THE FAIR HAVEN AND WESTVILLE RAILROAD PLANT.

In our last issue we described the power station and much of the detail of the lines of the Fair Haven and Westville Railroad plant. We now give details of the electric wiring of a trolley car and other items of interest connected with the railroad.

A passenger on an electrically propelled car, unless he happens to be an electrician, has very little idea of the maze of wiring and the intricacy of the switches necessary for the complete control of the current used on a car. The current, which is taken from the trolley wire above by the mere touch of the trolley wheel, and is delivered to the track, which, in connection with the ground and return wire, forms a return circuit, must be able to develop as much as 50 horse power for starting the car, for grades, for overcoming obstructions, and for towing a trailer or a disabled motor car, and it must also be controllable to any extent so as to produce any desired power from the fraction of a horse power up to the full capacity of the motor or motors. In addition to this the current is utilized for lighting and heating the car.

To cause the car to stop or start, to go forward or backward, slow or fast, and to permit of operating it from either end, there is placed on each platform a box known as the "controller," having two hand levers at the top, one for reversing the motor, the other for varying its speed and stopping. The controller contains insulated contact springs forming the terminals of the various wires, and also a cylinder carrying a number of metallic segments for forming the various connections of the wires by contact with the different springs.

Fig. 1 is a longitudinal section of a trolley car, showing a motor connected with each axle, the controllers on the platforms, the electric heaters under the seats, the incandescent lamps under the roof of the car, and the trolley pole with its trolley wheel held in contact with the trolley wire by the pressure of the springs on the turntable on the top of the car at the lower end of the pole.

The connections, as shown in the diagram, Fig. 2 (which represents the wiring of a car), are arranged for starting the car, i. e., with all the windings of the field magnets in series with the two armatures and the two resistances, C, C'. These connections can be traced by starting at the power switch, P. S. Between the power switch and the motors are located the fuse and the choke coil, c c, which latter is designed to impede a lightning discharge so as to cause the lightning to pass to the ground through the lightning arrester, L A, ground connection, G, motor box, car wheels and truck, rather than through the motors.

The current passes to the wire, T, which is open at the rear controller, but which in the front controller touches the upper segment which communicates through wire 2 with resistance, C, thence through

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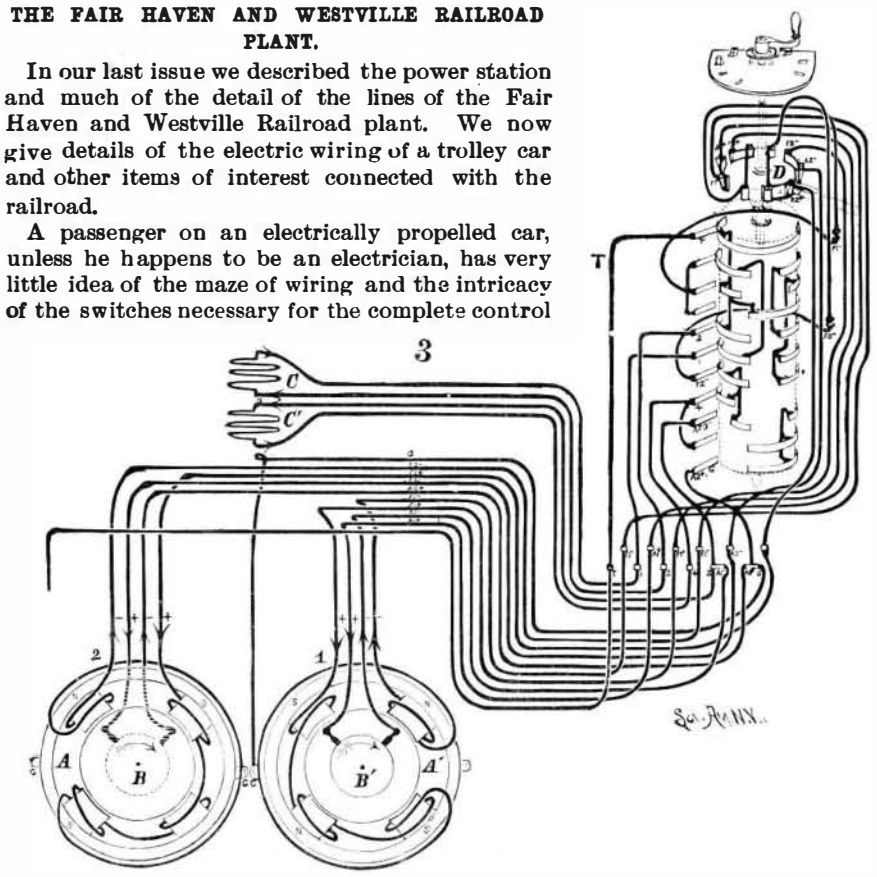

AN ARRANGEMENT OF THE CIRCUIT FOR REVERSING THE MOTOR.

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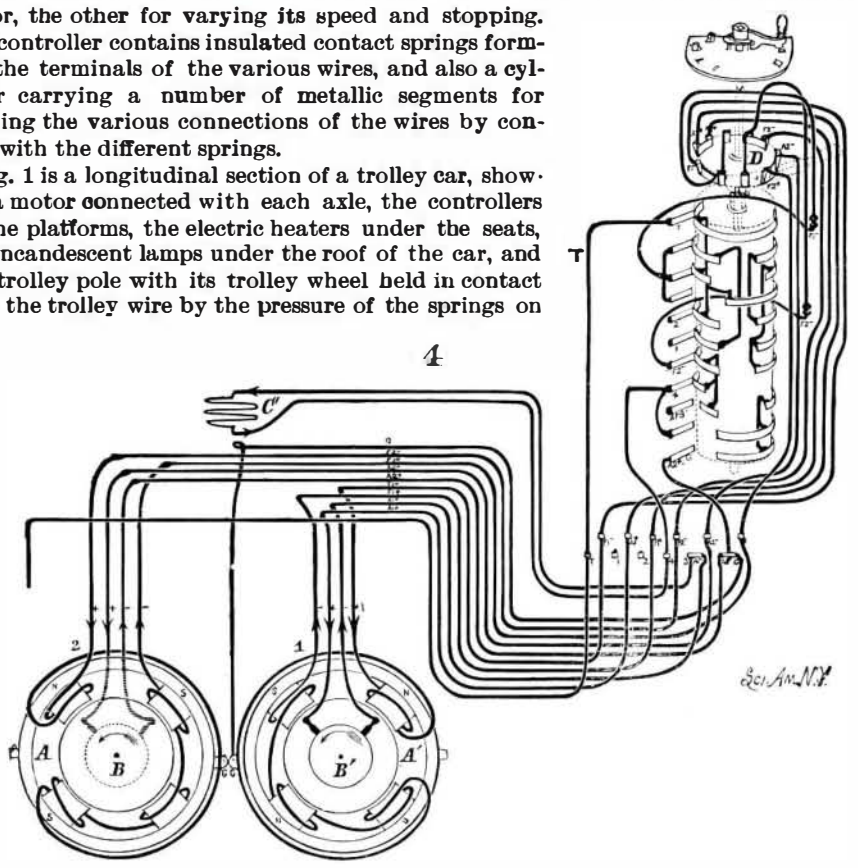

THE CIRCUIT WITH ONE-HALF OF THE RESISTANCE CUT OUT.

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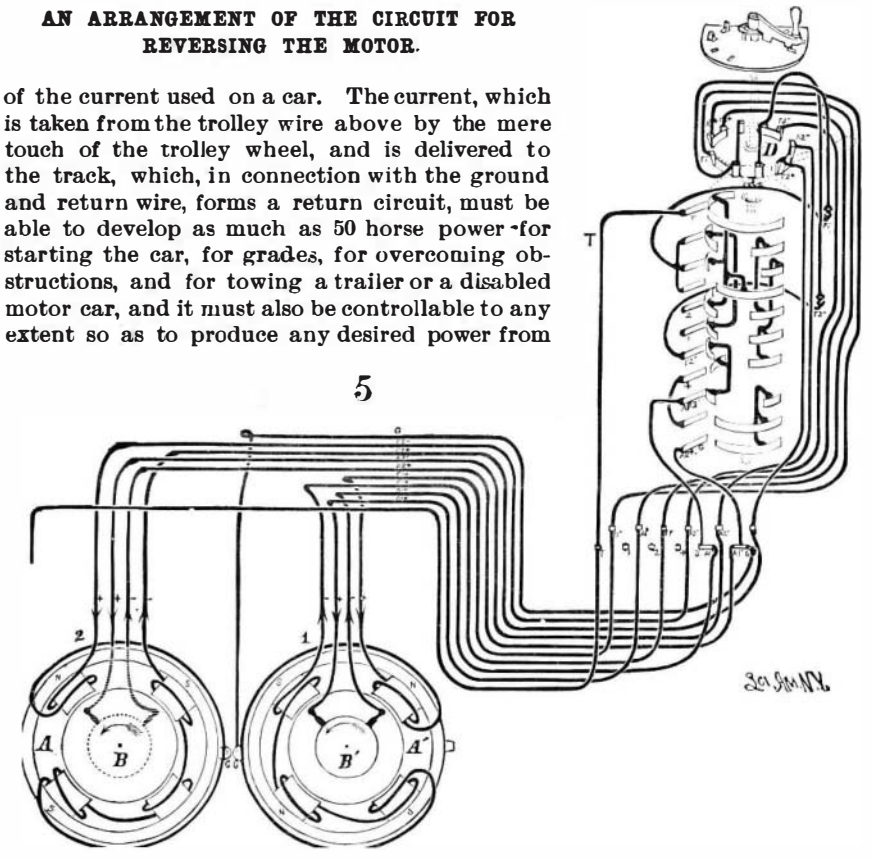

THE CIRCUIT WITH ALL THE RESISTANCE CUT OUT.

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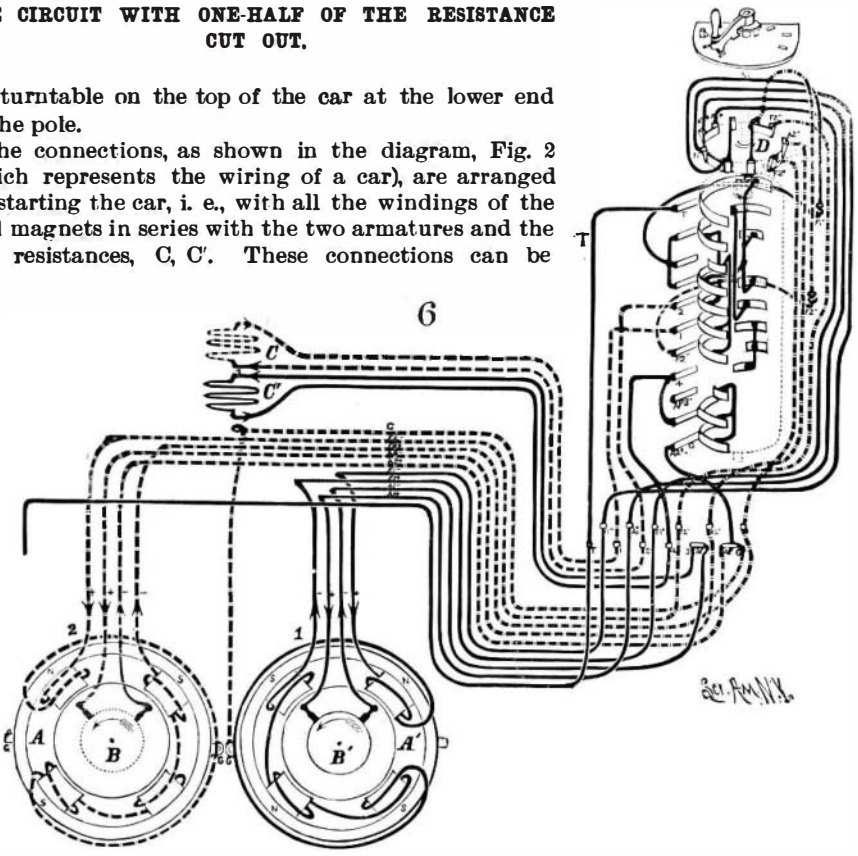

THE CONNECTIONS WITH MOTORS IN PARALLEL AND IN SERIES WITH THE RESISTANCE.

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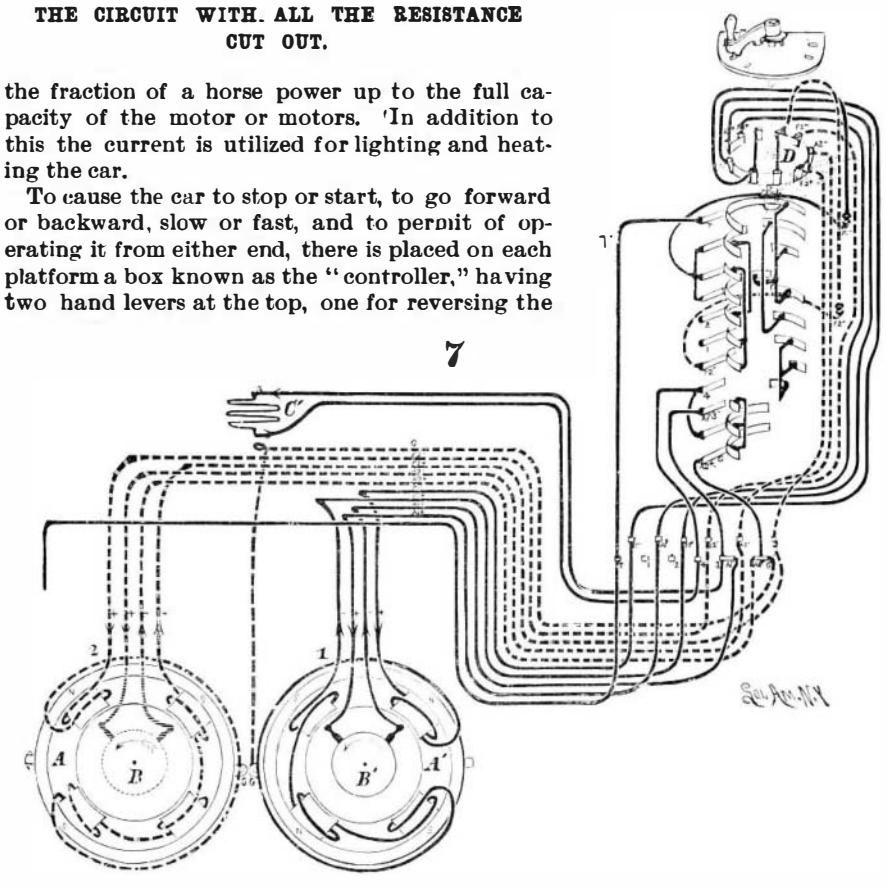

BOTH MOTORS IN PARALLEL AND IN SERIES WITH HALF THE RESISTANCE.

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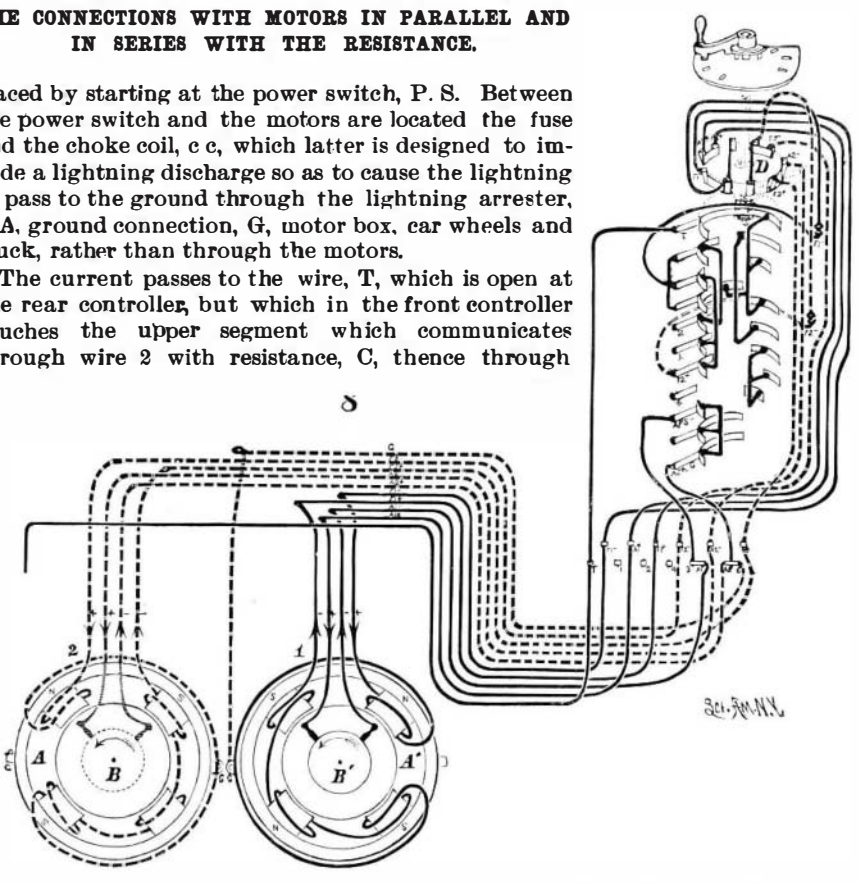

MOTORS IN PARALLEL WITH ALL THE RESISTANCE CUT OUT.

FAIR HAVEN AND WESTVILLE ELECTRIC RAILROAD.

wire 1 and the segment with one of the contacts in the reversing switch, D. The current flows thence to the field magnet of the motor, B', through the wire, F'—, and returns to the reversing switch through the wire, F^1+, thence through the wire, A'+, to the armature of the motor, B', through the wire, A'—, to the resistance, C', thence back to the spring, 4, of the controller, thence to the spring, F^2—, through the reversing switch, wire, F^2—, to the field magnet of the motor, B, returning through the wire, F^2+, to the reversing switch, thence to the armature of the motor, B, by the wire, A^2—, returning by the wire, A^2+, to the ground wire, G, which communicates with the ground through the motor box, car truck, car wheels and rails.

Fig. 3 shows the arrangement of the controller and reversing switch when the motors are reversed. The current enters the trolley connection, T, as before, passing to spring, 2, thence to the resistance, C, spring, 1, to the wire, F'—, thence to the reversing switch, D, and wire, F^2+, to the field magnet of the motor, A'; thence back to the switch, D, thence by the wire, A'+, to the armature, B', of the motor, A', thence to the resistance, C', to spring, 4, through the segment of the controller to spring, F^2—, thence by the wire, F^2—, to the reversing switch, D, thence by the wire, F^2+, to the field magnet of motor, A, thence to the switch, D, and back to the armature, B, of the motor, A, thence to the ground connection, C.

It will thus be seen that while the current remains the same in the armatures of the motors, it is reversed in the field magnets; this causes the armatures of the motors to revolve in the opposite direction.

When the controller lever is at the first notch the current is fully on, with both the field magnets, armatures and resistances in series, as shown in Fig. 2. When it is at the second notch the resistance, C, is cut out, as shown in Fig. 4. With the controller lever at the third notch both resistances, C C', are cut out as in Fig. 5. At the fourth notch the motors are in parallel with each other and in series with the resistance (Fig. 6).

When the controller is arranged as shown in Fig. 7, the two motors are in parallel and in series with half the resistance. When the controller is arranged as in Fig. 8, both motors are in parallel, the resistances being cut out. Circuits shown in dotted lines are in parallel with like circuits shown in full lines.

These various changes in the circuit give all the gradations of power required for starting and for running at different speeds.

The heating apparatus, F, which consists of a series of wire coils arranged under the seats behind gratings, is in parallel with the electric lighting apparatus and the motors. Enough current is taken from the supply wire to maintain a comfortable temperature in the car. There are two lamp circuits on the car, each including five 100 volt lamps, the lamps of each set being in series.

At suitable intervals on the various branches of the road there are telephone boxes, shown in Fig. 9, by means of which the engineer or electrician at the power station can be notified of anything occurring on the lines, and by which the dispatcher is informed whenever an emergency arises calling for more than the usual number of cars.

Much of the perfection of this trolley system is due to the efforts of Mr. Francis G. Daniell, electrical engineer for the company, who has kindly furnished us with the data here presented.

Proposed Amendments of the Patent Law.

At the recent Detroit meeting of the American Bar Association the report of the special committee on unification of the patent law was adopted. The committee comprised the following well known lawyers:

Edmund Wetmore, Wilmarth H. Thurston, Charles E. Mitchell, Frederick P. Fish, Francis Rawle, James H. Hoyt, Paul Bakewell, Arthur Stuart, Charles E. Foster, Joseph C. Fraley, E. B. Sherman, James H. Raymond and George H. Lathrop.

In their report they propose five general amendments to the patent law, as follows:

1. At present an applicant for a patent has two years to take action on his application for a patent after he has received notice that the Patent Office has received his application. This accounts for the notice on many devices that "patent has been applied for." It permits the use of devices exclusively for years at times before a patent is issued, and makes abuses possible. The committee recommends that the period be made six months, as that is ample time for any person living in any portion of the country to get his application to the Patent Office at Washington.

2. That the law be amended so that if a patent has been issued or published for two years in any foreign country before application has been made in the United States that patent here be barred. This is urged because an invention may be well known in Europe and be in general use, but may not have been patented here. This may be discovered and some thrifty individual making first claim to discovery can get a patent and get a royalty from an old idea. Foreign inventors, too, having no real conception of the value of their inventions, may come in late and get patents after their device is in general use.

3. To have a statute of limitations for patents, providing that no suit may be begun for an infringement of a patent dating six years or more prior to the commencement of the suit.

4. To so amend the law that the granting of a foreign patent to an American inventor shall not affect the American patent unless the inventor shall have made application for the foreign patent seven months in advance of his application for the home patent.

5. The law requires that assignments of patents shall be in writing, but there is no provision whereby an acknowledgment may afford prima facie proof of the execution of such instruments.

To remedy this the committee propose that a certificate of acknowledgment of these instruments before a proper officer shall be prima facie evidence of execution.

At an evening session of the section on patent laws, an able and exhaustive paper was read by Judge Robert S. Taylor, of Indiana, on "Some Reflections Suggested by the Creation of a Patent Law Section in the American Bar Association."

"It is a respectful form of speech," said the speaker, "to ascribe the wisdom of judical decisions to the courts, but we know that in fact the judges imbibe most of their wisdom from the bar, and are the most unblushing plagiarists in the world. So that when we get at the final truth, it comes to this, that the despised and rejected fraternity of patent lawyers are in reality the authors of the present system of patent law in America. Whether we consider the magnitude of the interests committed to their keeping, or the

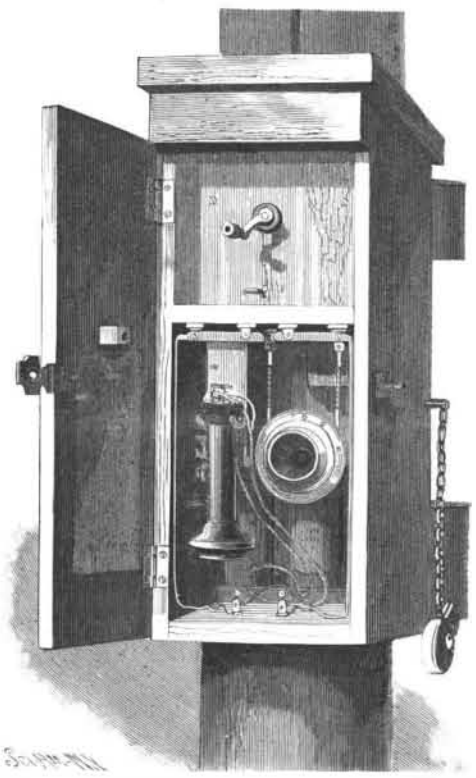

Fig. 9.—TELEPHONE BOX FOR COMMUNICATION WITH THE POWER STATION.

nature of the questions which arise in respect to those interests, it must be affirmed that no department ought to outrank that of the patent law in dignity, honor and usefulness to the public welfare. It is a question whether or no the marvelous development of invention would have been possible without the stimulus of the patent system. The rewards which the patent law offers are of a kind to spur human nature to its best. It is not the manufacturer who has adjusted his machinery, wages and prices to the condition around him, nor the merchant whose interest, his profits, nor prices; nor the customer, who rarely knows the history of the cost of what he buys, or bothers himself with speculation as to whether it could be cheapened or not, that gives to society its labor saving invention, but the solitary dreamer, looking at the world from his garret window, burning with the thought that to achieve an invention may be wealth, honor to him."

. . . . . .

"There are some respects in which the patent practice needs reformation as well as the law, and in which this section will, no doubt, interest itself at the right time. One of these is the length and cost of records. I doubt if the rules of evidence are as grossly disregarded elsewhere as in taking proofs in patent cases.

"Throughout his career the patent lawyer should never cease to be a student of the law at large. Be an all-round lawyer in heart, sympathy and aspiration and as nearly that in fact as the conditions of your life will permit. Buy a new book occasionally, if only to smell the leaves."

A TELEPHONE wire is carried a mile and a half without support over Lake Wallen, between Quinten and Murg, in the canton of St. Gallen, Switzerland.

THE TRANSSIBERIAN RAILWAY.

A work of prime importance is now being accomplished in Asia, silently and without parade—the construction of the Transsiberian Railway. When finished, this line will exceed in length any of those that exist upon the globe. In fact, its length, from Tcheliabinsk, its initial point, to Vladivostok, its terminus, will be 4,536 miles, while the length of the Transcanadian, which is alone worthy of being compared with it, reaches, between Montreal and Vancouver, but 2,760 miles.

On another hand, the Transsiberian will have a grave influence upon the economical and political relations of the states of Europe, Asia and America. This grand enterprise is worthy of fixing our attention, and the direction line of the road, the work that its construction will necessitate, like the motives that decided the Russian government to undertake it, ought to bespeak instant consideration. Since the year 1579, in which the Cossack Yermak, at the head of 850 adventurers of various origins, Russians, Cossacks, Germans and Poles, advanced victoriously as far as to the Obi, and gave final satisfaction to old Ivan the Terrible, in adding a new kingdom to his preceding conquests, the Russians have gradually seized the whole of Siberia, by a slow but sure march, that was finished only in 1858 by their taking possession of the regions bathed by the River Amoor.

This immense domain was neglected by the government of the czars for a long time. Its situation as a penal colony gave it a sorry reputation among the Russians, and the few free colonists who took the risk of emigrating thither established themselves among the aborigines. Far from raising the population by which they were surrounded to their own level of civilization, they descended to theirs and fell into barbarism. Nevertheless, fifty years ago, this country began to attract more attention, and it soon became evident that the creation of a great way of communication connecting it with Europe was the one condition of its development. The "trakt," that coachable route that unwinds from Perm to Kiakta, upon the Chinese frontier, was already doubtless contributing to the prosperity of Siberia, but it was the opinion of all those who were interesting themselves in the future of the country, Count Moravier, General Bogdanovitch, Merchant Lioubimor, etc., that this route ought to be replaced or rather doubled by a railway.

Many Transsiberian projects have been put forward within the last thirty years. Finally, on February 21, 1891, Czar Alexander III adopted the direction line that is now being executed. The Transsiberian is connected at Tcheliabinsk with the Russian system of railways. It prolongs the Moscow Riazan-Riajsk-Samara-Oufa line. It runs first directly toward the east in crossing the plains watered by the Tobol, the Irtych and the Obi. Starting from Krasnoiarsk, the line curves toward the southeast to reach Irkutsk (Fig. 1). It is afterward to pass around the southern extremity of Lake Baikal, run for a certain distance along its eastern shore, and then take a northeast direction. It will then follow the valleys of the Ingoda, Chilka and Amoor. But the topography of these regions is as yet too little known to allow of a definite direction line being decided upon. At Khabarovka, the line will leave the valley of the Amoor to ascend that of the Oussouri and reach Vladivostok. It will be remarked that the line does not leave Russian territory. There was some thought of making it run for a certain distance upon Chinese territory. The great curve described toward the north, starting from Lake Baikal, would thus have been avoided. As very friendly relations exist between the court of St. Petersburg and that of Peking, it was thought for a while that the great Asiatic railway would be partially Russian and partially Chinese; but strategical considerations finally prevailed, and as this railway is capable of serving some day for the reinforcing of the Russian garrisons, it was preferred to establish it solely upon Russian territory.

It will be observed, too, that the line does not divide Siberia into two equal parts. It is situated wholly in the southern part. An important section even runs along the Chinese frontier. This direction line was adopted because it is especially in the south of Siberia that the mining districts are met with. But there was still another reason. In the greater part of the country, the ground remains frozen for almost the entire year. In summer, it is true, the upper stratum thaws and the hard and unbreakable crust softens; but it then becomes converted into a muddy mass. To have tried to lay ties upon ground in so poor a physical condition would have constituted a grave imprudence.

It was absolutely necessary to establish the line upon ground that was at once more friable in winter and more solid in summer, that is to say, to the south of the border of the ground perpetually frozen.

Many difficult and costly bridges will be indispensable. The Transcaspian railway necessitated but one very important bridge, that of Tchardjoui, over the Amou Daria. The construction of the Transsi-