so arranged that the awning may be operated from the interior of the building, although protected from being tampered with by unauthorized persons.

BOTTLE FILLING MACHINE.—Samuel B. Smallwood, Long Island City, N. Y. Combined with a revolving tank containing the liquid is a series of filling tubes sliding in the tank, and a series of platforms in a circle in line with the filling tubes, the platforms supporting the bottles to be filled and moving with the tubes and tank. The construction permits the ready escape of the air from the bottle during the filling. A further patent has also been granted this inventor, under the same title, for an improvement designed to be

especially effective in insuring a ready flow of the filling liquid from the cask to the bottle, facilitating also the escape of the displaced air.

STOPPER.—James L. Miller, New York City. This stopper has a cork section adapted to be firmly secured to a wooden body or base, the body being also so made that a sponge, a tuft of felt, or an equivalent article may be conveniently and economically made a portion of the stopper when required.

MAKING SIRUPS.—Robert H. Hunstock, Hannibal, Mo. The apparatus devised by this inventor comprises a sirup reservoir within which is suspended a menstruum jacket with a reduced lower end carrying a strainer, into which fits an inner section having perforations connecting with the jacket. The apparatus is designed to produce simple medicinal and fruit sirups by cold percolation, adding in a convenient way just the required quantity of sugar, the apparatus being readily cleaned and the sirup properly filtered and clarified.

Designs.

CARPET.—John R. Cochrane, Newark, N. J. The body in this design is decorated with arched panels, with tulips, in connection with roses, thistles and small flowers, and the border has spray-surrounded panel figures similar to those in the body.

CARPET.—William F. Brown, Newark, N. J. The body of this carpet has groups of floral figures, each comprising curved bisecting sprays of small flowers, a ribbon tie and conventional foliage, the border having a horse shoe spray of small flowers tied with a bow, alternating with floral figures such as in the body.

MINER'S LAMP.—Charles D. Felix, Shamokin, Pa. This lamp is somewhat in the shape of a coffee pot, but with the back edge nearly vertical, there being an attached hook at the back.

SCARF PIN.—John H. Theberath, Newark, N. J. The head of this pin consists of outspread wings centrally in which rests a small outline face with an eyeglass at one eye, and surmounted by a diminutive stovepipe hat.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

A TEXT BOOK OF ORE AND STONE MINING. By C. Le Neve Foster. With frontispiece and 716 illustrations. London: Charles Griffin & Company, Limited. Philadelphia: J. B. Lippincott Company. 1894. Pp. xxviii, 744. Price \$10.

Mining engineering is at last adequately treated in this volume, and the different kinds of work that have to be done by the miner in the way of surveying, exploiting, drainage, ventilation, lighting, etc., as well as in the treatment of ores after their excavation, are all very fully treated. The book is adequately illustrated and excellently indexed. One section is devoted to legislation affecting mines and quarries, while another chapter, illustrating the thoroughness of the author, is devoted to the condition of the miners, their modes of life and the means for ameliorating their condition and elevating them. The book in its authorship is English, or rather Welsh, but England has done so much for the mines of all the world that this fact will not tell against it.

HYDRAULIC POWER AND HYDRAULIC MACHINERY. By Henry Robinson. Second edition, revised and enlarged. With numerous cuts and sixty-nine plates. London: Charles Griffin & Company, Limited. Philadelphia: J. B. Lippincott Company. 1893. Pp. xvi, 226. Price \$10.

Many of the modern processes of engineering are dependent upon hydraulic power. The American Bessemer steel industry is as regards its characteristic features largely derived from the work of Holvey in applying hydraulic power to this process. In their day these classes of work were considered marvels. Of late years hydraulic power has been applied in a more and more extensive way, and to a greater variety of things, so that as the present book very fully illustrates the building of hydraulic machinery for all classes of work, it will, we believe, be found very valuable and important. The work is well indexed, and will be found very interesting reading for those interested in engineering work, as well as for the profession.

MATTER, ETHER, AND MOTION. The Factors and Relations of Physical Science. By A. E. Dolbear. Revised edition, enlarged. Boston: Lee & Shepard. 1894. Pp. xv, 407. Price \$2.

Professor Dolbear, by the popular cast of much of his work in science, has become a favorite with the public. The present work, treating of the ether, naturally leads to the expression of rather radical views. It is questionable whether good is done by the assumption of the actual existence, as such, of the luminiferous ether, and whether it would not be better for scientists to accept the theory just for what it is, as a convenient handle for a quantity of facts. Professor Dolbear in the present work rather tends to fall into a way of treating the ether as a real thing, and of attributing properties to inert matter not generally supposed to belong thereto.

THE ENCYCLOPEDIA OF FOUNDING AND DICTIONARY OF FOUNDRY TERMS USED IN THE PRACTICE OF MOULDING. By Simpson Bolland. New York: John Wiley & Sons. 1894. Pp. iv, 535. No index. Price \$3.

The foundry man's art is here treated in dictionary form; alphabetically arranged, a large number of terms connected with his art are here defined and explained, the definitions being so full as to really entitle the work to the name given it, an encyclopedia. The author is well known as the writer of other works on the same subject,

and his title to a capacity for executing the work is given in the title page beneath his name, he being a practical moulder and manager of foundries.

HOW TO BUILD DYNAMO ELECTRIC MACHINERY, EMBRACING THEORY, DESIGNING AND THE CONSTRUCTION OF DYNAMOS AND MOTORS. By Edward Trevert. Lynn, Mass.: Bubier Publishing Company. 1894. Pp. 339. Illustrated. Price \$2.50

This work is quite thoroughly illustrated, and describes the general features of different dynamos. It includes a number of illustrations and a rather short index, enough, however, to save it from the reproach of being indexless. We have no doubt that it will prove of considerable use to many, and will be found an acceptable contribution to motor and dynamo building.

A LABORATORY MANUAL OF PHYSICS AND APPLIED ELECTRICITY. Arranged and edited by Edward L. Nichols. In two volumes. Vol. I. Junior Course in General Physics. By Ernest Merritt and Frederick J. Rogers. New York and London: Macmillan & Company. 1894. Pp. xiv, 294. Price \$3.

Harvard College sets an example of devoting much time to physics treated experimentally. Its entrance examination in physics, for instance, involves a large amount of quantitative work. These who have gone through this elementary entrance course may feel that it is open to criticism in the endeavor made to avoid the use of expensive apparatus. The present work, treating of the junior course, seems open to the same reproach. It would seem as well to allow the use of more perfect apparatus, because accurate work in physics cannot be done without the best appliances. It is, however, written for a specified course, and will be extensively used by those who desire to assimilate their work to the curriculum of Harvard College.

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SCIENTIFIC AMERICAN BUILDING EDITION.

AUGUST, 1894.—(No. 106.)

TABLE OF CONTENTS.

- 1. An elegant plate in colors showing a residence at Plainfield, N. J., recently erected for George H. Babcock, Esq. Perspective views and floor plans. A picturesque design. Mr. E. L. Hyde, architect, New York City.
2. A residence at Edgewater, Ill., recently erected for Mrs. Eva L. Prescott. Perspective elevations and plate in colors, together with floor plans. An excellent design. M. J. L. Silsbee, architect, Chicago, Ill.
3. A residence recently completed for J. P. Clarendon, Esq., at Hackensack, N. J. Two perspective elevations and floor plans. Mr. J. E. Turhune, architect, Hackensack, N. J. An attractive design.
4. A dwelling at Erie, Pa., erected for William J. Sell, Esq., at a cost of \$4,500 complete. Two perspective elevations and floor plans. Mr. C. F. Dean, architect, Erie, Pa.
5. A beautiful residence recently erected at Belle Haven, Conn. Three perspective elevations, one interior view, together with floor and ground plans. Mr. C. P. H. Gilbert, architect, New York City. A model design.
6. The beautiful residence of E. Einstein, Esq., at Pompton, N. J. Perspective elevation and floor plans. Cost complete about \$30,000. Architect, Mr. Manly N. Cutter, New York City.
7. A conveniently and economically arranged suburban cottage recently erected for George W. Payne, Esq., at Carthage, Ill. An attractive and picturesque design. Perspective elevation and floor plans. Cost \$3,000 complete. Architects, Messrs. G. W. Payne & Son, Carthage, Ill.
8. Perspective elevation and floor plans of a well arranged dwelling, recently erected for A. N. O'Harra, Esq., at Carthage, Ill. A pleasing design. Cost complete, \$5,500. Architects, Messrs. G. W. Payne & Son, Carthage, Ill.
9. A stable at Belle Haven, Conn. Perspective view and ground plan. A unique design. Mr. C. P. H. Gilbert, architect, New York City.
10. The Club House of the Knickerbocker Field Club, recently erected at Flatbush, L. I., N. Y. Engravings and floor plans. Messrs. Parsett Bros., architects, Brooklyn, N. Y. A neat design in the Colonial style.
11. An elegant residence of A. B. Bigelow, Esq., at Cranford, N. J. Perspective elevation and floor plans. Estimated cost, \$6,000. Mr. Manly N. Cutter, architect, New York City.
12. Miscellaneous Contents: The Hayes metallic lathing, illustrated.—Nonsuch Palace.—The Joseph Dixon Crucible Co.—The slate business.—New and old styles of eaves troughs, illustrated.—The Weathered hot water heaters.—Design for mantel and fireplace, illustrated.—The "P. & B." sheathing and insulating papers.—An improved vise, illustrated.—What becomes of all the lumber.—Globe ventilator, illustrated.—An improved sadiron, illustrated.

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Patent Electric Vise. What is claimed, istimesaving. No turning of handle to bring jaws to the work, simply one sliding movement. Capital Mach. Tool Co., Auburn, N. Y.

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(6183) T. C. G. asks: What power can be realized on 25 feet fall, 8 inch pipe at the discharge end, and gradually enlarging toward the top to 6 feet diameter, a turbine wheel to be used? Please give size of turbine suitable for the above flow of water and horse power. Your advice tending to better this plan will be greatly appreciated. A. The flow in the conical nozzle under the head stated, if the full head can be maintained, will be 584 cubic feet of water per minute. This should give in a modern turbine with a 17 1/2 inch wheel an actual 24 horse power; the turbine making 394 revolutions per minute. The turbine is the most effective method of developing water power for the head as stated.

(6184) Yale and Harvard asks: How many pounds does a cubic foot of pure gold weigh, and how many ordinary men does it take to lift it? A. A cubic foot of pure gold as a casting or ingot weighs 1203.62 pounds and will require eight strong men to carry it any distance.

(6185) E. B. U. says: I have a hard rubber tray which, while washing out, hit against the faucet and broke a small triangular piece out of the side of it. Can you tell me if there is any way to mend the tray? A. Equal parts of pitch and gutta percha are melted together and linseed oil is added which contains litharge. Melt until all are well mixed; use no more of the linseed oil than necessary. Apply warm.

(6186) C. C. C. says: What is the idea in melting old tin cans? Is it to get the solder or the tin, and how is it separated? A. Sometimes only the solder is saved, then again the tin is recovered. See the following issues of the SCIENTIFIC AMERICAN: May 27, 1893; March 25, 1893; May 14, 1887; April 7, 1888; October 27, 1888; November 9, 1890; October 3, 1891; May 23, 1892; August 1, 1885; July 8, 1882; July 14, 1877; February 12, 1876.

(6187) H. R. O. asks: 1. What are the resistances of each of the following lamps: 1. A 16 candle power 52 volt. 2. A 16 candle power 110 volt. 3. A 32 candle power 52 volt. 4. A 32 candle power 110 volt. A. 1. 37 ohms. 2. 244 ohms. 3. 74 ohms. 4. 488 ohms. 2. What would be the resistance of a solid bar of German silver five inches long, one-half inch wide and one-fourth inch thick? A. About 336 microhms, depending on the temperature and on the German silver used. 3. Does the E. M. F. of a chromic acid single fluid battery vary with the size of the cell? A. No. It is independent except as regards polarization. A polarized battery drops in E. M. F. A large battery for a given current resists polarization longer than does a small one. 4. Is there any book that gives directions for winding different kinds of dynamos, such as the alternating current, direct current, multipolars, generators, etc.? A. We can supply Hering's "Practical Directions for Winding Magnets for Dynamos," price \$1.25. Also Trevert's "Armature and Field Magnet Winding," price \$1.50 mailed.

For German silver address Queen & Co., Philadelphia, Pa.

(6188) J. R. asks for a plan by which he can steer a miniature yacht by the wind pressure on the main sail. A. Carry a tiller through the head of the rudder post so as to extend astern as well as forward. Attach two springs athwartship to the forward end so as to pull it straight, one spring leading to starboard, the other to port. Attach the end of the main sheet to the after end of the tiller. As a blow strikes her, the main sheet will ease off, and the helm will be put up, thus preventing her from going in stays. You will have to experiment a little to get the proper strength of spring, etc.

(6189) W. J. W. writes: How much resistance does water offer to the passage of an electric current, also that of ice? Why is such a high ampere current used on the street car trolley system, such as 500 amperes, and on the arc light system only 10 amperes and 2,000 volts are used? Could not one be used in either place? And is the size of the wire immaterial to the number of volts forced through it? A. The current on a street car system is perpetually changing and is not constantly 500 amperes. The size of a wire is independent of the voltage it can maintain under proper conditions. Pure water and ice are of almost infinite resistance.

TO INVENTORS.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

August 7, 1894,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Table listing various inventions and their patent numbers, including items like 'Acid, phenylrosindulin sulfo', 'Addressing machines', 'Air brake', 'Animal trap', 'Annunciator', 'Arms and hammers', 'Asphalt', 'Automobile', 'Automatic gate', 'Awning for vessels', 'Axle box', 'Axle making machine', 'Axle pile', 'Baz holder', 'Band cutter', 'Battery', 'Bed, folding', 'Beer glass counter', 'Bell, high', 'Belt, conductor's monkey', 'Bicycle', 'Bicycle saddle', 'Billiard time register', 'Boiler', 'Boiler furnace', 'Boiler furnace, steam', 'Boot or shoe sole cutting machine', 'Boring machine', 'Bottle filling apparatus', 'Bottle mouths, stopper or cover for', 'Bottle stopper', 'Bottle stopper and vent combined', 'Bottle washer', 'Bottle wrapper', 'Box, See Paper box', 'Box banding implement', 'Boxes, etc., adjustable partition for packing', 'Brake', 'Brush and comb, combination', 'Brush, fountain cleaning', 'Bucket, elevating', 'Burner', 'Butter box lining', 'Butter mould, adjustable', 'Button or stud, collar or cuff', 'Cake machine', 'Camera', 'Camera shutter', 'Can', 'Canning apparatus', 'Car buffer', 'Car coupling', 'Car fender', 'Car fender or guard, street or railway', 'Car fender, tram', 'Car life saver', 'Carriage, rocker attachment for baby', 'Cartridge stop, rimless', 'Casting machine, type', 'Cement mill', 'Chain coupling', 'Chair', 'Churn', 'Churn, rotary', 'Clamp', 'Clipping machines, power transmitter for', 'Clothes line reel', 'Coffee or tea pot, steam', 'Compasses', 'Condenser, exhaust steam', 'Confections, machine for moulding', 'Coop, folding chicken', 'Cork puller', 'Corn silker', 'Cotton gin', 'Coupling', 'Cross over tip, automatic', 'Curtain pole support, adjustable', 'Cut-off, rain water', 'Cutter', 'Demijohn crate', 'Dice thrower', 'Dispatch tube system', 'Drawer extension', 'Drier', 'Drying apparatus', 'Dye, azo', 'Dye, blue', 'Dye, blue, R. Kniesch', 'Dye, blue tetrazo', 'Dye, orange', 'Dye, orange, disazo', 'Dye, safranin azo naphthol', 'Dye, substantive blue', 'Dye, violet red', 'Eaves trough hanger', 'Eaves trough hanger, C. O. Street', 'Electric heater', 'Electric light wires, rosette for', 'Electric machine, dynamo', 'Electric machine, dynamo, G. Rennerfelt'