U. S. Circuit Court

Western District of Pennsylvania.

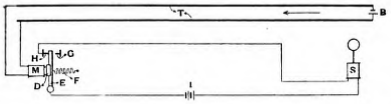
The Hall Signal Company

vs.

The Union Switch & Signal Company

BUFFINGTON, J.:

This bill charges infringement of Letters Patent No. 497,489, granted May 16, 1893, to the complainant, as assignee of John P. Buchanan, for an improvement in circuit-controlling devices. The patent relates to automatic railway signalling apparatus. Its principal object was to overcome the dangers resulting from lightning fusion in the ordinary Robinson closed track-circuit system. That system is illustrated in the accompanying sketch:



The rails composing the sides of Block T are electrically connected at their abutting ends and the two continuous lines thus made are, at the block ends, transversely connected electrically with each other and insulated from the abutting blocks. An unbroken electric current path covering each entire block, is thus made. A galvanic battery, B, the opposite poles of which are connected to the opposite rails, is placed at one end of the block and the terminals of the coil of an electro-magnet, M, are attached to the opposite rails at the other end. When the block is free from trains, or in a condition of safety, there is a continuous current flowing from the positive pole of the battery B, thence through one rail line the entire block length, thence transversely and through the magnetic coil M, to the other rail line, thence by the latter to the end of the block and thence transversely to the negative pole of the battery. This safety condition is automatically signalled to the engineer by a signalling apparatus actuated by this electric current. The current passes through the coils of the electro-magnet, energizes it and puts it in a magnetic condition so that the armature D is attracted to it against the tension of the retractile spring F.

Attached to such armature is a bar, E, pivoted at the lower end and adapted to be moved between the stops, H and G. It will thus be seen that, so long as the current flows, the upper end of the bar will rest against the front contact, H. When the current ceases, the bar will be drawn by the spring from H, and rest against the back stop, G. The armature bar, E, and the front contact, H, are both made of conducting material and are members of a secondary circuit embracing a battery, I, and a signal magnet, S.

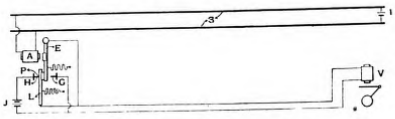
This mechanism is so controlled by the magnet S, that when that magnet is energized and in magnetic condition, a safety, and when de-energized, a danger signal will be displayed. When the block is clear, the path of the secondary current is from the positive pole of the battery I, to the foot of the armature bar E, front contact H, through one terminal of the signal-operating magnet S, through coils of said magnet to its other terminal and thence by wire or ground, to the negative pole of battery I. It will thus be seen that so long as the primary current flows in the path described and holds the armature bar E against the front contact H, the secondary current is closed, the magnet S energized and the signal held at safety, thus indicating to the engineer of an approaching train that the block T is vacant. When his train enters the block, the wheels and axles establish a new electrical connection between the rails, which, during the train's passage through the block, affords a current path of less resistance than through the electro-magnet M. The current from the battery is, therefore, shunted or short circuited through the wheel-axle connection, the magnet of M is demagnetized, and this releases the armature bar E, which is drawn by the spring F from its front contact, G. The break of the contact between H and E breaks the current path from the battery I of the secondary circuit, de-energizes the signal-operating magnet S and throws the danger signal. When the train leaves block T, the currrent will again flow through M; H and E will re-engage, the secondary circuit be restored and the signal returned to safety position.

But this mechanism was open to a grave objection. If the wires were struck by lightning and received a greater charge of electricity than they could carry, a high heat would be generated at these contacts and the stop H and armature bar E become fused and welded together. When this happened and thereafter a train entered the block, although the current would short-circuit through the wheel axle transverse connection and electro-magnet M be de-energized, the spring F was powerless to break the welded contact of H and E, and the secondary circuit would still continue to display a safety signal, although a train was upon the block. It will be seen that the mischief was not alone that the signalling system was rendered inoperative, but that it was left in a misleading condition where it represented safety when the actual condition of the block was that of danger.

To obviate such danger from fusion, as well as when too fine an adjustment or other cause had closed fixedly the controller of the secondary circuit, the device of the patent suit was intended.

Not only does it do this, but it enables the signalling system to continue its work in spite of such permanent closure.

The accompanying sketch will explain its operation.



The main relay circuit runs through the magnet V, which operates the signal, and through the lever L. This lever L and its contact point H, are the normal or primary circuit controllers. Such control is effected by making or breaking the circuit of battery J through V, thus energizing or de-energizing the magnet and operating the signals. Lever E is the armature bar of magnet A, and is the secondary circuit controller. When magnet A is energized, lever E pushes lever L against contact point H, thus closing the circuit through V. When magnet A is de-energized, E is retracted by a spring, not shown in the patent sketch, but an X obvious mechanical expedient, and L by a like spring. This breaks the circuit at H. A piece of non-fusible insulation P, attached to one of them prevents the current from passing through L and E. A piece of insulation on magnet A (designated in the patent as Q of Figure 1) prevents E from sticking to such magnet. This magnet is connected to the track system as shown in the Robinson sketch and is affected by the wheels of the trains on the block in the manner already shown.

When this block is clear, the passing current energizes magnet A, lever E is drawn to it, lever E pushes lever L to point H. This closes the circuit, energizes magnet V and displays the safety signal. When a train enters the block the magnet A is de-energized, E and L are retracted, the circuit through L, H and V is broken and the danger signal thrown.

Now if lightning fuses L and H, or too fine adjustment prevents their effective operation, the useful function of the secondary circuit controller, E, comes at once into play. If the train enters the block after such fusion or other permanent union of H and L, the magnet A is at once de-energized and the lever E is drawn to its back stop G.

Owing to its then separation from the back stop G and the insulations P and Q, the lever E was not affected or fused by the lightning stroke. In falling back to its back stop G, it is obvious that E makes a shunt circuit around magnet V, that magnet is de-energized and the danger signal displayed. The course of the shunt current is from left of battery I to H, down L and up to the fulcrum of E, thence through E and G to the other side of battery I. But not only does this simple expedient serve when a train enters the block to throw the signal to danger in spite of the fusion of H and L, but when the train leaves the block and the magnet A is energized, E moves forward, breaks the shunt current at G and the main current, owing to the fusion of H and L, resumes its course through magnet V and throws the safety signal, or in other words, continues the general efficiency of the system.

The patent sets forth that the invention "relates to circuits and to means for controlling the current therein," and the object of the controlling means "is to provide a path for the current through a translating device, included in a circuit, and to exclude the current from said translating device at the proper time with a greater degree of certainty than has heretofore been attained." The controlling device, which the patentee defines as "a relay," "comprises two or more pairs of contact points connected with a circuit, any pair of which will act, when in one position, to exclude the current from the translating device and when all the pairs of contacts are in their other position, a path through the translating device will be provided."

The essential elements of the invention are again defined by the patentee as following. "As long as the pairs of contact are so arranged that when all are in one position a path for the current is provided through the circuit and, when either pair is in the reverse position, current is excluded from the circuit it is obvious that there is no departure from the true spirit of my invention."

The device was self-operative, and it is clear that in its operation the invention provided for two, and only two, positions or conditions of the pairs of contacts. One position was such that when both pairs of contacts were in that position the current would necessarily whole-circuit. The other, which he defined as the reverse position, is one such that when either pair of contacts was in such reverse position, the current would necessarily short-circuit. In other words, the joint action of both pairs of contact was essential to long-circuiting, the separate action of either pair could effect short-circuiting. Not only was the invention defined as relating to these two positions, but it was illustrated and applied to a mechanism where there were but two positions, Railroad signals are thrown into, and rest in, but two positions, viz.: safety and danger.

When they were placed in one position, the object of the device was to leave them there until electric movement changed them to another. This change was made, and was only made, when one or both pairs of contacts were in the reverse or non-reverse position. The reverse and non-reverse were the only regular positions; there were no other or intermediate ones. Now it is quite clear that no such result was produced by any of the patents cited in anticipation, neither do any of them disclose the means or method by which Buchanan produced this result. The same may be said of the electric publications cited. Although the danger resulting from lightning fusion were known, no one found in these alleged anticipations a mechanism susceptible, by mere mechanical improvement, of barring such danger.

Resemblance to Buchanan's device and indeed anticipation thereof by these publication devices are now alleged, but it is clear to us that such alleged resemblances are fancied and not substantial. These devices must be considered not in the light of Buchanan's subsequent advance, but apart from it. Suppose Buchanan's patent were earlier, could it be held that these devices infringed it? While both were electrical devices, it is clear that their purpose and office were wholly different. These appliances were used by operators for duplex telegraphy, and it was only when operators were present that they were of use. They were not automatic, their purpose was not to avoid or counteract fusion from lightning. If the apparatus, with its delicate and accurate adjustment, was fused by lightning, it was at once replaced. In the nature of things, there would be no special attention paid to its working when it was so struck. It is not shown that the supposed case of the welding of the sliding spring and the upper contact point ever happened or was known or even thought of. Moreover, it will be noted that the practical use of the mechanism contemplated but two positions—one when the key was depressed, the other when it was raised.

The instantaneous, transitory passage of the current over the shunt course during the instant the key is moving between its two positions, was an incidental matter, and served simply to provide, for the briefest time, between the breaking of one contact and the making of the other. It was simply intended to secure circuit continuity. The more the time be minimized the better.

Thus it is said: "If the springs are adjusted too far apart, there will be a break in the circuit, as the lever will break contact with one spring before it touches the other; if too near together, the battery will be placed on short circuit too long, from one contact being made before the other is broken. By careful adjustment, this period can be reduced to almost nothing, and the more accurate this adjustment, the better will be the performance of the apparatus."

It will thus be seen that while there is a general resemblance in that in both a shunt current is used, that the objects to be attained were wholly different. In one the shunt current is used to avoid a momentary break of current continuity through the entire mechanism. In the other the shunt current is maintained for an indefinite time, and during such time the current affected the positive result of operating the signalling mechanism. In the one device the permanent maintenance of the shunt current would result in suspending the practical working of the mechanism, to wit, the transmission of messages; in the other, it had the positive effect of displaying the desired signal.

The wide divergence between these two devices in form, object and operation, were such that the change from the one to the other was more than mechanical improvement. The only thing in common was the perfectly familiar function of a shunt current, but in our judgment the mechanism used by Buchanan to short circuit the current for the purposes he used it would not suggest the use of a shunt current, and the mechanism employed in maintaining circuit continuity, in the duplex system.

E converso the duplex system did not suggest its use or the method of its use in the Buchanan. Be it observed that the use of a shunt current per se was not the novelty of Buchanan's invention, but its use in connection with pairs of contacts so arranged that when both pairs were in one position the current did not shunt, but when either was in the other it did. The alleged anticipation shows no such mechanism and no such object.

Another defense, to which brief reference will suffice, is that the patent in suit is void because the invention was the joint work of one Scott and Buchanan, the patentee. The patent, issued to Buchanan alone, is prima facie correct and valid, and the defendant can overthrow it only by the clearest and most reliable testimony. 3 Robinson on Patents, Section 1032 and cases cited; Walker on Patents, Section 516. The proofs in this case do not reach that standard.

The alleged joint inventor, Scott, is dead, and we are without testimony from him in that regard, but his explicit disavowal of any such claim is clearly shown. Mr. Hall, the president of the complainant company, testifies that during his negotiations with Buchanan for the purchase of the patent, he asked Scott as to Buchanan's interest; that Scott told him Buchanan was the sole inventor, and that the only interest he had in it was a prospective one, viz., a half interest in the sale of the invention which he hoped to make to the Union Switch and Signal Co. on Buchanan's behalf. S. M. Young, apparently a wholly disinterested witness, testifies to hearing Mr. Scott make this same disavowal of joint inventorship. And the witness, White, who was present when Buchanan first showed his invention to Scott, testifies that Scott there accredited the invention to Buchanan, and that a joint interest in the proceeds of its sale was then arranged. In view of Mr. Scott's own disclaimer of joint inventorship with Buchanan, but of his, Scott's conditional joint sharing of the proceeds of the sale of the invention to the Union Switch and Signal Company, the use of certain ambiguous statements by both Scott and Buchanan would seem to apply rather to their joint interest in the proceeds of the sale of the invention, and not to their joint inventorship.

The several sketches found in Scott's possession after his death have received due consideration. When they were made, for what purpose or the circumstances under which they were made, are not shown. Viewing them in the strongest light, the most that can be said of them is that they throw some uncertainty on the inception of the invention.

But even such uncertainty is far from the measure of positive proof required to overcome the prima facies of the patent. It is to be noted, however, that these sketches would rather seem to have been simultaneously prepared, and that by one person, than to have been drawn at the times alleged. Although having dates months apart, they are drawn on the same kind of paper. A further difficulty arises when the testimony of White is considered. His testimony at least negatively proves the sketch of May 2, 1890, which is in ink, was not exhibited that day. White states that before Scott came in, Buchanan made a pencil sketch to show the witness. The sketch dated June 9, which is now claimed to embody the invention, was evidently not made at that interview. White says that Scott's suggestions were made in a pencil sketch; this seems probable. That Scott should then have at hand and use the same kind of paper as Buchanan's sketch of May 2d, that he should carefully do it in ink (and seemingly the same ink) and with the elaboration of border, finish and detail shown, is quite improbable. Then, too, we have the explicit testimony of White that even in the pencil sketch of Scott, Buchanan showed him at once wherein such design was lacking, and at Buchanan's suggestion the essential parts were added. To avoid this patent on a finding based on surmises instead of proofs, upon suggested doubt instead of proved certainties, would be at variance with the well grounded principles of the patent law and dangerously affect the stability of many patents in that regard.

In view of the stipulation in the case as to the devices sold to the Central Railroad Co. of New Jersey and the uncontradicted testimony of the complainants expert as to the same, we deem it needless to further extend this opinion by discussing the subject of infringement. We find infringement of all the claims except the tenth.

Let a proper decree be drawn.

RAILROAD GAZETTE

FRIDAY, OCTOBER 19, 1900.

CONTENTS

Relays for Automatic Signals—A Correction.

n obvious error, a clerical one, was made on page 674 ast week's *Railroad Gazette*, where we said that the hanan patent had been assigned to the Union Switch ignal Company. It was assigned to the Hall Signal ipany, which is, by this decision of the United States uit Court, made sole owner of the shunt circuit ıod of preventing an automatic electric signal from aining fixed in the all-clear position in case the conpoints in the track relay are fused by lightning. We not heard whether or not there will be an appeal higher court, but meantime, the natural sequence be an order enjoining the Union Company from ing, selling, or using the device, and also an order an accounting of profits and damages during the past or more years. Railroad companies using the device ıout licenses from the Hall Company are liable to nction, that, of course, depending on the policy of Hall Company.

Contributions

A Storage Battery Lighting Accident.

Boston, Oct. 19, 1900.

THE EDITOR OF THE RAILROAD GAZETTE.

'here recently appeared in some of the daily papers account of an accident to a dining car lighted with tric storage batteries, which was caused by an exsion underneath and near the center of the car, where located the box containing the storage batteries. A king up and severe fright was caused to a colored ter who was standing over the spot at the time, but escaped with only slight injuries. On the train being ıped it was found that the box was partly detached n the car, some of the hangers being broken, and there s a narrow escape from its falling on the track, with sible derailment of the train. This was undoubtedly sed by the faulty construction and arrangement of the containing the battery cells, and since the use of rage batteries on trains is being greatly extended, it is l to call the attention of railroad companies to the ortance of securing proper ventilation for all receples which contain storage batteries.

'he action of the current when such a battery is charged pecially if the current is not stopped as soon as the rging is complete) is to cause the decomposition of ortion of the water in the cells, with the consent liberation of hydrogen and oxygen gas, a mixture which (as is well known) is violently explosive when contact with a flame or an electric spark. A broken partly broken connection between two of the cells of h a battery may easily produce a spark when the curıt is turned on or off (or at other times), and if the es produced when the battery is charged accumulate in onfined space an explosion is quite certain to result, ore or less violent according to the amount of gas in receptacle. All danger from this source may easily prevented by a few holes at the top of the battery box, ranged when possible on opposite sides so as to ure a draught through the box, and there need be no ore fear of accidents from storage batteries than from y other appliances for lighting trains. This simple precaution is often neglected, however, and, while explosions are extremely rare, they are often possible.

The rules of some insurance companies require that where storage batteries are used the rooms or compartments containing them should be well ventilated, but the insurance people are not yet accustomed to supervise the use of electric appliances on moving trains. It is, therefore, for the interest of the railroads themselves to see that great care is used in the installation and maintenance of every such device. Such work should be under the direction of a competent expert, who should have charge of the laying out and installation of all electrical devices, and whose services can be well paid for by the amount of money saved in the operation and maintenance afterwards.

GEO. W. BLODGETT.

The Barschall Joint.

New York, Oct. 12, 1900.

TO THE EDITOR OF THE RAILROAD GAZETTE.

I beg to draw your attention to the incorrectness of the cut representing the Barschall joint in the article on Rail Joints by Mr. F. C. Schmitz, page 647, of your issue of Oct. 5, and the consequent incorrect statement in reference to same by Mr. Schmitz, that "the N. Y., P. & O. joint and the Barschall joint have many points in common."

I enclose a correct cut of the Barschall joint, and you will notice that the top and bottom of the filling piece is flat, not rounded or beveled. [This engraving appears in the article on joints published in this issue.—Editor.] This shape permits the ready insertion on rail ends which have been hammered down. Of still greater importance is the fact that the four edges or bearing surfaces of this filler are narrow and rounded, where resting on the main and auxiliary rail, and that the bolt holes are somewhat larger than the bolt itself, permitting a limited movement of the parts, and equalizing or distributing between them the weight of the passing train. The proof of this fact, that it is not a rigid, inflexible joint is seen on examining a filling piece in use for some time, which shows these rounded bearing surfaces to have become polished by this movement.

The independence of the auxiliary rail, resting as it does wholly on the ties and not at all on the base of the rail, as well as the filling piece and its peculiar shape, are the most essential and important features of the Barschall joint, and it differs therein from all other joints invented or used to date. The N. Y., P. & O. joint rests partly on the ties but also on the base of the rail, and therefore possesses more or less the objectionable features of all similarly supported fishplates or joints. A joint resting on the main rail must necessarily follow the movement or deflection of the rail ends caused by a passing load. It is just this undesirable fact that is done away with by the Barschall joint, and by no other. This is shown most clearly in the application of the joint to a bullhead rail.

It is the independent movement of the auxiliary and main rail that causes the smooth, noiseless, non-hammering passage of the wheel over the joint, even though the tires are much worn.

The theory that wheel-carrying joints are too rapidly destroyed, and cause hammering by the false flange of worn tires, is exploded by the actual experience with this class of joints made by the Royal State Railroad of Saxony. No other existing road has made the exhaustive tests and had the many years of experience of this road, and they some years ago equipped their entire line with this class of joint, owing to the savings thereby made. The Saxony joint also rests partly on the base of the main rail and must consequently possess the faults of other similarly supported joints, while the Barschall joint is free from these objections owing to its independence of the main rail.

If properly understood the superiority of the Barschall joint to all others must be apparent. It insures smooth, noiseless riding, decreased cost of maintenance, great saving in the wear and tear of rolling stock, etc., while if applied to old rails with hammered ends these same rails can be used until worn out in their entire body before replacing.

M. BARSCHALL.

Acceptance Tests for Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE.

In a discussion of locomotive road-tests at the May meeting of the Western Railway Club, reference was made to the advantage which would result to all concerned if builders of locomotives were to determine the performance of engines before sending them out. While the tendency of the general discussion gave no emphasis to this suggestion, it is nevertheless worthy of careful consideration.

It is a noteworthy fact that a decade's progress in locomotive designing, significant as it is, has been confined chiefly to structural matters. To satisfy demands for greater power, locomotives have been made larger and heavier. Each proposed increment in size has presented difficult problems for the designer. In many cases he has been required to re-arrange important members and give new form to many details, but in accomplishing this he has succeeded in preserving in his design those elements of strength and simplicity which have hitherto characterized the American locomotive. At the same time he has greatly improved the general character of his design. Parts have been made stronger and at the same time lighter, materials entering into their construction have come to be more carefully chosen, and the workmanship expended upon them is now of a higher character than ever before. The result is that the modern locomotive is not only marvelously certain in action but it is a machine of so high an order that the service required of it is continually becoming more exacting.

From this brief review of results accomplished, it will be seen that progress in locomotive design has been finding expression entirely in the domain of mechanism. Nothing to which reference has been made can improve or in the least degree affect the thermodynamic action of the machine. Except for such progress as has been achieved in the matter of compounding, it is impossible to show that the locomotive of to-day delivers more work per pound of coal consumed than the locomotive of twenty years ago. Moreover, the conditions affecting the thermodynamic efficiency of a locomotive are so little understood that it happens not infrequently that a new type of engine is even less economical in its action than engines of an older type. Referring to this matter a prominent superintendent of motive power recently defined the situation by saying that he could point to a number of new locomotives, the cylinders, ports and valve gears of which had, in the working out of the designs, received unusual attention, but which now in service were "proving to be regular coal eaters." The adoption of the compound principle opens the way to important thermodynamic improvements, but the number of compound locomotives now running is still comparatively small. The slow progress which has attended their introduction is in part, at least, due to a lack of definite information concerning their performance.

An acceptance test would secure the purchaser of a locomotive against such gross defects as sometimes appear in badly fitted bearings, in imperfect draft appliances, in displaced cores in saddle and cylinder castings, and in the annoyance and loss incident to the process of "breaking the engine in." It would serve to satisfy the purchaser that he is getting all that he pays for. Such tests would be of advantage to the builder in many ways. Results derived from them would lead to the elimination of many of the uncertainties which now attend the process of designing. They would give the builder of a superior engine the advantage of a secure basis upon which to fix a guarantee. The advocate of the compound would soon be able to re-enforce his arguments by a specific performance guarantee which, being made with the full knowledge that a test would follow the completion of his work, would be entitled to very great respect.

A test before delivery would insure the builder against annoyance and loss arising in unfounded claims because of alleged defects which may be put forth by the purchaser after the delivery of the engine. It not unfrequently happens that locomotives of a new type when put in service fail to give the results which those responsible for their design had anticipated. The new engine may be larger than those previously employed and, if worked to its full power, may demand greater exertion on the part of its crew. Firemen may argue that if the new engines are forced to their full capacity the whole equipment of the road may soon be composed of similar engines, a change which would operate to greatly increase the severity of their labor. Engineers sympathizing with their firemen, may run with a partially open throttle or with the reverse lever close to the center. When the engine tugs lazily up a slight grade they may refuse to drop the lever a few notches, saying, "She's doing all she'll do now. If the lever is dropped she doesn't seem to free herself," and the word goes around that the new engine, although heavier and larger than those of an older type, will do no more work. The purchaser perhaps withholds payment, disputes arise, time passes, effort is lost, and ill feeling engendered before the real facts are apprehended and a proper remedy applied. All this could not be if the seller, the purchaser, and the operator all knew that the engine had been subjected to tests which had demonstrated its ability to do the amount of work expected of it.

It may be safely asserted that no one thing has contributed more largely to the present efficiency of the American pumping engine than the influence exerted by acceptance tests. The fact that such tests have been imposed has stimulated designers and builders, and the information derived from them has served as a sure guide to better work in all subsequent designs. Acceptance tests of pumping engines have been expensive but the benefits have been great. They have resulted not only in good engines but in higher ideals. Is it not now time when the locomotive should be subjected to a similar process?

The adoption of an acceptance test would require the addition of several paragraphs to such specifications as are now commonly employed. These might be somewhat as follows:

1. Upon its completion the builder shall run the locomotive under its own steam in the presence of a representative of the purchaser, upon a testing plant or otherwise, for the purpose of establishing its performance, as hereinafter set forth.

2. *Bearings.*—In case the fitting of bearings to their journals is such as to make it impracticable to run the engine at its full power, after being first started, the engine is to be subjected to such preliminary running as may be necessary to allow it to operate without interruption under the conditions of such tests as are hereinafter specified.

3. *Performance Under Conditions Approximating Maximum Traction.*—The engine should be run upon a testing