

particularly to improvements in ejecting devices for coin-controlled vending machines—such, for instance, as shown in a former application filed by Mr. Lynes—an object being to provide a simple device whereby a cigar or other vendible article when raised to discharging position will be thrown forward upon the top of the machine-casing.

APPARATUS FOR PRINTING WARPS ON PRINTING-DRUMS.—F. SCHMIDT, 7 Edisonstrasse, Oberschöneweide, near Berlin, Germany. The present invention relates to an apparatus for printing warps on printing-drums, wherein it is essential that the adjustment of the drum is effected in such a manner that its movement is dependent upon the movement of the adjusting device for the design. In manipulation of the apparatus, the operative places an indicator upon the threads to be printed, and turns the hand-wheel till indicator points to the check to be printed. Printing of warps can be then immediately proceeded with by means of rollers or the like, as the warp-drum has been automatically adjusted at the same time as the pattern-drum.

DOUBLE PRINTING-DRUM FOR WARPS.—F. SCHMIDT, 7 Edisonstrasse, Oberschöneweide, near Berlin, Germany. The subject-matter of the present invention is a double printing drum for warps, wherein it is essential that there be two drums of different circumference which can simultaneously be printed with the same pattern, as both drums receive the same angular rotation. This uniform angular rotation is obtained by the intercalation of gearing. It is furthermore essential that the two warp-drums of different circumference be driven together with a drum containing the design or pattern, the driving thereof being effected in that driving-crowns are provided on the circumference of the drums.

Prime Movers and Their Accessories.

DRIVER-WHEEL.—E. STANCLIFF, New York, N. Y. The invention provides an attachment for a locomotive driving-wheel adapted to economize power and reduce frictional resistance. It consists essentially of an annular ring provided on its outer circumference with a flange and a tread surface, of the usual type, adapted to roll upon a rail. The driving wheel rolls on the inner circumference of the ring, the latter being formed with a groove to receive the flange of the wheel. The construction partakes of the nature of an internal gear.

BOILER.—H. L. DES ANGES, New York, N. Y. The invention relates, first, to a boiler in which water-tubes are provided around which tubes the gases of combustion circulate and through which tubes internal or fire tubes are passed, so that the heating-surface of boiler is very greatly increased; and it relates, second, to a novel manner of fitting the several tubes which holds them securely in place and at the same time allows any one of the tubes to be removed conveniently for repair and other purposes.

COMBINED THROTTLE AND GOVERNOR FOR EXPLOSION-ENGINES.—O. MINTON, New York, N. Y. The principal object of the invention is to provide between a governor of any suitable design and the gas-inlet valve of an explosion-engine a connection whose length may be varied so as to adapt the action of the governor and valve to the load carried by the engine. It has special reference to explosion-engines designed for use upon automobiles and other vehicles.

STEAM-TURBINE.—T. J. MASTERS, 29 St. Mary's street, Cardiff, Glamorgan, England. This improvement relates to a compound reversible steam-turbine or rotary engine designed to utilize both the impact or momentum and also the expansive force of the steam in such manner as to avoid back pressure and economize power in a high degree, the improved turbine or rotary engine being provided also with means whereby the speed and direction of running may be controlled more efficiently than heretofore possible in engines of the same general type.

Railways and Their Accessories.

RAILROAD SYSTEM.—C. MEHRING, Charlottesville, Va. In this instance the invention relates more particularly to single-rail car systems; and the object had in view is to simplify and improve similar railroad systems constructed as heretofore. The inventor's leading idea is the employment of novel trucks, whereby the cars are prevented derailing, and thus rendered secure for speed not safe with railroad systems as formerly constructed.

RAILROAD CROSS-TIE.—S. HOAGLAND, Astor, Fla. The object of the invention is to provide a tie which is simple and durable in construction, cheap to manufacture, and arranged to properly support and securely hold the rails in position, to avoid spreading of the rails, and to allow of conveniently placing the tie and rails in position.

REGISTER SYSTEM.—A. FEVOLA, Yonkers, N. Y. Mr. Fevola's invention relates to systems for registering the number of persons passing some predetermined point, it being especially useful in recording the number of passengers carried by such a public conveyance as a street car. Its principal objects are to provide a convenient apparatus which will operate but once for each passenger, giving a registration of the exact number using the vehicle.

VESTIBULE.—T. A. RYAN, Yonkers, N. Y. In the present patent the invention pertains to vestibules for the fronts of vehicles, it being particularly convenient for use in connection with electric cars. Its principal objects are to provide such a structure which may be readily folded out of the way when not needed and yet will furnish an effective closure when in use.

LUBRICATOR.—J. MCQUEAD, Hunt, Ill. This invention relates to lubricators, and more particularly to those adapted for use in connection with the journal boxes of cars. Its principal objects are to provide such a device which will deliver the lubricant in substantially definite quantities when the car is in motion and will stop this supply when it is at rest.

STOCK-GUARD.—H. A. MIDDAGH, Seattle, Wash. Mr. Middagh's invention has reference to improvements in stock-guards, the object being the provision of an absolute guard against the access of stock from the highway to the tracks of a railroad crossing the same, and one which shall be simple, cheap, and easily applied and removed.

Pertaining to Vehicles.

PNEUMATIC TIRE.—G. DEVOLL, Boston, Mass., and G. H. RISLEY, Brielle, N. J. The present invention has reference to pneumatic tires, such as are used on the wheels of vehicles; and its object is to provide a new and improved pneumatic tire arranged to prevent the rubber tube of the tire from being punctured and at the same time afford the desired elasticity.

LAMP-HOLDER.—E. E. HENRY, Georgetown, S. C. This holder is especially useful for supporting lamps on moving vehicles, such as automobiles and bicycles. The object of the invention is to produce a device of simple construction and which will afford means for supporting a lamp movably, so that the rays of light will be always projected in advance of the vehicle and in the direction in which it is advancing.

INNER TUBE AND MEANS FOR INFLATING SAME.—W. A. HOLLIS and H. S. HOLLIS, 1 Palmeira Avenue, Hove, Sussex, England. The invention relates to inner tubes for pneumatic tires and means for inflating the same. The improvement consists in the construction and arrangement of two or more inner air-tubes so that they lie around the rim of the wheel without shifting their relative positions and without bursting when the tire is inflated.

COMBINATION TRUCK AND SCALE-PLATFORM.—P. MORGAN, New Orleans, La. Under the present systems of transferring coffee-bags from the pile to the railway-cars weighing and transferring are two separate operations, each costing about three cents per bag. Mr. Morgan provides means for performing these operations at once, thus making a great saving of cost and time. The invention is capable of use in other connections. It may be used in weighing all kinds of material in sacks or other receptacles and also in bulk.

MOTOR-VEHICLE.—IL. SÉCHAUD, Gentilly, Seine, France. The invention has for its object a device which permits of effecting by means of a single appliance changes of direction and velocity, throwing into and out of gear the braking, and also the regulation of motor-vehicles. The combination constituted by this device renders unnecessary all the individual parts hitherto employed for operating the different mechanism, leaves the hands of the driver at liberty, and renders it possible for complete novices to drive motor-vehicles.

WHEEL.—J. B. McMULLEN, Howard County, Md. In the present patent the invention is an improvement in wheels, and is designed particularly for use on automobiles or other vehicles of that general character; and the inventor's object is, among others, to provide a novel construction whereby the tire may be conveniently applied and removed from the wheel by means of a removable side plate.

FOOT-WARMER.—C. H. WHITAKER, Bordentown, N. J. The foot-warmer is intended especially for use in carriages and like vehicles, and it is of that class in which a base is provided and heated by an ordinary lantern-burner mounted on the base and having heat-communicating means extending from the top of the burner to or into the base.

AXLE-LUBRICATOR.—J. ADEN, Ruralhall, N. C. In this case the improvement pertains to automatic lubricating devices for vehicle-axles of that class in which a reservoir for oil is located on the axle, just back of the axle-collar, from which oil is fed down along the spindle by distributing-grooves. The oil is uniformly fed without obstruction and in a manner to exclude the dust and remove the gummy waste matters.

Designs.

DESIGN FOR A TOILET-POWDER RECEPTACLE.—W. A. BRADLEY, New York, N. Y. This new design for a toilet-powder receptacle shows an oval contour of the box and the radial fluted ornamentation appearing at the top of the box together with the fluted and apertured cap.

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Manufacturers of all kinds sheet metal goods. Vending, gum and chocolate, matches, cigars and cigarettes, amusement machines, made of pressed steel. Send samples. N. Y. Die and Model Works, 508 Pearl St., N. Y.

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Inquiry No. 6862.—For manufacturers of machinery for turning out spoon oars and paddles.



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References to former articles or answers should give date of paper and page or number of question. Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and though we endeavor to reply to all either by letter or in this department, each must take his turn.

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(9632) A. G. L. asks: What is the cause of that buzzing noise when the receiver of a telephone is held to the transmitter? Is it a sign that the line is all right? How is a telephone wired that is used on the central energy system? A. When you hear a sound in the receiver of a telephone, it means that something is going on over the line. It may be someone is talking on that line, which is all right. It may be cross talk from some other line, in which case it is not all right. A central energy system is wired so that all instruments have connection with the battery to ring their bells at all times when the telephones are on the hooks. Diagrams of wiring will be furnished for any system by those who handle and sell the instruments for that system.

(9633) A. B. asks: 1. Can you tell me of a simple test to tell platinum wire? A. Platinum is characterized by its high fusing point, about 3450 deg. Fahrenheit. It cannot be melted by any temperature below that of the oxyhydrogen flame. This is the simplest test. Heating in an ordinary flame does not alter it. It is not soluble in any single acid, but is dissolved by aqua regia. 2. Is it true that there is a salt lake that has a crust of salt on the surface? If so, what is the name of it? A. There is a place called Salton in California where salt is plowed up from the surface of the shore of a lake and purified for the market. Later another crop can be harvested from the same place. Salt does not float on water. There cannot be a crust of salt over the surface of a lake. 3. Why is it that ice is a non-conductor and water is a conductor of electricity? A. Neither ice nor water when pure is a conductor of electricity. Water owes its conductivity to minute quantities of impurity in it. Ice tends to freeze itself pure from impure water. Hence ice is usually a non-conductor of electricity. 4. Can you explain to me what watt and watt-hours denote? A. A watt is the unit of electrical power. One ampere flowing at a pressure of one volt gives power of one watt. One watt working for one hour makes a watt-hour. You would find all such questions answered in Swoope's "Elementary Lessons in Electricity," which we can send for \$2.

(9634) W. S. M. says: I want to put an electrical plant on my farm for lighting, water service, etc. We use compressed air for water service. Have plenty of wind. Storage batteries, from my experience, have not been satisfactory during a calm. Has any one tried compressed air as a power during a calm? Do you believe that compressed air could be used to any advantage in generating electricity? A. We know of no experiments or experience with compressed air obtained from windmills for electric lighting purposes, and would not advise its use. Storage batteries are also unsatisfactory in the hands of inexperienced persons. We would advise a gasoline or kerosene engine as the most satisfactory source of power in the majority of such cases as you have in mind.

(9635) E. G. B. says: Would it be possible to revolve an iron plate 1/4 inch thick, 6 feet diameter, at the rate of 616 revolutions

per second? In other words, would it be possible to make a point on the circumference of the wheel move at the rate of 1,000 miles per hour? If not, what would be the drawback? Is air a fluid? Kindly describe a fluid. A. The centrifugal force would cause the iron plate to burst and fly in pieces at a speed far below the one which you mention. Air is a fluid. The definition of a fluid is "a substance which will readily and without perceptible friction flow in such a way as to completely fill any shaped vessel in which it may be put." Liquids and gases are fluids.

(9636) H. O. N. asks: There has been quite a bit of discussion here on this subject, and I write to you so that I may help it along. Which goes the fastest, the top of a wagon wheel or the bottom? What would be the center of it in that case? Is a wheel that is on the ground any different than a pulley in the same case? Some say that the top goes twice as fast as the axle, and that the bottom stands still. A. The discussion about the "going" of a wagon wheel turns wholly upon the use of the word "go." Define going, and all will become clear. A wheel goes with reference to the axle in one manner and with reference to the ground in quite another manner. Going may then be rotating or moving along. It rotates around the axle. All parts rotate alike, going around at the same speed, that is, going around in the same time, each point in its own proper circle. The whole wheel moves along with the axle over the road, at the same speed as the axle and, for that matter, at the same speed as the whole wagon moves over the road. This being settled, it remains to inquire how the parts of the wheel move with reference to a point on the ground past which the wheel may be "going." Consider a point just in front of the wheel. As it approaches this point the tire, or rather a point on the tire, comes down and rests for a moment on this point of the ground. It is not in motion on that point, if there is no slip of the wheel on the ground. This is what is meant by saying that the bottom of a wheel "stands still." It is at rest on the ground underneath the wheel for an instant. At the next instant that point of the tire begins to rise from the ground, and goes on up till it reaches the top of the wheel. The motion is a very curious motion, as you can see by marking a point on the tire of a wheel and watching its path as it comes down to the ground and rises again to the top of the wheel. It describes the curve called a "cycloid." Now when the point of the tire is at rest on the ground, the axle does not stop. It moves right on, and so does the top of the wheel. As the top of the wheel is twice as far from the ground as the axle is, it will be seen that the top of the wheel must be moving along two times as fast as the axle is moving. This can be seen in another way. Take a point on the rim which is at the same level as the axle and is behind the axle. As the wheel rolls along the road this point goes up over and comes down to the front of the wheel and to the same level as the axle. It has gained on the axle the whole diameter of the wheel. It was behind and now is in front of the axle. To do this it must have moved faster than the axle moved over the road. See if you can calculate how much faster. During the next half turn of the wheel this point drops down to the ground, rises again to the same level, and is behind the axle, by the whole diameter of the wheel. It has lost distance, and has gone over less space than the axle of the wheel went over in this half turn. See if you can calculate how much less distance it has gone over. You will find that there is just as much distance lost as there was distance gained when the point was on the upper part of the wheel. There is more of curious interest in the rotation of a wagon wheel than your questions implied. Most of the differences of opinion in discussions would be removed by a careful definition of the terms employed and a careful statement of the conditions of the case which is under discussion. There are many hot discussions in which both sides mean the same thing, but use words in different senses in expressing their meanings. Probably this is the case with your discussion.

(9637) S. T. B. asks: 1. I have read that in the secondary coils of induction coils there is sometimes a current of 30,000 volts with as low as 0.001 ampere. To me this seems to conflict with Ohm's law. To put it at a safe figure, the resistance of the secondary coil of such an instrument would not be more than 500 ohms. Then if we divide volts by ohms according to Ohm's law, we would get 60 amperes. This I can plainly see would be impossible, but please point out my mistake in reasoning. A. We do not see any reason why Ohm's law should not be applied to any case of volts and amperes to find resistance. No correct result can be impossible. It is, however, not to be supposed that the resistance in the case given is that of the secondary coil alone. It is that of the coil and the air for the spark length, whatever that was. Even when air is ionized, several inches of it has a high resistance. Nor is the resistance of a secondary coil likely to be as low as 500 ohms. No. 36 wire B. & S. has 2.4 feet per ohm, and 500 ohms would be only 1,200 feet, while a large coil giving a 12-inch spark would require at least 17 miles of such wire, with a resistance of 18,270 ohms. Spottiswoode's great coil had 280 miles of wire in its secondary; but that is more than is required for the same

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spark length nowadays. There are two errors in your note, one in underestimating the amount of wire used in secondaries and another in neglecting the air resistance as a factor in cutting down the amperes required in a secondary coil for a given voltage. Now again the self-induction at the moment of breaking the primary circuit causes a tremendous inductive effect upon the turns of the secondary, with the result that a tremendous voltage is produced in the secondary coil. This rises enormously above 30,000 volts when the spark distance is large. A table recently issued shows that 20,000 volts are required to throw a spark 1 inch between sharp points in the air; while to throw a spark 15 inches, 150,000 volts are required. Now coils have been made to throw 45 inches. How many volts do they represent? We do not know; 30,000 volts are a very little thing. And what is the voltage for a lightning spark a mile or two long? 2. How does magnetism interfere with the working of a watch? A. The magnetism of the steel parts of a watch affects the motion of the hairspring and balance wheel when that is of steel or has steel balancing parts upon it. 3. Have diamonds ever been produced artificially? A. Diamonds have been made artificially by Moissan in his electric furnace experiments, and they have been found in meteorites. See Moissan's "Electric Furnace," page 77.

(9638) W. R. M. asks: I am puzzled over a problem in electricity. Here it is: What number of volts and amperes will light a 12-watt electric lamp?

1 volt X 12	amperes = 12 watts
2 volts X 6	amperes = 12 watts
3 volts X 4	amperes = 12 watts
4 volts X 3	amperes = 12 watts
6 volts X 2	amperes = 12 watts
12 volts X 1	amperes = 12 watts
24 volts X 1/2	ampere = 12 watts

You see the products are all the same from the multiplication of the volts X amperes. Please explain about the lamp and voltage and amperage. A. We do not see any puzzle about your problem. You show that there can be seven different ways of dividing the volts and amperes so that the lamp will have 12 watts. There is no puzzle about that. It is quite true. The only question is, which would be the better way to divide the volts and the amperes. We would decide that to be either the 6 volts and 2 amperes, or the 12 volts and 1 ampere, or 24 volts and 1/2 ampere. The higher the voltage the smaller the wire necessary to carry the current without overheating the wire, and so the cheaper the wiring will be.

(9639) C. B. R. writes: What controls the circulation of elaborated sap of trees? Why does, or does, it rise in the spring? Or where does it come from? At what time each month can a bush having sugar in its roots be cut so that it will sprout and grow? At what time each month will it die if cut? What stops the circulation or keeps it back from the roots at times? Why would freezing the ground make a free flow of sap, and no frost a moderate flow? Why when a board or straw is laid on the ground at certain times, it will settle down, at other times it will rise? A. The rise of water in trees from the root tips to outermost twig is a strange thing, and its mechanics is not even yet clear. Capillarity plays a part, as also does osmotic pressure. The power of living protoplasm to imbibe water was once thought to explain it. Again, others have thought that the evaporation from the leaf surfaces causes the water below to rise as if drawn up by pulling on the end of a filament of water. All these and perhaps other and undiscovered causes may be at work to raise the water sometimes hundreds of feet. The water rises most easily in the new wood, and this is formed in the early summer or late spring. We do not believe that the time of the month has anything to do with the sprouting of seeds or the growing of sprouts. This is an old superstition connected with the moon, which dies hard. If a twig is cut off, the power of growth in the tree usually is sufficient in the early part of the year to produce other shoots to take its place in the support of the life of the tree. Late in the season these sprouts do not so readily appear. There are always buds in the bark which will grow if moisture is supplied to them. They may stay years without starting, and wounds given to the tree may then make them start to grow. Sap circulates freely till the ring of wood and new bark is formed and the walls of the cells have thickened so that water cannot easily pass through these walls. The flow is not then much. The season of growth is over for that year. The flow of sap out of a tree in which a hole has been made, as in the sugar maple, in early spring is due not to the freezing of the ground, as most suppose, but to the expansion of the water by the warmth of the sun during the day. The tree is gorged with sap, which is ready for the production of wood for the spring. The nights are cold, below the freezing point, the day is warm; the large difference of temperature expands the sap, and forces some of it out of any hole in its course up the tree. When this large fluctuation of temperature from the day to the night and back again ceases, the tree also ceases to give sap for sugar. We do not understand the question of the board laid on the ground and sometimes sinking and at others rising. We never saw or heard of that before.