ings are released. Great advantage is also claimed because the abrupt walls of the sunken recesses prevent the cushions from slipping. But if it was not new, as is shown by the English patent to Newton, to make recesses in a metal saddle to receive cushions, it can hardly be said to require invention, when the cushions as used are liable to slip, to make the recesses sufficiently abrupt to prevent slipping. The strongest and most persuasive argument which the complainant urges in favor of the patentability of the Christy saddle is based upon the testimony showing the rapidly increasing sales, and its decided popularity, since it has become known upon the market. But the saddle manufactured differs so widely from the saddle shown in the specifications and drawings that it is not easy to determine just what features make it acceptable to the trade and to those who use it. It would appear that some of the features of the saddle as manufactured which are not shown in the saddle as patented possess more novelty and utility than those described in the patent. It may well be that the advantages of the manufactured saddle result from the fact that the saddle plate is reduced in size until it is nothing more than a support for the two pads, and has no bearing at all for the fleshy portion of the buttocks so that the rider's weight rests exclusively upon the two ischii of the pelvis, and also from the fact that the interval between the cushions or pads leaves an open space from front to back similar to that shown in the Hicks patent, through which there can be a current of air, and because of which there can be no pressure upon the perinæum. It seems quite probable that it may be these unpatented features, not shown in the specifications or drawings, which have given the Christy saddle the acceptance which it has obtained, rather than any advantage of construction arising from the fact that the pads are set in depressions, and are detachable. It may also be that, with the enormously increased use of bicycles experience may have taught particular riders that upon long runs it is less injurious to use one kind of a saddle than another, although not so agreeable at first. The fact of comparative utility when the acceptance of the improved device may just as well be attributed to features not claimed in the patent is an unsafe guide in determining the existence of patentable invention. Upon the whole case, considering the prior state of the art, I have been forced to the conclusion that it did not require invention to form the recesses on the surface of a solid-top saddle with abrupt marginal walls to receive the pads and keep them from slipping.

UNION SWITCH & SIGNAL CO. et al. v. PHILADELPHIA & R. R. CO. et al.

(Circuit Court, E. D. Pennsylvania. May 26, 1898.)

1. PATENTS—PRIOR USE—RAILWAY SIGNALING.

The Westinghouse patent, No. 270,867, for improvements in electric circuits for railway signaling, is void because it was in practical and public use for more than two years before the patent was applied for, and because a complete description of it was previously published in the "Railroad Gazette," a trade paper having a general circulation among railroad people and those connected with railroads.

2. SAME—INFRINGEMENT.
The Gassett patents, Nos. 233,746 and 246,492, for electric railway signaling apparatus, which disclose improvements on the preceding Robinson system (No. 130,661, reissue 5,938), consisting in the exhibition of a danger signal set at the entrance of a track section until the train has passed over a certain portion of the track section next in advance, thus securing two danger signals rearward of the train while it is traversing the overlap, are not infringed by a device in which two danger signals are set at the beginning of each section while the train is traversing that section, and one of which continues at danger, as a distant cautionary signal, during the passage of the train over the second track section in advance. At most, these patents secure the exclusive right only to use the specific means described to produce the described result.

3. SAME—INFRINGEMENT—CONNECTORS FOR ELECTRIC TRACK CIRCUITS.
A patent for an improvement in connectors for electric track circuits, consisting of a wire having its ends coiled around and soldered to the outer ends of tapering plugs, which are driven into holes bored in the rails to be connected, is not infringed by a connector formed by laying the ends of the wire in longitudinal grooves formed in the sides of the tapering plugs, and then driving the plugs, with the wire, tightly into holes in the rails.

4. SAME.
The Gassett & Fisher patent, No. 227,102, and the Means patent, No. 273,377, for improved connectors for electric track circuits, construed, and *held* not infringed, the former as to claim 1, and the latter as to claim 6.

This was a suit in equity by the Union Switch & Signal Company and others against the Philadelphia & Reading Railroad Company and others for alleged infringement of a number of patents relating to electric railway signaling.

Geo. H. Christy, J. Snowden Bell, and J. Warren Coulston, for complainants.

Witter & Kenyon and Thomas Hart, Jr., for respondents.

ACHESON, Circuit Judge. The plaintiffs sue for the alleged infringement by the defendants of five letters patent, namely: First, No. 233,746, dated October 26, 1880, to Oscar Gassett, for electric railway signaling apparatus; second, No. 246,492, dated August 30, 1881, to Oscar Gassett, for electric railway signaling apparatus; third, No. 270,867, dated January 16, 1883, to George Westinghouse, Jr., for improvements in electric circuits for railway signaling; fourth, No. 227,102, dated May 4, 1880, to Oscar Gassett and Israel Fisher, for a connector for electric track circuits; and, fifth, No. 273,377, dated March 6, 1883, to Charles J. Means, which includes improved means for attaching a conducting wire to the rails of the track. The Gassett and Westinghouse patents relate to signaling devices for the protection of a railway train against rear collisions from other trains following on the same track.

Before considering the particular features of the signaling appliances of these patents, it will be well to give some attention to the prior state of the art of railway signaling. Prior to the date of the earliest of the inventions of the patents in suit, electrically actuated railway signaling apparatus, automatically operated by a moving train, was in common use. The railway track was divided into a series of blocks or track sections of any desired length, and the protecting signals were located and operated with respect

to the track sections as the train passed over them successively. The moving train protected itself against rear collisions by setting signals to "danger," "caution," and "clear," for the information and guidance of the engineer of the following train. It was common to maintain at least two protecting signals to the rear of a moving train. "Home" and "distant" signals were in use. These signals act in connection with each other. The home signal is the signal for the track section at the entrance of which it stands. The distant signal is placed at a convenient distance to the rear of its home signal, and gives cautionary notice of the showing of the home signal. All this was part of the art as practiced anterior to any of the inventions of the patents sued on. A reference to a few of the prior railway signaling patents may be helpful.

The British patent of 1872 (No. 3,448), to Sykes & Francis, shows a series of springs arranged along one of the rails of the track in electric connection with electro-magnets for working the signal lights and signal arms, and operated by the passing train. The patent states:

"For example, a train on leaving station No. 1 (see diagram, Figure 4), acts upon a spring outside that station, and thereby moves the signals at that station to danger. On reaching a position midway or between stations Nos. 1 and 2, it acts upon another spring, and moves the signals, which may be the 'distant signals' in connection therewith to danger, without interfering with the signals at station No. 1. Then, on leaving station No. 2, it acts upon another spring, thereby moving the signals at this station to danger, and at the same time returning the signals at station No. 1, and the intermediate or distant signals to caution. This mode of working signals automatically may, of course, be modified to adapt it to the various systems now in use on different lines."

The British patent, of 1873 (No. 344), to Carr & Barlow, for improvements in railway electrical signaling apparatus, states:

"The object effected by our invention is that no train passing along a line of railway can approach within a limited distance of the preceding train without receiving a warning signal. The distance at which trains are kept apart may be any suitable distance, and the apparatus works automatically."

The specification, among other things, says:

"Now, let us suppose a train to be starting from A. It arrives at the lever at a, passing over it, breaks the current a, A, thus leaving the signal 'line blocked' at A. The train, going on, will arrive at B, and receiving the signal 'line clear' will proceed, passing over the lever, b. In doing so, it breaks the current b, B, thus leaving the signal 'line blocked' at B, and at the same time, by the wire b, a, brings in action the electro-magnetic apparatus at a, which couples up the circuit a, A, thus leaving signal 'line clear' at A, and so on. The arrangement, so far as above described, is suitable for lines of railway on which every train stops at each of the stations; but, for the lines of railways where this is not the case, we modify the arrangement by employing, in addition to the insulated bar situated at each station itself, another corresponding bar at a distance in rear of the station to act as a distance signal apparatus, as shown by the diagram view, Figure 1, so that a train receiving a signal of 'line blocked' at the distance signal may slacken its speed as it comes up to the station, when it will receive another signal, and either go on or stop, according to the signal it receives."

The United States patent to Henry Flad, No. 162,369, dated April 20, 1875, shows improvements in safety signals for railways, embodying the principle of overlapping signals. The patent states:

"For a double track (where the trains only run in one direction on each track), the signal abreast of the train is set to indicate danger (to a train following), and the signals are left standing at danger for a sufficient distance in the rear of the train, but are set to indicate safety, after the train has proceeded a given distance, by connection with the same mechanism by which the signals are set to indicate danger. At least one signal in condition indicating the danger is at all times left to the rear of the train, the train reversing the second signal to its rear; so that, in case of an accident between signal stations, the train following would have sufficient warning. For single-track railways (on which the trains run in both directions) the construction of the signal apparatus is such that upon each side, abreast of the engine, the signals are reversed by the passing train; and simultaneously the signal two stations ahead, upon the left side, is set to danger, while upon the right side the signal two stations to the rear is set to safety, so that a train either following or meeting the first will be warned about two stations from the train first mentioned. Thus, it will be understood, the train does not act on the signal at the station next in advance or to the rear, but upon signals more distant, so as to always leave at least one danger signal in advance, and one to the rear of the train, and at sufficient distance for warning to another train. This is what I denominate my system of overlapping signals, as the pipes or other means of communication, between the train and distant signals, overlap or run past each other, as is fully explained hereafter by reference to the diagrams."

The first claim of this patent indicates the scope of Flad's invention, viz.:

"(1) The method herein described of signaling, whereby overlapping signals at a distance from the train are reversed, while other signals, between the former signals and the train, remain at rest, to be reversed in their turn, all substantially as and for the purpose set forth."

Flad's preferred means of carrying out his invention is by pneumatic action, but he does not confine himself to that, and, after stating that hydraulic or other specified means may be employed to work the apparatus, he adds: "Or the communication between the train and signal may be by electricity, the closing or opening of the circuit setting in motion mechanism by which the signals are reversed." There can be no doubt that, at the date of Flad's patent, any electrical engineer of ordinary skill, acting upon the suggestion of the patent, could have successfully applied Flad's system of overlapping signals by means of mechanism electrically actuated and operated by the train.

The overlap relation of safety signals is a main feature of United States patent No. 150,030, to Hall, dated April 21, 1874, for an improvement in train-operated electric railway signaling apparatus. It is proved that this Hall overlap was in practical use for a considerable time, beginning about the year 1873, on the Eastern Railroad, in the state of Massachusetts, where there was for each track section an overlapping space of 500 feet in length during the passage over which the train was protected by two danger signals behind it, the first of these signals not being put to safety until the train had passed beyond the 500 feet overlap.

Originally, the method of operating railway electrical signaling apparatus automatically was by means of instruments so arranged along the track that the train in passing engaged with them. This method is called the "track instrument system." Afterwards William Robinson devised and patented a method for the automatic operation of

railway electric signals by the passing train, which was a very great improvement upon the track instrument system. Robinson's invention is described in his United States patent No. 130,661, dated August 20, 1872 (reissue 5,958). His specification states the object of his invention thus:

"The object of this invention is to operate electric signals, audible or visible, by means of moving or standing vehicles or trains without the use of ordinary track connections for closing or breaking circuits, and without the use or with a limited use of line wires for conducting the electric current, the rails of the track being used for the latter purpose."

His patent shows the track divided into sections insulated at their ends, and the poles of the battery connected by wires to the two opposite rails, and the electro-magnet which controls the signal in like manner connected to the two lines of rail. Robinson thus provided a normally closed circuit in each track section with the signal normally in safety position. The method of operation is this: As the train enters upon a track section, its wheels and axles, by short-circuiting, cut off the battery current from the electro-magnet, which is thus demagnetized, and thereby the signal is shifted to danger, and remains at danger as long as any part of the train is on the section. The specification states:

"When the signal banner is in a position of exposure, as shown, the lever, L, may serve to close an additional circuit through the battery, B, which may be used to operate an alarm, I, in conjunction with the signal, S, or to actuate another signal at any distant point. Furthermore, instead of using the magnet, H, to actuate the signal directly, it may be used as a relay, operating, when magnetized, to keep the circuit which directly actuates the signal open or closed, as desired. The signals may be used also on a single track, and be applied as block signals, and for other purposes on single or double tracks. When used as a block signal or for other purposes, it may be desirable to indicate at a distant station when the signal is operative. To accomplish this object, carry one of the wires from the magnet, M, to the distant station. Here let the wire be passed through the coils of a bell magnet or other signaling device, and thence be carried to the track, and attached to the same, as already described. The distant office or station signal will operate simultaneously with the signal S. Thus, any desired number of signals may be operated simultaneously at different points from a single section of track."

Robinson's British patent of August 29, 1879 (No. 3,479), which includes his closed circuit system of signaling, thus speaks of its capability:

"One or more lines of wires may also be used to operate additional signals; for instance, to indicate at a station the approach of a train, or to indicate when the block signal has changed."

We come now to the patents here in suit, and we take up first the earlier of the two Gassett patents, No. 233,746, dated October 26, 1880. The specification begins with an acknowledgment with respect to the previous condition of the art, and a statement of what the patentee had in view. We think it best to quote here at length:

"My invention relates to that system of automatic electric railway signaling which consists in dividing the whole or a portion of the length of a line of railway into a signal section of any required or convenient length (which length corresponds to the minimum interval of space which it is desired to preserve between different trains moving upon the same track), and in guarding each of said sections by a signal placed at or near the entrance of

such section, which signal is actuated or controlled by an electro-magnet included in an electric circuit extending the entire length of the signal section to which it appertains, said electro-magnet being, in its turn, controlled through the electric circuit by a movable circuit closer attached to the train. By this means the passage of a train over each successive signal section causes a danger signal to be exhibited at the entrance of such section from the time that the train enters it at one end, until it leaves it at the opposite end, when the danger signal is withdrawn or discontinued, leaving the way clear for the next succeeding train. It has been found in practice that it is frequently desirable and necessary to continue a given danger signal in action after the train which sets it in action has passed off from the section which the signal is designed to guard until such train has passed over the next section in advance or a certain portion thereof, by which means an additional security is provided, especially upon dangerous portions of the road, such as sharp curves or descending grades. The object of my invention is to effect this result; and it consists, principally, in a novel arrangement of electric circuits in which the several circuits, appertaining to the different signal sections, instead of being entirely independent of each other, as in the ordinary arrangement, are made to act to a certain extent dependently, so that each circuit is, as heretofore, under the direct control of the train while the latter is traversing its own section, but, in addition to this, is also indirectly under the control of the train through the agency of the next signal circuit in the series while the said train is traversing a certain portion of the next signal section."

The specification then proceeds to describe Robinson's closed circuit system of signaling, and the patentee adopts Robinson's apparatus and method in their entirety. Gassett's disclosed improvement upon Robinson consists in continuing the exhibition of the danger signal set at the entrance of a track section until the train has passed over a certain portion of the track section next in advance, thus securing two danger signals rearward of the train while it is traversing the overlap. Gassett shows specific means for accomplishing this result. At a certain point (b2) in advance of the entrance end of the track section, he inserts an insulated splice "in one line of rails only, the severed ends being connected by the wires 3, 4, which form the terminals of an electro-magnet, C2." The electro-magnet, C2, controls the circuit breaker, d. A peculiar adjustment is given to this electro-magnet, C2, and its armature, d. Further details here may be omitted. Indeed, they would hardly be intelligible unless accompanied by diagrams. The object to be attained and the general method of its accomplishment are thus summed up in the specification:

"Thus, it will be understood that the danger signal of each section is exhibited during the passage of a train over that section by the shunting of its electro-magnet, and that its exhibition is continued during the passage of the train over a portion of the next advance section by the interruption of the circuit by means of a circuit breaker controlled by the train while traversing the latter section."

The specification then adds, with respect to the extent of the overlap, the following direction:

"The insulated splice, b2, may be placed at any desired point between a2 and a3, according to circumstances. In practice it is usually preferable to place it at a distance from the point a2, at the entrance of the section, equal to the maximum distance required to stop a train after passing the signal S2 at full speed, and this will obviously be determined by the circumstances of the particular location."

To understand the force of this last citation, it must be noted that a2 and a3 are the insulations at either end of the track section, and

therefore the "insulated splice, b2," to be inserted "in one line of rails only," cannot be coincident with either end insulation, but must have an intermediate position, as, indeed, the drawings show and the specification directs.

Infringement is alleged of the third and fourth claims of this patent. These claims are as follows:

"(3) The combination, substantially as hereinbefore set forth, of a railway track divided into two or more signal sections, a signaling apparatus actuated or controlled by an electro-magnet, and placed at the entrance of each one of said signal sections, a circuit closer controlled by a moving train, which acts to exhibit a danger signal by diverting the actuating current from the electro-magnet during the time occupied by the train in traversing the section guarded by said signal, and a circuit breaker controlled by the moving train, which acts to continue the exhibition of said danger signal by interrupting the current through its electro-magnet during the time occupied by the train in traversing a determinate portion of the next succeeding signal section.

"(4) The combination, substantially as hereinbefore set forth, of a series of two or more normally closed railway signaling circuits and a series of circuit breakers, one for each circuit, each of which circuit breakers is actuated or controlled by an electro-magnet included in the next circuit in the series."

The second Gassett patent, No. 246,492, dated August 30, 1881, like its fellow, is based upon Robinson's closed circuit system of signaling, and it makes the same acknowledgment as to the prior state of the art as was made by the earlier Gassett patent. It contains this recital and statement of invention:

"In letters patent of the United States No. 233,746, granted to me October 26, 1880, I have described and claimed a combination of electric circuits and apparatus in which the several circuits appertaining to the different signal sections, instead of being entirely independent of each other, as in the ordinary arrangement, are made to act to a certain extent dependently; so that while each signal is, as heretofore, under the direct control of a train which is traversing the section appertaining thereto, it is also under the indirect control of the same train through the agency of the next signal circuit in the series during the time in which the said train is traversing a certain portion of the next signal section. My present invention consists of an improved organization of circuits and apparatus whereby the same result may be obtained in a more reliable and efficient manner."

The second Gassett patent, then, is a mere improvement upon his first invention in arrangement of circuits and apparatus. It involves simply a change of means—the substitution of other special devices—for attaining the same result. The first Gassett patent, as we have seen, prescribed the insertion of the "insulated splice," b2, "in one line of rails only." The second patent directs the insulating splice, b2, to be put in both rails, at the same point, and the purpose of the change is thus stated:

"Additional insulated splices, b2, b2, are inserted in both lines of rails at some suitable intermediate point of the signal section, whereby each signal section is divided into two subsections, constituting two complete circuits, which are electrically independent of each other."

The special electro-magnet, C2, and the peculiar adjustment between it and its armature, d, which characterized the first Gassett patent, are absent from the second patent. A circuit breaker is placed in each alternate signaling circuit of the series, and these circuit breakers are placed under control of electro-magnets included in the adjacent intermediate signaling circuit, while in No. 233,746, circuit

breakers are located in each and every circuit of the series. There are other differences in details which need not be mentioned. The result attained is the same as that aimed at by the earlier patent (No. 233,746), namely, the continued exhibition of the signal set to danger at the entrance of the track section, "while the train is passing over a certain portion of the next adjacent section ahead."

The action of the train is thus stated in the specification of the second patent:

"Thus, it will be understood that the danger signal of each signal section is automatically exhibited during the passage of a train over that section by reason of the successive shunting and the consequent demagnetization of the electro-magnets, c and m, and that the exhibition of a danger signal is continued during the passage of the same train over a certain portion, viz. the adjacent subsection, of the next signal section ahead, in consequence of the interruption of the circuit by means of a circuit breaker controlled by the train while traversing the last-named subsection."

The direction here given as to the extent of the overlap to be obtained is precisely the same as in the first Gassett patent, namely:

"The insulated splice, b2, may be placed at any desired point between A2 and A3, according to the circumstances. In practice it is usually preferable to place it at a distance from the point a2, at the entrance of the section, which is equal to the maximum distance required in order to stop a train which has passed the signal S2 at full speed; and therefore the proper distance will necessarily be determined by the circumstances of the particular location."

Infringement of the third claim of this patent is alleged. That claim is as follows:

"(3) The combination, substantially as hereinbefore set forth, of a secondary circuit for actuating an electro-magnet controlling the movements of a signal, two independent circuit breakers placed in said secondary circuit, and two independent primary signaling circuits, respectively controlling the action of the said circuit breakers, which primary circuits are themselves actuated successively by a train while traversing the signal section protected by said signal."

We turn now to the Westinghouse patent, No. 270,867, dated January 16, 1883. Infringement of the fourth claim of this patent is alleged. That claim is as follows:

"(4) In combination with a track circuit and a relay-magnet therein, a signaling circuit opened and closed by such relay, and at least two signals in such signaling circuit, one of which is arranged at or near the entrance end of such track circuit, and the other at the required distance to the rear for safety, substantially as set forth."

The nature of this invention is concisely stated by the plaintiffs' expert (Mr. Waterman), and his statement may be accepted as substantially correct. He testifies thus:

"This invention, like those of Gassett, is founded upon the Robinson system, specific mention thereof being made in the specification. And it has therefore, in common with that system, a division of the track into blocks by the interposition at intervals, in each line of rails, of insulating pieces, which break the electric continuity of the rail. At all other points the rails are electrically connected. Each block has, like the Robinson system, a battery with its poles connected to opposite rails of the block, and an electro-magnet having its two terminals likewise connected to opposite rails, thus forming, for each block, a normally closed circuit. Referring to Fig. 1, the successive blocks into which the track is divided are shown at R1, R2, R3, the location

of the insulating pieces being designated by r1, r1, r1. The several batteries connected to the rails of each block are designated a1; the main-track magnets are c1, c2, c3, c4. These magnets act as relays, making or breaking contact by means of armatures, s1, s2, s3, s4. The several circuits of the signals are designated by numerals placed just above the main magnets, as circuits 1, 2, 3, 4. Circuit No. 1, being controlled by the first section of the track, contains three signals, b, d, d2, receiving current from battery d1, as shown. Circuit No. 2, and also the remaining circuits, contain four signals, those of circuit No. 2 being designated b1, b2, d1, d4. All these signals are so arranged that normally a current flows through them, and they are held at the safety position, but when, under train action, the current ceases to flow in the main-track magnet, and the circuit breaker breaks the circuit of the signals so that no current flows through them, they indicate danger. Supposing now a train, which we will call 'No. 1,' to enter section R1, proceeding from right to left. Its wheels and axles will divert the current from magnet c1, causing circuit breaker s1 to open circuit No. 1, thereby setting the signals on that circuit to danger, and a train approaching from the rear cannot enter block R1, but must stop and wait, because the signal b, which is the lower of the two signals at the entrance to block R1, is at danger, indicating by its position that train No. 1 is upon block R1. When train No. 1 enters block R2, its magnet, c2, is de-energized, causing circuit 2 to be broken at s2, thereby setting to danger signals b1 and b2 in its rear, and signals d1 and d4 in its front. The engineer of train No. 2, seeing signal b go to safety, and signal b1 go to danger, will know, by reason of the fact that b1 is the upper signal, that train No. 1 has passed on to section R2 in advance, and that he may proceed with caution. At the same time, if a train (No. 3) should be on block R4, it will find signal d4 at danger, indicating to the engineer of train No. 3 that train No. 1 is upon block R2. As train No. 1 runs onto block R3, it sets behind it signals b3 and b4 to danger, signals b1 and b2 returning to safety; and the engineer of train No. 2 on block R1, finding only one danger signal at the entrance to block R2, and that signal the upper one, will know that train No. 1 has passed on to block R3, and that he may still proceed with caution. In the application of the system to a double-track road, it is evident that it is only necessary to omit the forward signals."

This patent need not long engage our attention. It is not necessary to consider the question of its alleged infringement, or the question whether claim 4 shows patentable novelty, in view of the Robinson patent and the state of the art prior to Robinson's invention. A complete defense on other ground appears. This patent, as we have seen, was issued on January 16, 1883. Assuming that it was applied for on November 16, 1882, as alleged, no earlier date than that can be accorded to Westinghouse. Now, the proof is clear that more than two years before the last-named date the invention described in the Westinghouse patent, and covered by its fourth claim, was in practical and public use on a portion—about 10 miles of track—of the Chicago, Burlington & Quincy Railroad, near the city of Chicago. The installation of this signaling system upon that railroad was the work of the Union Electric Signal Company (the plaintiff's predecessor in business) under a written contract entered into in September, 1879. The work was completed in August, 1880, and was taken possession of by the Chicago, Burlington & Quincy Company on October 7, 1880. The apparatus was thereafter operated by that company for a period of about two years. This installation was an embodiment of the invention of the Westinghouse patent in a completed and operative form. The use was public and practical, and was continued until about 1883. The only reply attempted to be made to this defense is that this

use upon the Chicago, Burlington & Quincy Railroad was in the nature of an abandoned experiment. This suggestion is unsupported by the evidence. It is against the clear proof. The apparatus, indeed, was set up at the expense of the signal company on trial to satisfy the railroad company with a view to a sale to that company, and the company declined to buy. But in no other sense was the use experimental. Furthermore, it is shown that an article on the "Union Electric Signal System" was printed and published in the "Railroad Gazette," a trade newspaper published in New York and Chicago, and having a general circulation among railroad people and those connected with railroads, beginning with the number issued on March 12, 1880, and ending with the number issued on April 2, 1880, which contained a substantially complete description of the invention of the Westinghouse patent. I can see no patentable difference between the subject-matter of the fourth claim of the Westinghouse patent and the description contained in the publication in the Railroad Gazette. That article was not in the nature of a trade circular addressed to the customers of the signal company, but was a publication to the world, and intended for general circulation and information.

The defendants' signaling apparatus now demands our attention. The defendants have employed two forms of apparatus, but they are substantially alike, and a description of one will answer for both. The defendants' line of rails is divided into blocks or track sections, insulated from each other, and the signals are operated according to Robinson's closed circuit system, which has been free to the public since 1889. At the entrance end of each track section two signals are placed on the same post. One is the block signal for that section, and is denominated the home signal. In this record it is designated signal H. A series of H signals guards the entire line of railway, each H signal guarding its own track section exclusively. Each signal circuit is independent of the signal circuits of adjacent track sections. The other signal at the entrance end of each track section, is denominated the "distant signal." In this record it is designated "signal D." Its purpose is to give preliminary notice to an engineer of a train about to enter a block of the then condition of the second block or track section in advance. To effect this, an indicator wire is run back from the track section in advance to the entrance end of the track section in the rear, and is put in electrical connection with the D signal there. The H signals are alone depended on for blocking the train. The D signals are cautionary, giving the engineer an indication of what he may expect when he reaches the entrance end of the track section second in advance.

In the defendants' apparatus, with everything in good order, and with the track free, all track circuits are closed, all signal circuits are broken, and all signals stand at danger. In that situation let us illustrate the operation: The initial track section may be designated as "A," and the two following ones as "B" and "C." A train entering upon section A would put to safety both signals at the entrance end of section B, and also signal H at the entrance

end of section C, if the track ahead were in normal condition. When the train reached the entrance end of section B, if the engineer should find signal H at safety, he would thereby learn that there was no train on section B. If he should find that signal D was also at safety, he would thereby learn that there was no train on section C, the second section ahead. The engineer would then be at liberty to proceed at schedule speed. When the train entered section B, it would put to danger the two signals H and D at the entrance of that section, and keep them at danger while it was on that section. As soon as the train had passed beyond section B, the signal H, at the entrance of that section, would be returned to safety, but the signal D would remain at danger. If at this juncture a second train following on section A should approach the entrance end of section B, its engineer would learn from the safety position of the home signal (H) that section B was clear, and from the danger position of the distant signal (D) that the second section in advance, section C, was occupied. Under these circumstances, the engineer might proceed with caution with his train under control, so as to stop at the entrance of section C if the home signal there should show danger. The result, therefore, is this: A train, on entering a track section (say, B), leaves behind it the two signals H and D at the entrance at danger; and, when it enters the next track section ahead (say, C), it leaves behind it at danger the two signals H and D at the entrance of that section, and also the signal D one whole block to the rear, as a cautionary signal to indicate to the engineer of a following train that the first train is on the second block in advance, section C. And this is repeated from block to block. The only reason for having the signal D show danger when the signal H on the same post is at danger is to avoid confusion. If signal D then stood clear, the engineer might possibly be misled. By repeating the danger showing of its companion, signal H, possible mistake is averted. At this juncture the function of signal D is not brought into play at all. For practical purposes it might as well be absent. The real function of signal D begins when the train has passed into the second section ahead, and then it announces the condition of that section to the engineer, who is a whole block to the rear. Upon this subject the plaintiff's own expert (Mr. Waterman) truly says:

"The only time when the engineer does not know exactly what his distant signal means is the time when it makes no difference whether he knows or not, namely, the time when the adjacent home signal is at danger. In effect, therefore, this is not doing anything more than would be done if a covering could be dropped down over the distant signal, so that in effect it could be removed altogether."

Do the defendants infringe the Gassett patents, or either of them? It is not pretended that any such infringement is to be found in the defendants' home signals or in the manner of their operation. Clearly, to that extent the defendants have simply followed Robinson's system, as described and illustrated in his expired patent. The alleged infringement of the Gassett patents by the defendants lies in their use of the distant signals,—the series of signals D. These distant signals, however, are set, shifted, and operated under

train action by Robinson's method, and not otherwise. Here, then, nothing is borrowed from Gassett. The supposed violation of the plaintiffs' rights consists exclusively in the fact that the distant signal D is set to danger while the home signal H on the same post makes that showing, and that it continues at danger during the passage of the train over the second track section in advance. Does this afford any fair ground for the charge of infringement if we regard the substance of things? The office of the distant signal is solely to give warning to the engineer of the following train that the track section second in advance is occupied. Its function springs into action when the forward train enters on the second section ahead. The D signal does not guard the section at whose entrance it stands. Its functional relation is to the section second in advance, and it is in electrical connection with that section for the purpose, and only for the purpose, of preliminary announcement and caution to the engineer of the oncoming train when he is a block's length rearward.

Again, the system of home and distant signals was old, antedating Robinson. Now, plainly, Robinson's method, no less than the track instrument method, was applicable to the working of signals standing in the home and distant relation. It is not to be doubted that to add to the apparatus shown in Robinson's patent a signal to repeat at a distance to the rear the showing of the block signal would have been an obvious expedient to a skilled electrical engineer, even had the patent been wholly silent with respect to the employment of additional signals. The patent, however, gives express directions for carrying a wire from the electro-magnet which controls the block signal to a distant office or station to indicate when the signal is operative. This particular use is put as an example only, for the patent adds: "Thus, any desired number of signals may be operated simultaneously at different points from a single section of track." Clearly, this language points to and covers the employment of a distant indicator signal. The British patent says that lines of wire may be used to operate additional signals; "for instance, to indicate when the block signal has changed." In view of these suggestions, certainly no invention was involved in carrying back a wire to a signal at a distant point in the rear to give cautionary notice to the engineer of an approaching train of the condition of a forward block. This, then, is a legitimate exercise of Robinson's invention, now open to the public. Moreover, the feature of preliminary notice to a following train of the condition of the track section second in advance is not taken from Gassett. It is altogether wanting in Gassett's patents. In the working of his apparatus, the engineer, when stopped by the danger showing of the signal at the entrance of a track section, cannot tell where the forward train is, whether upon that section or upon the overlap in advance. Gassett has but one signal for each track section, and that signal, if at danger, acts as an absolute block upon any further advance of the train until the signal shifts to safety.

What, then, was Gassett's real improvement in the art of railway signaling? As we have seen, Robinson had devised a closed track circuit method, which gave complete and continuous train control

over signals. The problem to which Gassett addressed himself was to introduce an overlap into a Robinson operated system, by continuing in action the danger signal at the entrance of a signal section after the train had left that section, and while it was passing over "a certain portion of the next adjacent section ahead." It is insisted that Gassett contemplated the continuance in action of such danger signal during the passage of the train over the whole of the next advanced section. Whether or not he considered this to be desirable is immaterial. He suggested no means for accomplishing such result. Nothing can be plainer than that Gassett's novel organization of circuits and apparatus, both in the original and in the improved form, was intended and devised so as to secure the continued exhibition of the danger signal at the entrance of a block while the train is traversing a definite portion only of the next signal section in advance. To attain this declared object, each of his patents disclosed specific means. It may here be remarked that neither of Gassett's patents shows a pioneer invention. The proofs abundantly establish that devices for securing a train from rear collisions by means of overlaps and the setting of two danger signals behind the train were old in the art. Gassett may have been the first to incorporate an overlap into a Robinson worked system; but, if so, his patents conferred on him the exclusive right only to use the means he specified to produce the described result; and anyone may lawfully accomplish the same end, without infringing the patents, if he uses means substantially different from those described. O'Reilly v. Morse, 15 How. 62, 119.

Now, while it is true that Gassett and the defendants both aim at the same general object, namely, to secure safety to the train in advance as against a train following on the same track, yet the special purposes they respectively have in view are quite different, as also are their respective organizations of circuits and apparatus. Gassett's achievement was a forward overlap, effected by a peculiar arrangement of circuits, whereby the action of the danger signal at the entrance of the section is prolonged after the train has gone beyond that section. His improvement has no relation whatever to distant cautionary signals for the guidance of the engineer of a following train. On the other hand, that part of the defendants' apparatus complained of relates altogether to the series of distant cautionary signals. The specific means employed by Gassett, such as the insulated splice, b2, whether inserted in one line of rails or in both lines of rails, the special electro-magnet, C2, and its peculiar adjustment with its armature, d, the division of each signal section into two subsections, and the interdependence of adjacent signaling sections, are absent from the defendants' organization. After a patient investigation of the subject, I cannot do otherwise than hold that, in structure, operation, purpose, and result, these two organizations of signaling circuits and apparatus are essentially different, and that the defendants are not shown to have infringed either of the Gassett patents.

We are now brought to the examination of the fourth patent embraced in this bill, namely, No. 227,102, dated May 4, 1880, to Oscar Gassett and Israel Fisher, for an improvement in connectors for electric track circuits. The specification describes the invention thus:

"Our invention consists in punching or drilling holes in the flanges of adjacent rails at convenient points near, but so as not to interfere with the rail joint, and driving into these holes the ends of a wire connector long enough to reach between them and span the rail joint, the said connector being provided at its ends with driving studs a trifle larger in diameter than the holes and tapering; so that, when they are forcibly driven into the holes in the rail, they form a perfect and permanent contact therewith, and, on account of the taper, fit so tightly that they cannot be driven out or removed except by a special instrument for drawing them, thus removing from them any scale or loose or tarnished surface, and leaving the surface thereof bright where it comes in contact with the rail, such bright metallic surfaces, forced together, insuring a perfect electric connection. The ends of the wire connector are coiled around the said driving studs just under their heads, and the whole then dipped in molten solder or other suitable metal."

The specification adds that "a connector of this kind is cheaper and more reliable than one applied by soldering or clamping."

The claim alleged to be infringed is the first, namely:

"(1) The combination, with a rail bored to receive it, of a wire provided at its ends with a connected driving stud, to be driven into the said rail to form a continuous metallic conductor therewith for an electric current, substantially as described."

The alleged infringement consists in this: The defendants bore a straight hole in the rail; then take a longitudinally grooved tapering stud, lay the end of a piece of wire in the groove, and drive the stud with the wire in the groove tightly into the hole. From an examination of the prior patents in this record, and the general proofs relating to this subject, it is very evident to me that, if the Gassett and Israel patent is to be sustained at all, it must be narrowly construed, and restricted to the identical device described. Now, the only way of connecting the wire with the driving stud here suggested is by coiling the wire around the stud, and then soldering it. The coiling of the wire around the driving stud is essential to the described device, and perhaps its only patentably novel feature. But the defendants do not coil their wires around the stud, and, indeed, they do not, in the sense of this patent, connect their wires at all with the driving stud. They simply lay their wire lengthwise in a longitudinal groove formed in the side of the stud, and the stud with the wire laid in the groove is then driven into the hole in the rail. The result really is a clamping attachment or connection between the wire and the rail. Clamping, however, in effect, is disclaimed. Under all the proofs, I am thoroughly convinced that the defendants have not infringed this patent. As, therefore, the defense of noninfringement must be sustained, I do not deem it necessary to consider the other defenses to this patent.

We reach, finally, patent No. 273,377, dated March 6, 1883, to Charles J. Means, for improvements appertaining to electric railway signals. Infringement of the sixth claim of this patent is alleged. That claim reads thus:

"(6) The combination, with the conducting wire, U, of the split plug, X, and railroad track, Q, substantially as and for the purpose set forth."

The part of the specification upon which this claim is based is as follows:

"The other end of the coils of electro-magnet, K, is connected to the rail, Q, by means of a spring plug, X. This plug is tapered, and has a hole in the center just the size of wire U. The end of the plug is slit like the plugs used for making connections on switch boards, so that, when it is driven forcibly into a hole drilled in the rail, it clamps the wire, making a reliable electric connection."

Several defenses are here set up, but none of them save that of noninfringement need be considered. Most clearly, the defendants do not infringe this patent. Their plug has no hole in the center; it is not split; it is not a spring plug, and has no spring action.

Let a decree be drawn dismissing the bill of complaint, with costs.

WALES v. WATERBURY MFG. CO.

(Circuit Court, D. Connecticut. June 20, 1898.)

PATENTS—INFRINGEMENT—DAMAGES AND PROFITS.

Where complainant executed a license to defendant, but, after defendant began to manufacture thereunder, canceled the license, and defendant continued to manufacture and sell the goods, the measure of damages is not to be determined by the license fee, but by the actual profits of defendant.

This was a suit in equity by Harriet H. Wales against the Waterbury Manufacturing Company for alleged infringement of a patent. The cause was heard on exceptions to the master's report.

Henry Stoddard and Roger S. Baldwin, for complainant.

Charles R. Ingersoll, Geo. E. Terry, and John K. Beach, for defendant.

TOWNSEND, District Judge. In this cause, upon final hearing, the court held that certain claims of the patent in suit were infringed, and referred the matter to a master for an accounting. 59 Fed. 285. The questions herein arise upon exceptions to the master's report.

The patent was for an improved buckle. Complainant gave defendant a license to manufacture said buckle upon payment of a royalty of 15 cents a gross. The buckle was also used in connection with a pencil holder to be attached to the clothing, and, for each gross of buckles and pencil holders combined, defendant agreed to pay a license fee graded according to the selling price, and amounting to $2.03\frac{1}{2}$ where the selling price was $5.08 per gross. After defendant had commenced to manufacture, complainant canceled the license. Defendant continued to manufacture, and complainant brought suit. The license was canceled in June, 1881. The bill was filed in November, 1881, and the answer was made in May, 1882. Complainant first began to take evidence seven years later, and brought the case to the court for a final hearing in 1893, after the patent had expired. Complainant in the meantime made no attempt to manufacture. Defendant manufactured between June 15, 1881, and January 18, 1893, $11{,}609\,{}^{5}/_{12}$ gross of buckles, of eight different sizes and prices, 9,561 of which were made in connection with a pencil holder. Large profits were made on No. 1,403, which was used in the pencil holder.