it to a conducting temperature. The heater as now constructed consists of a thin porcelain tube, overwound with a fine platinum wire, pasted with cement, the latter serving to protect the platinum from the intense heat of the glowers. These tubes are wound for 110 volts and are connected in pairs of two in series according to the service; the one, two and three-glower lamps taking one pair, and the six-glower two pairs. These heater tubes are mounted on a porcelain support in such a manner as to be readily accessible. The life of the heater is surprisingly long; in fact, is so lasting that it cannot be considered as a repair part. Fig. 1 shows a number of heater tubes. In Fig. 2 the left-hand illustration shows four heaters and the overlying glowers in close proximity.

The lamp is automatic—a necessity in the lighting world. It requires a cutout to disconnect the heater from the circuit as soon as the glower shall have lighted. The cutout is a magnet-coil which actuates a pair of keepers, breaking the circuit. From the position in which the cutout is placed in the lamp it must operate at rather a high temperature and without possibility of failure. It must, therefore, be heat-proof, the contact must not weld, and the moving member should not hum on alternating current. Severe as these requirements are, they have been met in a most effective and satisfactory manner by embedding the coil in cement, by making the contact of silver, and by suspending the moving member from a single point of support.

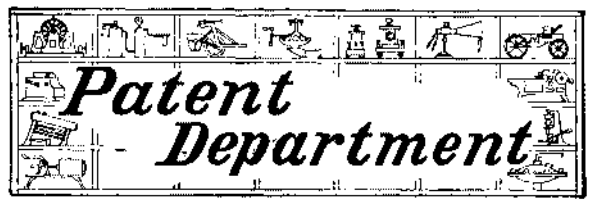
The lamp is suspended by an I-bolt, which being removed allows of immediate access to the inner part of the lamp. On removing the I-bolt the housing comes off and we find the steadying resistance-bottles placed in a semicircle around the cutout. The connections are made with small aluminium plugs on the ends of the inner connecting wires, a procedure which avoids the troublesome setscrew. All parts are mounted on porcelain; in fact, the lamp contains no combustible material whatever. The heaters and glowers are attached to a removable piece or "holder." The design is such that the heaters backed by a porcelain disk are immediately above the glowers, a disposition of parts that is conducive to efficiency in service. The glowers and heaters are attached to the binding posts of the holder by means of small aluminium plugs. The holder carries the heaters and the glowers. Electrical contact is provided for these by contact-prongs, which, when the holder is pushed up into the lamp, automatically makes the desired connections. A small glass globe, called the heater-case, is held by spring clamps around the glowers, and serves to retain the heat and thereby decreases the efficiency of the glower. The lamps are made of from 50 to 2,000 candle power. There is one glower in all lamps of 50 candle power, and the number increases up to 30 for the 2,000 candle power.

Engineering Notes.

Two compressed air cars have been placed in service on the North Clark Street line, Chicago, Ill. They are used after 1 P. M. when the cable stops running. The reservoirs in these cars are charged to a pressure of 2,500 pounds to the square inch. The working pressure is 150 pounds to the square inch. The cars are charged on every downtown trip.

The much-discussed question of American versus English locomotives, which occupied a great deal of attention the past summer, is dismissed, for a time at least, by The Engineer, London, in these words: "In the United States economy of fuel is a secondary consideration. There has been a large consumption of oil, and rather heavy repairs because the workmanship is not equal to that of British locomotives, nor does it pretend to be. In a very short time trouble will begin with the fireboxes because of the intense combustion required to make steam, but there is nothing inconsistent in this with American practice. The engines were very cheap, they have done their work, and have tided the company over by prompt delivery, but it is unfair to compare them with English locomotives made to use little coal and oil, to last long and require few repairs. Probably price for price, the American engines are as good as anything that can be made in this country."

English railway men recently visiting us say that there will have to be a great change in their own management as regards loads hauled by one engine, citing the case of American engines pulling 1,500-ton loads as against their own with capacity for only 300 tons. Fifteen hundred tons is no load for an American engine built for the work; more than double this quantity has been hauled at 15 miles per hour by engines built at Schenectady. As to the heating surface of American engines, it was thought that the limit had been reached in these same engines, 3,500 square feet, but the "Soo" line is having 74 "decapods" built which will be the largest in existence, weighing 236,000 pounds, with 5,400 and 5,800 square feet of heating surface.



Prof. Rowland's Telegraphic Inventions.

The late Prof. Henry A. Rowland filed in the United States Patent Office applications for patents on telegraphic improvements, which have recently issued.

The one invention provides an improved method of transmitting messages over an alternating-current circuit by selecting for each signal or character a predetermined number of the current impulses and modifying them by changing their polarity, but otherwise maintaining their form and characteristics. Prof. Rowland also contemplated the division of the line current impulses into groups, each of which corresponds to a character or signal. A predetermined number of the impulses are reversed in sign, the order and relation of the reversed with respect to the normal impulses of a group determining the signal or the character of the code. In carrying out this invention a mechanism is introduced into the alternating-current circuit by which the connections of the source of alternating currents may be reversed at any moment, so as to reverse the polarity of any desired impulse or any number of impulses. By reversing the wave instead of cutting it out, as Prof. Rowland formerly did, two or more adjacent impulses of a group may form a combination when received upon a polarized relay—a result which could not be obtained with the cut-out wave.

Another invention of Prof. Rowland's is a multiplex printing telegraph of the synchronous type, in which the local transmitting and receiving instruments are controlled by synchronously-operating mechanism. The system is adapted to be used with an alternating line-current, which is employed both for transmitting signals and for producing synchronous motion. The advantages to be derived from such an adaptation of the alternating current are many. An alternating current can be sent over a line to a greater distance without any change of form of its waves or impulses than any other current. Consequently messages can be transmitted to great distances without relaying or repeating them. Moreover, there will be practically no diminution of speed with increase of distance. The synchronous motion is produced by and maintained between continuously moving or rotating parts as contradistinguished from the intermittent motion of "step-by-step" telegraphs. In Prof. Rowland's invention the inertia of the moving parts is utilized in steadying their motion and in maintaining synchronism, whereas in the step-by-step devices the inertia is entirely gotten rid of, so that if for any reason the current which operates the step-by-step devices should be interrupted, the motion of these devices would be arrested accordingly.

Prof. Rowland also invented an improved form of printing machine by which telegraphic signals can be translated into typographical characters and printed in page form on sheets of paper. The paper upon which the characters are printed is delivered to the printer-carriage either from a roll, in single sheets, or in any other convenient manner. The printer-carriage, actuted by suitable spacing mechanism, moves the paper step-by-step under a continuously-rotating type-wheel until the end of a line is reached, when, by the operation of a lining mechanism, the paper is fed up, a new line is formed, and the carriage is returned to its original position. The carriage may, however, be caused to reverse its motion or return to its original position at any desired point of its travel. The characters are printed by an electrically-operated platen, which is caused to strike the paper and bring it in contact with the proper character on the type-wheel for each combination of signals received. In order to accomplish this, as well as to actuate the spacer, liner and other electrical devices of the printer, Prof. Rowland employed circuit-combining devices somewhat similar to those described in connection with his multiplex printing-telegraph. Owing to the weight of the printer-carriages and paper-carrying devices hitherto used in printers of this general character, some difficulty has been encountered in moving these devices fast enough, since they are usually slow in starting. Prof. Rowland obviates this difficulty by making the carriage and other traveling parts extremely simple and light.

At the entrance to the harbor of Genoa, Italy, there is an acetylene lighthouse, which has been established two years. In that time many experiments have been tried which go to prove that it is superior to electricity. There is one of this type at Tino, forty miles from Genoa, which cannot be seen from there, whereas the acetylene is plainly visible; the latter is by far the cheapest, costing only $250 per annum, against $5,000 for electricity.

Brief Notes Concerning Patents.

Prof. William Duane, Professor of Physics at the Colorado State University at Boulder, has been recently granted a patent on an improved system of transmitting messages over a wire. It is said that as many as eighteen messages can be sent back and forth at the same time by this new method.

Cassius A. White, of Rome, N. Y., the inventor of the mop-wringer which bears his name and which reaped him a fortune, died on December 8, aged 57 years. The mop-wringer business established by him at Jamaica, Vt., is still carried on, having been organized into a corporation on his retirement over a year ago.

George De Groat, a letter-carrier connected with the post office at Morristown, N. J., has been granted a patent on a recording device for letter boxes. This consists of an electrical connection maintained with the main office, by means of which it can be ascertained at all times if the collections have been made according to schedule. An alarm is given when any effort is made to rifle the box of its contents.

Jacob Olinger, a farmer living on the National Pike not far from Springfield, Ohio, is the inventor of an automatic oiler to be applied to the disks of grain drills, harrows and similar machinery, which is said to be a great convenience to those making use of these implements. Briefly, it consists of a hollow bearing which is kept at all times filled with oil. Mr. Olinger recently sold a shop-right to the Thomas Manufacturing Company for $3,000 and a royalty on each machine equipped with the device.

Anna Catherine Draper, who died on December 12 at her home in Hastings, N. Y., is said to be the first woman to have her photograph taken. Her brother, Dr. John W. Draper, invented an improvement on the Daguerre process by which the time of exposure was cut down from one hour to six minutes, and this made photography available for portraiture. Upon the completion of his process the first picture made was that of his sister, which was examined with great interest. The original is now in the possession of the heirs of Lord Herschel.

Prof. Charles Washington Wynn, who attracted a great deal of attention in mining circles in Denver by his claim of having discovered a process for profitably extracting fine gold from extremely low-grade ores, died very suddenly a few weeks ago, just as preparations were being completed to put his process into commercial use. He had fifty-four patents covering his discovery, and at the time he was stricken he was superintending the installation of the new plant. His secret, however, is not lost altogether, for a description of it written by himself was deposited in the safe of the company.

William Gee, of No. 1885 Bockius Street, Philadelphia, who was the inventor of one of the earliest power looms for weaving carpets, was found dead on December 6 beside an invention on which he was putting the finishing strokes. This device was for knotting fringes in upholstery manufacture, an operation which has been done exclusively by hand. On the day before he had told a friend named Ewing about the wonders of this machine, and invited him to come around the next day, when he said the machine would be in operation. Ewing called according to the engagement and found the inventor dead on the floor, where he had just been discovered by his wife. The deceased was the inventor of a number of other loom improvements.

Josef Hofmann, the pianist, takes his recreation in the shape of automobiling. He has developed not only into an experienced chauffeur, but also into a designer of several automobile improvements. On his arrival in this country a short time ago he at once applied for a patent on a new form of engine. Gasoline and steam are combined in a somewhat peculiar way in this design. He recently said in relation to his invention: "While gasoline is used, it is not a primary power. It is used to generate a high steam power, which steam is itself the motive power of the vehicle. In the steam boiler of the ordinary type the heat surrounds the coils of pipe containing the water. Gasoline exploded in these pipes creates a tremendous heat, transforming the water instantly into steam."

A company has been organized at Hartford, Conn., for the purpose of manufacturing a "yearly-wind" clock, the invention of David Vauthier, a Frenchman who has been residing in Hartford for several years. H. D. Mildeberger, a well-known lawyer of that city, is the president of the company, and he has in his office a clock of this kind which was wound on January 4, 1900. It has been running without an intermission ever since. The movement is said to contain but one heavy spring, which is placed within a drum or barrel. This drum is equipped on the outside with a ratchet-gear connecting with the train. The drum revolves but once a month, and consequently makes but twelve revolutions in the course of the year.

Some Curious Inventions.

The editor of our French contemporary, La Vie Scientifique, M. Max de Nansouty, describes in a rather entertaining manner some curious patented inventions which have recently come to his notice.

One of the patents which attracts his attention has been granted to the Improved Electric Glow Lamp Company, of London, for an improved process of treating incandescent lamps to obtain peculiar lighting effects. The outer surface of the bulb is coated with a mixture comprising an alkaline silicate, silicon, cryolith, and any desired mineral color. Depending upon the particular mineral employed, green, red, orange or any colored light is obtained by the transmission of the rays through the coated glass.

Linen has always been proverbially known for its softness to the touch, but two inventors, MM. G. Florin and H. Lagache, desire to make it still softer to the touch and therefore subject it to a very peculiar process. When the linen has lost some of its softness by the chlorine bleaching process it is first treated with an alkali, whereby the acids which it contains are neutralized. The linen is then immersed in an aqueous solution containing the salt of a tetravalent metal. After this treatment the linen is exposed to the air and becomes as soft as can be desired.

In order to render wall paper impermeable to the moisture that often oozes through the walls of a dwelling, Wilhelm Antony has taken out a German patent for a process whereby the paper is enabled to withstand the action of water. Unsized paper is treated with a solution of rubber in petroleum, and then with a camphorated solution of collodion. Not only is this paper impermeable to water, but it will also resist the attacks of microbes and fungi.

It is not always the easiest matter in the world to slake lime properly. Sometimes too much water, and sometimes too little is used. Sometimes the boiling is too violent; sometimes it is not violent enough. In a German patent W. Olschewsky states that the slaking can be very nicely controlled by adding fine wet sand to the quicklime.

A new method of preserving eggs is the invention of C. Utescher. The eggs are first given a thin coating of paraffine and are then immersed in lime water. The process is so simple that the inventor maintains that its effectiveness can be easily verified by actual experiment.

A formula for a bleaching agent is given in a recent American patent. The vegetable fibers to be treated are impregnated with a solution of soap or a silicate, caustic soda, oil and water. The fibers are then subjected to the action of steam. According to its inventors, Charles F. Cross and G. A. Parkes, of London, this process bleaches rapidly without in any way deteriorating the goods.

AN AUTOMATIC CAR TIPPLE FOR MINE RAILWAYS.

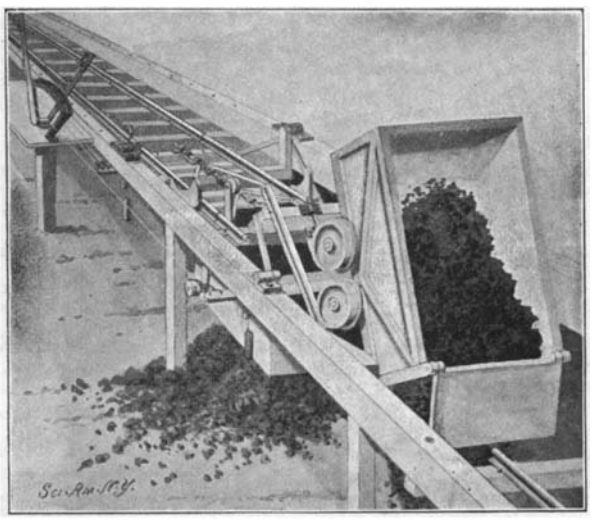
A means for automatically dumping railway-cars successively is the subject of an invention for which the firm of Miller & Geske, of Seattle, Wash., have received a United States patent. The novel feature of the invention is a tipple of such construction that one car is automatically pushed off the tipple by the car next following, which latter car is then dumped in its turn.

The tipple comprises a counterbalanced rocking cradle, the rail-sections of which register with the track-rails. Wheel-chocks are pivoted vertically on the cradle so that they may swing into and out of the path of the car-wheels. The chocks are pivotally connected by links with a sleeve on a longitudinally-reciprocal, spring-pressed rod. The spring-pressed rod holds the chocks normally in operative position. At the rear of the rod a roller is carried, engaged by a tipple lever fulcrumed on the bed of the road.

Each tipple on the line is designed to be actuated by an operating lever. Each operating-lever is connected by a cord with the first-mentioned tipple lever. The tipple-lever furthermore carries a cord connected with a crank on a rock-shaft mounted in the bed of the railway and having an arm arranged to be struck by the car and thrown down.

The rail-sections of the tipple and of the main track may be rigidly held together by latch plates mounted to slide at each side and connected in pairs. The latch-plates are pivotally connected by links with the previously-mentioned spring-pressed rod, so that they are normally thrown into inactive position.

When an operating-lever is pulled to the left, the tipple lever is thrown so as to move the longitudinal rod against its spring, thus throwing the chocks outward and the latch plates into active position. The cradle is thus adjusted so that a car may pass over it unobstructedly, and is also horizontally locked. This movement of the operating lever slacks the cord extending from the tipple lever to the crank of the rock-shaft, thus permitting the crank to fall so that a car may pass over it. But when the operating lever is thrown to the right, the tipple lever will be allowed to assume the position which will permit the chocks to swing inward into active position and the latch plates to move backward into inactive position under the influence of the spring-pressed rod. The cradle will then be allowed to tilt. When a car rolls on a tipple thus adjusted, it first strikes the upwardly-projecting arm of the rock-shaft, during which time the latch-plates will be thrown into active position and the chocks moved out. When the arm has been passed, the parts will return to their positions and the car in rolling on the tipple will engage the chocks and be arrested. The loaded car will then be dumped by its weight, and returned by the counterweight when emptied. When the next car comes along, the upwardly projecting arm will be again thrown down, the chocks

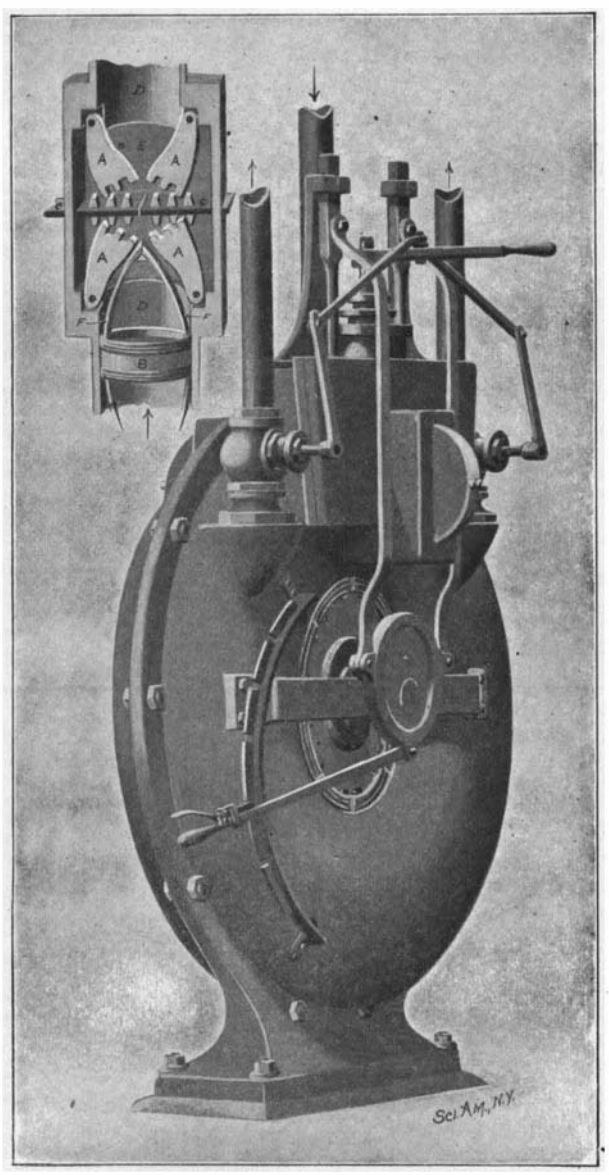


THE MILLER-GESKE AUTOMATIC CAR-TIPPLE.

momentarily opened, and the latch-plates operated. The loaded car strikes the empty car, and before the chocks can move in, the empty car will be driven off the tipple. The loaded car will now be passed onto the tipple, stopped by the chocks, and dumped. The entire action is automatic, it being necessary only to lock or unlock the tipple by actuating the operating-levers. The invention is certainly ingenious and should attract the favorable attention of mining engineers and contractors engaged in excavating.

A NEW ROTARY ENGINE.

Chief among the difficulties which have stood in the way of the production of a successful rotary engine have been those of providing a satisfactory form of valve-gear, steam-ports for the admission and control of the steam, and a suitable sliding abutment to support the reaction of the steam within the cylinder. The accompanying engraving of a rotary engine invented by Robert Sanderson, of Halcyon Hot Springs, B. C., Canada, shows an ingenious attempt on the part of the designer to overcome these difficulties. The piston, *B*, is fitted steam-tight within the cylinder and is provided at both of its faces with V-shaped cam-shoes, each formed by rods fastened to the piston and curved inwardly toward each other. At the upper part of the cylinder casings are arranged in each of which sliding gates, *C*, are fitted. These gates move toward and from each other and serve to close the cylinder so as to form an abutment for the steam pressure. The approach of the piston is utilized to throw the gates into open position—an end attained by forming the gate, *C*, with teeth meshing with the teeth of pivoted cams, *A*, arranged in pairs on each side of the gates. As the piston approaches, the cam shoes, *F*, will spread the cams, *A*, thereby moving the gates, *C*, apart to allow the passage of the piston. The gates are returned to their normal position by means of springs which are not shown in the engraving.



THE SANDERSON ROTARY ENGINE.

The valve mechanism employed to control the steam comprises two steam-chests, carrying valves which command feed-ports arranged in the cylinder at opposite sides of the gates. The valves are moved by connecting-rods attached to the valve-stems and to an eccentric-strap working on an eccentric fastened to the engine-shaft. The throw of the eccentric can be regulated by an arm working with a quadrant held on the cylinder and disposed eccentrically to the shaft, so that by the adjustment of the arm the eccentric will be regulated to increase or diminish the movements of the valve. Steam is led into one of the valve-chests, depending upon the direction in which the piston is to be turned. Exhaust-valves are provided which are thrown in time with the valve regulating admission to the two valve-chests.

Improvement in the Goldschmidt Method of Alumino-Thermic Welding and Casting.

The Goldschmidt process has the disadvantage that it generally requires the use of skilled labor, especially for the welding of rails. With a new modification which has just been made public, an ordinary workman can easily effect a good weld; and the time required for making the mold and running the metal need not be greater than that necessary for jointing a rail, including bonding with copper by the usual method. The "thermit" mixture (of which 1 kilogramme yields 450 grammes of molten iron) is placed in a crucible made of iron plate lined with refractory material, mounted on a substantial tripod and closed at the bottom with one or more small iron plates, according to the quantity of "thermit" used. The "thermit" is covered with a layer of kindling or priming mixture, and an iron plate having a central hole, through which the charge can be ignited by means of a fuse, is placed over the whole. The crucible thus prepared is placed with its tap-hole immediately above the gate of a refractory mold built around the ends of the two rails to be jointed, which are so clamped together that the surfaces to be welded are pressed against each other. When all is ready, the charge is ignited, and in a few seconds the contents of the crucible should become fluid, and melting away the supporting iron plates, should flow into the mold and make the required joint. In this process it is the molten iron which first enters the mold, and the molten corundum slag floating on the top passes out last, instead of first as in the older teeming process. The method lends itself well to the jointing of rails already laid, and insures a sound electrical contact; it is of no use, however, for rails of which the ends are worn, as it does not assist in checking the hammering of the wheels on the rails. The process cannot well be applied to the welding of tubes, as the hot metal is liable to melt its way through the tube at first contact; it is, however, very suitable for the repair of broken shafts or axles, and is especially recommended for use on board ship, as the appliances required are exceedingly simple and convenient.

The temperature of the electrical incandescent lamp has been determined by the French physicist Janet, of the Paris Academy of Sciences. To preserve the heat radiated from the carbon filament of the lamp is a matter of great difficulty, since the filament is separated from the atmosphere by a vacuum. Janet has determined from investigations made with four different lamps, that the filaments attain a temperature varying from 1,610 to 1,720 deg. C. It is remarkable that so high a temperature in an incandescent lamp radiates so little heat. Nevertheless, the radiation is sufficiently pronounced to bring water to the boiling point.

In order properly to harden small articles made from steel it is necessary to treat them individually in a manner that requires experience and skill. Even under the most favorable circumstances considerable loss is entailed, due principally to unevenness in hardening. A St. Louis inventor, Mr. Charles J. Johnson, has discovered that by submerging an article, after it has been formed, at a cherry red temperature, in a solution of sal soda, resin, water, and animal oil, all difficulties are overcome, and that each article is given its proper durability, strength, and elasticity.