

I have repeatedly watched the great depression at the rail joints from the passing of locomotives on good track and away from stations. In one instance, five heavy mountain engines coupled together passed me between stations on a road accounted one of the best. The rails not only bent deeply at the joints, but the ties away from the joints seemed to move freely up and down in the ballast. The ballasting, though apparently of the best, was too coarse, so that it did not hug the ties, and a large proportion of the spikes did not bind the rails to the ties. Though the curves were short here, and the grades heavy, there was no lateral bracing of the rails to insure their standing up, and I was told that accidents on this part of the line were of frequent occurrence. And here was in use a heavy, wide, tie plate, which practically covered the full width of the ties, whereas the ordinary tie plate, as I have seen it, is so narrow as to afford but little more bearing than the rail itself. Section men say that the short life of the tie is owing not so much to decay as to the cutting occasioned by the pounding of the wheels. How necessary, then, to employ a tie plate with a wide bearing on the tie.

On at least one great transcontinental line, the tie plate, so essential in preventing lateral movement also, is conspicuous by its absence; and this line boasts some of the heaviest locomotives in use. I noted also along this line piles of ties just removed and awaiting the torch, which seemed to be but masses of splinters and decay, so long had they been kept in the ground.

On another line I saw one place where the shattered ties, four or five together, afforded but little support for six or eight feet of rail. And no doubt it is in such places as this that the rails spread, as certainly there is little to hinder. One fast train which I failed to catch, I was later interested in learning, was ditched while running at good speed on straight track, by spreading rails.

No doubt individual pieces of track show care, or the want of it, on the part of the section boss, but the lack of tie plates, and of lateral bracing on curves, indicate a defective system.

I saw two rails, opposites, in which only two spikes at each end of the rail were driven home, the section men evidently having been called off to other work. All the rest were started only, and stood from one to three or four inches above the rail base. This condition lasted for forty-eight hours on a main line where there was an average of a train an hour, many of them fast and heavy express trains. It was invitation to disaster, and yet had a derailment and wreck occurred, who even of the officials would have suspected the cause?

On one electric line I watched for many miles a new curve. The usual joint depression was marked, but in addition the rails were spread at the joints, where they were highly polished by the pounding of the wheels, while on the apex of the curve the wear showed only on the inner half of the rail face. While high speed was made on this road, its roughness appeared from the fact that it was difficult to keep one's seat without bracing the feet. The rails were comparatively light, and more readily responsive to the inequalities of the roadbed.

I think these observations go to show not only the remarkable endurance of the American rail, but the need of a better bed for it to lie on, not only for its own life, but for that of the traveler.

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THE LOCUST TREE: AN IMPORTANT FIELD FOR INVESTIGATION.

To the Editor of the SCIENTIFIC AMERICAN:

The locust is one of the most valuable trees growing in the United States. In common speech we have the black, yellow, and honey locust. The botanists recognize the false acacia, or *Robinia pseudacacia*, and the *R. hispida*. The wood has a strength as great as or greater than any of our native woods. Its only rival in common use is the hickory. The latter, however, is not nearly as strong. Hickory has the one advantage of being much more elastic. The locust resists crushing in experiment to the extent of 9,800 pounds, and its tensile strength is put at 18,000 pounds per square inch. The wood is almost insensible to decay, and lasts under water like white pine, which is in that position indestructible. Its great tensile strength and durability caused its universal use for treenails in wooden ships. No other wood ever took its place for this purpose.

The insensibility of the wood to decay appears to be due to some form of pitch or waterproof varnish within the wood. It seems to the casual observer that there was some chemical combination with the cellulose itself, which rendered it immune from the action of water. Even a locust post seems perfectly indifferent to decay at the surface of the ground.

Since the cellulose of the locust seems not to be different from that of other trees, the importance of a chemical investigation, which shall discover the secret of its remarkable and valuable characteristics, can at once be seen. The discovery of some means of converting ordinary cellulose into a compound having the same properties as that of the locust would be simply invaluable in the arts. If merely a method of imparting its waterproof qualities to the cellulose of the spruce, for example, could be discovered, it would result in the creation of a new and gigantic industry, perhaps several.

An investigation of this subject opens a wide field to the young man. Its importance and value can hardly be overestimated.

It will be interesting to note the fact that the finest, strongest, and most desirable locust timber in the United States is said to be found on Long Island. It is also said that the tree grows more rapidly there than anywhere in the country. From the so-called annual rings, it appears to be one of our most rapidly-growing trees. Owing to the extreme hardness of the timber, it does not promise to be a favorite with lumbermen. It is somewhat surprising that the locust is not more frequently recommended for railroad plantations.

B.

WHAT IS THE SELDEN PATENT?

BY CHARLES B. HAYWOOD.

Although manufacturers' organizations, formed as the result of differences of opinion concerning its validity, have done a great deal to spread knowledge concerning it and have greatly emphasized its importance, much confusion exists in the public mind as to just what the so-called Selden patent is. Exactly what its claims cover is something of which even the majority of well-informed motorists have but the haziest conception. Probably the one thing that is generally known regarding what bids fair to make for itself a niche in American patent history, as lasting as that of the Bell telephone, or McCormick reaper litigation, is that there are a certain number of manufacturers who acknowledge the validity of the Selden patent and pay royalties under license; likewise that there are others who refuse to part with even the small percentage of their profits now demanded as tribute. Originally the royalty paid by the licensees to the owners of the patent was 1.25 per cent. A reduction to 1 per cent was afterward made by the owners of the patent, voluntarily, as the volume of business increased. Subsequently, owing to the refusal of several of the licensees to pay the royalties at the old rate to the receivers of the Electrical Vehicle Company, the owners of the patent, a petition, filed by the licensees, was granted by the Federal Court for a reduction in the amount of royalty from 1 per cent to 0.8 of 1 per cent.

It is also generally known that the two trade organizations in question have been formed for the mutual protection of the interests of their members; one to uphold the Selden patent, hold automobile shows, and generally advance the welfare of its supporters by various means, such as the maintenance of a laboratory, an engineers' department holding monthly meetings, and the like; the other to fight the patent, its objects otherwise being the same as the first, though it has not developed them to the same extent as yet. These are respectively the Association of Licensed Automobile Manufacturers and the American Motor Car Manufacturers' Association, generally known as the Licensed Association and the Independents. Each holds an automobile show in New York annually. In Chicago, they sink their differences for the time and exhibit together simultaneously. This serves to sum up the extent of general knowledge on the subject. It may be added here that there are other manufacturers, of no small importance, who acknowledge the standing of neither association by holding aloof from both. Needless to add, they pay no royalties.

The Selden patent was granted to George B. Selden, of Rochester, N. Y., November 5th, 1895, and is known in the United States Patent Office files as No. 549,160. The application for patent rights was filed sixteen years earlier, or on May 8th, 1879. The subject of the patent is set forth by the applicant as an "Improved Road Engine," while its chief advantages are stated as "the elimination of the great weight of the boiler, engine, water, water tanks, the complicated apparatus necessary to adapt the machine to the roughness of the roads which it must traverse, the necessity of a skilled engineer to prevent accidents, and the unsightly appearance of locomotives built on this plan."

Parts of the specifications upon which the inventor and the Licensed Association found their appeals to the courts to sustain the basic nature of the Selden patent, are as follows: "I have succeeded in overcoming these difficulties by the construction of a road locomotive propelled by a liquid hydrocarbon engine of the compression type, of a design which permits it to be operated in connection with the running gear . . . very largely reducing the weight of the machine in proportion to the power produced, and which enable me, while employing a most condensed form of fuel, to produce a power road wagon, which differs but little in appearance from, and is not materially heavier than the carriages in common use, is capable of being managed by persons of ordinary skill at a minimum of trouble and expense, and which possesses sufficient power to overcome any ordinary inclination. Any form of liquid hydrocarbon engine of the compression type may be employed in my improved road locomotive. As the general mode of construction and operation of liquid hydrocarbon engines of this class are now well known, it is considered unnecessary to further describe them here.

"The traction wheels are attached to the axle by clutches, splined on the driving shaft and held in mesh by springs in order to permit of the wheels rotating independently of each other to facilitate progress over rough roads and the turning of corners. These clutches may also be used for the purpose of disconnecting the engines from the traction wheels. Friction or ball clutches may be used for this purpose. Provision is made for backing my improved road engine by reversing the motion of the driving wheels by a set of reversing gears . . . a clutch is interposed between the engine and the driving wheels so as to admit of running the engine while the carriage is stationary."

Selden accordingly made the following claim:

"The combination with a road locomotive, pro-

vided with suitable running gear, including a propelling wheel and steering mechanism, of a liquid hydrocarbon gas engine of the compression type, comprising one or more cylinders, a suitable liquid fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device, and a suitable carriage body adapted to the conveyance of persons or goods, substantially as described."

It will be apparent from this that the patent granted to Selden accordingly covers every one of the fundamental essentials of the gasoline automobile of the present day—the internal-combustion motor working on a compression cycle, a clutch or means of disconnecting the road wheels from the engine, the latter being designed to run much faster than the road wheels, and a means of reversing by a gear train. The differential principle of driving the wheels was also involved, but this has no bearing on the patent. Evidently, if Selden's claims can be substantiated, they are basic, and enormous royalties may be collected. It all hinges upon whether or not Selden was anticipated by other investigators in the same field, or as the legal phraseology of the Patent Office has it, whether there is anything in the "prior art," which would render his claims to originality entirely unfounded.

Apparently, this is rather a simple question and it has been settled times without number, both *pro* and *con*, by automobile enthusiasts, who are willing to pass unequivocal judgment in accordance with their own views without the slightest hesitation. Thus far, however, it has consumed nine years of litigation, almost half a million dollars, and 60,000 folios of testimony to provide the courts with something upon which to base a decision, and this has yet to be rendered. The life of the Selden patent comes to an end, November 5th, 1912, and there is at least a doubt as to whether the question of its validity will be finally settled before it legally expires. It has been considered in automobile circles that this is somewhat of an exceptionally long-drawn-out instance of patent litigation, but the telephone, reaper and binder, and the sewing machine furnish parallel cases that greatly exceed it, these landmarks in our patent history having been in the courts throughout practically the entire terms of their legal existence of seventeen years.

As early as 1899, George Day, then president of the Electric Vehicle Company, became convinced of the value of the Selden claims, and his company accordingly acquired a controlling interest in the patent. The company in question, which is now operating in the hands of a receiver, was then making gasoline as well as electric vehicles, and in 1900 it undertook the task of enforcing its right by bringing an action against the Buffalo Gasoline Motor Company, and the Automobile Fore Carriage Company (it was always Selden's idea to drive the forward wheels) as infringers. Half a year later, another action was instituted against the Winton Motor Carriage Company, which was one of the first concerns in this country to market gasoline-driven vehicles on any scale. About two and a half years then passed without any developments of note, and then George Day, having resigned as an official of the Electric Vehicle Company, undertook the organization of the Association of Licensed Automobile Manufacturers. It was on March 10th, 1903, that the association came into existence with ten American manufacturers of automobiles as charter members. The litigation against the Buffalo and Winton concerns was then amicably terminated by the defendants agreeing to become members of the association and to pay royalties. A number of minor actions in the shape of petitions to the federal courts to enjoin the use of imported vehicles were brought against individuals and importing companies about the same time, with varying results. One or two were allowed to go by default through the defendant's failure to appear and contest the case, and injunctions obtained under such circumstances were exploited as evidence of the validity of the patent, Judge Hough of the United States Circuit Court for the Southern District of New York, denying an application to punish for contempt of court the violation of one of the injunctions obtained by default, stating emphatically that the patent could not be established by injunction. As a whole, the result of these actions was not any great gain or loss to either side.

About six months after the actions against the first infringers to be proceeded against had been ended by their capitulation, the Ford Motor Company was organized in Detroit. One of the most important clauses in the articles of agreement of the Association of Licensed Automobile Manufacturers is to the effect that only firms which were actually engaged in the manufacture of automobiles on or before the date of its organization (it is not an incorporated body) were eligible to membership, and as the industry was hardly in its first swaddling clothes in the early part of 1903, it will be apparent that many important companies entering the field later were barred, willy-nilly. A notable instance of this was found in the organization of the Selden Motor Car Company in 1907, the inventor being com-