same results in another connection, I wrote another brief and sent it to the examiner. I will not give the argument that I used before him. There was no sense or reason in it in the world."

Senator Chaffee: "Then you were not very scrupulous?"

Mr. Raymond: "No, I am bound not to be, in securing and protecting all the rights the law may give my client. But I will pay my respects to that idea in a moment."

Senator Chaffee: "Is that the case with all the rest of the patent lawyers?"

Mr. Raymond: "Yes, sir; with every one of them, without a single exception, in my opinion. But I sent my brief on and got a patent on the railroad-switch. Now as to the suggestion of Senator Chaffee: I came, two years ago, to the conclusion that there was no logical sequence following through the patent law from the commencement, nor yet was there a great deal of conscience in it. Of course there is conscience in the practice of patent law. A man came into my office the other day who had no claim in the world in law. He had in fact and morally a claim. He had been swindled out of a monopoly of a very valuable invention which we wanted to use. I gave him a hundred dollars, simply because he did not have money enough to get out of town. In another case, a man comes in with a case against us which he ought to maintain, but which some technicality of the Patent Office gives us a right to use. I know of no other basis, and there is no other basis, than that the law said thus and so. My conscience in patent matters is the patent statute enacted by Congress, and I cannot substitute anything else. If a man has a legal claim against us (as in one instance that comes to my mind, where there was not the first shadow of a moral right), if the law gives it to him, I say, 'You have a claim'; and in the case to which I refer I paid $34,000 where, morally, the man had no claim at all. Another man comes in to whom I ought to pay $40,000 on conscientious grounds, but I say, 'The law does not give it to you, and I cannot give it to you."

In my observation a man who avows so complete a want of moral principle and attributes the same to all his associates, is never worthy of confidence.

If the eighty-one railroad corporations which Mr. Raymond claims (page 116) to represent have no more soul or conscience than their representative, can there be any doubt that they are ready to assault the barriers of justice, and crush with their combined power every interest they may regard as standing in their way? Respectfully yours,

GARCELON.

THE WORLD'S WORK.

New Forms of Electric Lamp.

AMONG the many new appliances for creating the electric arc between the ends of carbon rods may be observed one or two of some interest. One of these employs two carbons standing erect in hinged brackets, or holders, so arranged that when unsupported the carbons fall together and rest one against the other in the form of an inverted V. In the center, between the carbons, is an upright rod made of some refractory material like kaolin. This is supported at the base by a horizontal lever, the shorter arm of which makes the armature of an electro-magnet. When the apparatus is at rest the weight of the upright rod causes it to fall, lifting the armature from the magnet and permitting the carbon rods to touch each other. On passing a current through the lamp the magnet is excited and the armature is pulled down and thus pushing the rod upward between the carbons and thrusting them apart. This separates them sufficiently to cause the electric arc to spring up between them. The kaolin rod melts away in the heat as fast as the carbons are consumed and the light is maintained somewhat on the principle of the familiar electric candle. If the current decreases in strength the armature of the magnet is released and the rod falls, permitting the carbons to come together again and re-establish the light. Another form of lamp employs two carbons, one standing upright and the second supported by a lever leaning against it. One arm of the lever forms the armature of an electro-magnet, and in action the second carbon is alternately permitted to fall against the upright carbon and then pulled away by the action of a spring somewhat after the manner of a "chattering" electric bell. This vibration of the carbons is so rapid that, to the eye, the quivering light is practically continuous, and appears to be steady. Another form of vibrating lamp has two carbons placed one over the other in a vertical line, the lower carbon resting on a lever that forms the armature of a magnet. Still another form of lamp, and one said to be much more successful in general practice than either of these, employs four carbons, two placed in the form of the letter A and two inverted like V, the four making the figure X. The light is maintained at the junction of the four carbons. The rods are held in cups connected by cords with weights that keep them adjusted to each other and in the best position for maintaining the light. An electro-magnet is also used with this lamp. The advantages found in this lamp are steadiness in the light and ease of adjustment, as a carbon can be replaced when burned out without extinguishing the lamp.

In the search for an electric lamp of moderate power, attention has already been drawn to the fact that a strip of metal or carbon inclosed in a glass jar charged with nitrogen and brought to incandescence by an electric current will give a good electric light. Hitherto, experiments in this direction have not been wholly satisfactory. More recently this field has been investigated with better results, and a new electric lamp and an improved system of electric switches have been brought out that present some features of interest. The lamp is designed for domestic use, and gives a light varying from a faint cherry red to sun-like whiteness, and developing at its brightest a light equal to 27 candles. In shape and size it resembles the chimney of an argand burner. The lamp is divided into two parts, the electrical apparatus and a hermetically sealed cylinder charged with nitrogen. This cylinder is a heavy glass tube closed at the top, and having a thick glass base accurately fitted to the bottom, and having two openings for the electrical connections. Within the cylinder are two long

convoluted ribbons of copper (silver plated) extending nearly to the top of the cylinder. At the top is secured a disk of soap-stone nearly filling the cylinder and designed to prevent downward radiation from the incandescent carbon. At the top these conductors are joined by a slender bow or arch of carbon. In constructing the lamp great ingenuity has been shown in overcoming the difficulty of removing all traces of oxygen from the cylinder and charging it with nitrogen. Brass tubes, each containing a stop-cock, are fitted to the glass base of the lamp, passing quite through the base, and joining the copper conductors within. Connection is made through these tubes with a supply of nitrogen, and a current is passed through the lamp till the air is displaced. The stop-cocks are then closed and the tubes are filled with a soft fusible metal. Brass caps, filled with hot liquid gum, are screwed over the tubes to secure both insulation and a perfectly air-tight joint. A ring on the base of the cylinder serves to hold a brass ring or cap that may be pressed by screws tight to the glass base, and heavily coated with insulating material. Within the lamp is placed, as an extra precaution, a small quantity of sodium, to absorb any remaining traces of oxygen. In connecting the lamp with a dynamo-electric machine, one wire may be brought through an ordinary gas fixture, and the return wire may be connected with the fixture and thus to earth. In this case the electric lamp stands on the gas bracket in a convenient position for use. This lamp in practice gives a pure, white, steady light by the incandescence of the carbon, and varying from a dull glow to intense white. When the lamp is to be used the current is gradually sent through it, the light growing in brightness gradually. Early experiments in this direction often resulted in a fusing or rupture of the carbon by a too sudden increase in the current, and to prevent this an ingenious form of switch has been devised that deserves attention. This apparatus is based on the fact that an electrical current will readily divide among conductors of equal resistance, or will divide in proportion to the resistance the conductors offer. If one has a resistance of one-fourth of an ohm, and the other of three-fourths, the current will split in these proportions. The new switch consists of a series of pins arranged in pairs, and a sliding bar that may be made to move from pin to pin, connecting them in pairs, and making new circuits of varying resistance each time. When at rest the whole current passes in one direction. On moving the bar to the first pair of pins, a certain proportion of the current is diverted to the lamp. At the next pair, more is turned aside, and so on till the whole current passes to the lamp; in each case the resistance is exactly balanced, and the current flowing from the main line divides with perfect precision. If two lamps are placed on a circuit, each will get half the current. On putting out one lamp the resistance, by means of the switch, is maintained the same, one lamp being unaffected by the action of the other. In like manner the change in intensity in any one lamp does not affect other lamps; nor is it possible to turn on the full power of the current at once, as the switch passes through a series of changes in resistance as the current is turned on or off. This involves time, but it is only a matter of seconds and not, therefore, of consequence. This system of electric lighting is soon to be tried on a large scale, and new data will be presented as soon as obtained.

Illuminating Watch Dials.

THE attempt to make clocks self-luminous by covering the dials with some chemical preparations has led to the invention of other methods of obtaining the same result. A Geisler tube containing a gas giving a good light is placed on or near the dial and a minute battery and induction coil are connected with it. To illuminate the dial a spring is touched and a current is passed through the coil and to the Geisler tube and lighting up the dial for a moment. It is said the whole apparatus can be easily carried in the vest pocket and will keep in order for a year without attention. The same idea has been applied to clock dials of every size.

Paper Friction Pulleys.

A CHEAP form of friction pulley is now made by cutting pieces of pasteboard into disks of the size of the required pulley, pasting them heavily with hot glue and laying one over the other till the proper thickness is obtained. The hole for the shaft is cut in each piece before they are glued together, and when the wheel has been formed it may be pressed till the glue is cold. The face of the pulley may then be turned down smooth in a lathe and, to make a firm edge, iron rings or clamps may be fastened to the sides. Such paper pulleys are said to run with good usage for a long time.

Plating with Tin.

A NEW method of coating metals with tin by electro-deposition is reported. A zinc and carbon battery is employed, the inner cell, containing the carbon, is half filled with chromic acid, and the outer cell, containing the zinc, is filled with dilute sulphuric acid. The articles to be coated with tin are first "pickled" and then suspended in a bath containing eight parts of protochloride of tin, and sixteen parts of cream of tartar dissolved in twenty-two liters (about 100 gallons) of distilled water. The articles suspended in the bath are connected with the positive pole of the battery, while the negative pole is connected with a piece of tin hung in the bath. After plating, the articles are held over a fire to give the tin a bright surface.

New Tools for Amateurs.

THE demand for light wood-working tools for the use of young mechanics and amateurs has led to the manufacture of a great number of novel and ingenious tools of more or less merit. Some of these have already been described in this department. Among the more recent is a new foot-power lathe having a circular saw, scroll saw and bracket