Oct. 29, 1940. W. C. BARNES ET AL 2,219,885

FLAW DETECTING APPARATUS

Filed Oct. 11, 1937

Fig. 1

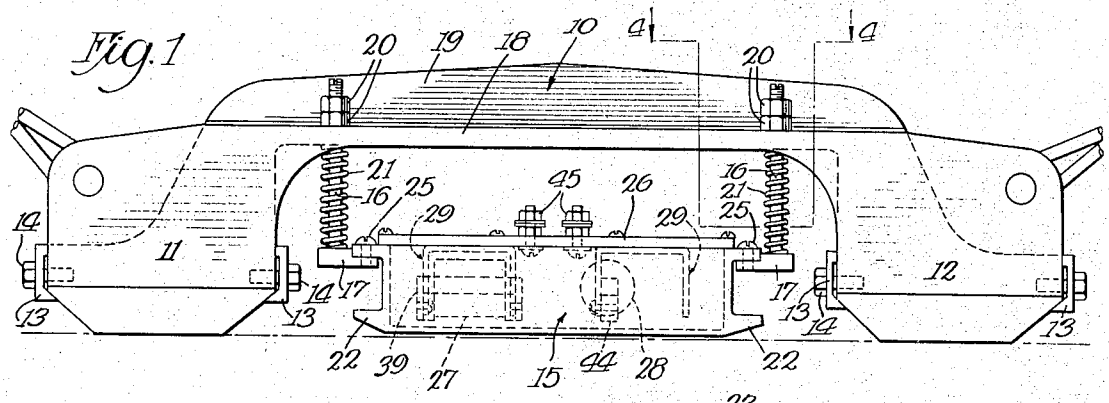



Fig. 4

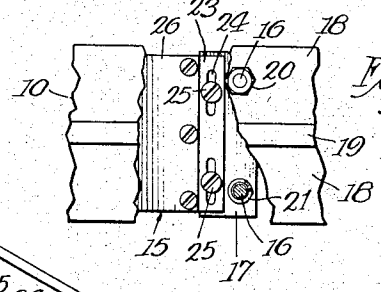
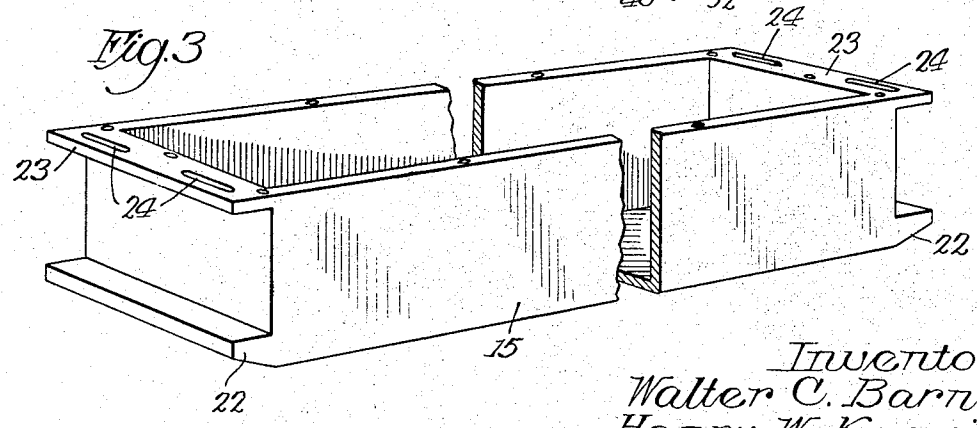



Fig. 2




Fig. 3




Inventors:
Walter C. Barnes
Henry W. Keevil
By Gilson, Mann & Co.
Attys.

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## FLAW DETECTING APPARATUS

Walter C. Barnes, Lake Bluff, and Henry W. Keevil, Highland Park, Ill.

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12 Claims. (Cl. 175—183)

In testing rails for flaws by electrical and magnetic methods, experience teaches that the specific character of the rail over which the apparatus passes dictates to a large extent the particular kind of a flaw responsive device (usually a coil) which should be used. On some rails, a single longitudinal coil may be used; on other rails, two coils spaced apart a given distance will give superior results. There are a great number of combinations in coil arrangement which are constantly being used and it has been the practice to mount the coils on the floor of a hollow box holding them in place by paraffin or some other sealing means. But whenever a change in the coil arrangement became necessary or desirable, considerable time was required to effect the change. As a matter of fact, it is often found more convenient to carry a plurality of pickup boxes, each containing a different coil arrangement, and then change the entire box when rail conditions require a different combination of coils.

The present invention seeks to simplify the problem by providing a single box which is adjustable to various positions with reference to the detector carriage from which it is supported, and to which coils may be fastened in various positions.

Further and other objects and advantages will become apparent as the disclosure proceeds and the description is read in conjunction with the accompanying drawing, in which

Fig. 1 is a side elevational view of a detector carriage and pickup box embodying the principles of this invention;

Fig. 2 is a perspective view of the inner or under surface of the cover for the pickup box showing one of the many possible coil arrangements;

Fig. 3 is a perspective view of the pickup box with a fragment broken away to show the floor of the box; and

Fig. 4 is a fragmentary, sectional view taken on the line 4—4 of Fig. 1, showing the means for adjusting the pickup box laterally with respect to the detector carriage.

The invention may obviously be embodied in various forms, and the specific illustration chosen for description should not be regarded as imposing limitations on the appended claims unless required by the prior art.

It is well known that latent flaws in rails may be located from a suitably equipped moving car if the flaw is properly magnetized by a flux sent through the rail, or if the portion of the rail containing the flaw is subjected to a strong electrical current which produces a characteristic magnetic condition in the vicinity of the flaw. Since this invention is not concerned with the means for establishing the desired magnetic condition in the vicinity of the flaw, but is only concerned with the detecting apparatus, it is unnecessary to illustrate or describe the known methods of obtaining these particular magnetic conditions.

The flaw detecting apparatus of detector cars used for locating flaws in rail ordinarily includes a detector carriage, here indicated at 10, which in the present instance comprises a brass or bronze casting having legs 11 and 12 to which hardened steel shoes, preferably of cast manganese steel, are removably secured by clips 13 and bolts 14. The intermediate portion of the detector carriage 10 is raised to accommodate the pickup box, generally designated 15, which is supported from the detector carriage by four stainless steel stud bolts 16 secured at their lower ends to cross plates 17 and passing through the horizontal flanges 18 which extend on opposite sides of the central web 19 of the intermediate portion of the detector carriage. Adjusting nuts 20 enable the cross plates 17 to be adjustably positioned vertically with respect to the detector carriage, and springs 21 serve the dual purpose of making certain that the cross plates 17 occupy the lowest position which the nuts 20 on the studs permit and resiliently allow the pickup box to move upwardly in the event that the box strikes some kind of a projection, such for example as a high rail joint.

The pickup box 15 is preferably cast in brass, although it may be formed of molded Bakelite or other relatively hard plastic material. The ends of the box are provided with inclined bumpers 22 which facilitate the riding of the box over high rail joints.

The box is supported on the cross plates 17 by flanges 23, each provided with slots 24 through which fastening screws 25 extend in entering the cross plates 17 with which they are in threaded engagement. Obviously, by loosening the screws 25, suitable lateral adjustment of the pickup box with reference to the detector carriage may be made. This adjustment is important particularly where rail is encountered having a scaly edge.

The box 15 has a cover 26 preferably of linen base Bakelite to the inner face of which the detector coils or other flaw detecting devices are attached. In the present embodiment of the invention, the cover is shown as supporting a longitudinal coil 27 and a transverse coil 28, the coils being so designated because of their posi-

tion with respect to the longitudinal axis of the rail. The coils are supported by brackets, generally designated 29, each being formed of sheet metal, preferably brass, and formed to provide downwardly extending legs 30, 31, 32 and 33 with an intermediate portion 34 having longitudinal slots 35 and 36 by means of which the brackets are longitudinally positioned on the under surface of the cover 26. Small retaining blocks 37 held in place by screws 38 constitute with the slots 35 and 36 the so-called "pin and slot" device by which the supports are capable of longitudinal adjustment with respect to the cover. A fixed bar 46 assists in maintaining proper alinement of the brackets.

The coil 27 is shown as having a core terminating in laterally extending arms 39 which turn downwardly to provide feet 40, all as disclosed in Keevil Patent No. 2,089,967. The core for the coil 27 also has a centrally disposed downwardly extending leg 41. The feet 40 of the core are secured to the legs 30, 31, 32 and 33 of the support 29 by screws 42 which pass through slots 43 in the legs of the support and are screw-threaded into the feet 40 of the core. Obviously the coil 27 is by this means capable of vertical adjustment with respect to the cover 26.

The coil 28 has a core provided with downwardly extending feet 44 which similarly are adjustably secured to the legs 30 and 31 of the other support bracket. The relative sensitivity of the two coils 27 and 28 may be conveniently adjusted by the vertical adjustments of the two coils on the brackets 29.

Although longitudinal and transverse coils have been shown mounted on the brackets 29, it is apparent that other kinds of coils could be used in place of either the longitudinal or the transverse coil, such for example as a coil having its core extending between the legs 30 and 33, or between the legs 31 and 32 of the coil support bracket. The coils might also be provided with cores which are fastened to the legs of the support bracket in such a manner that they are vertically tilted with respect to the top surface of the rail.

The cover 26 of the box is provided with a plurality of brass terminals 45 to the lower portion of which the leads from the coils are secured and to the upper part of which the connections with the recording apparatus are established.

It will be seen from the above description that an infinite variety of coil (or other flaw detecting device) arrangements may be conveniently made in the pickup box; that the pickup box can be readily adjusted laterally with respect to the rail; that the adjusting nuts 20 on the studs 16 permit the vertical position of the pickup box to be adjusted relative to the detector carriage; and that the adjusting nut 20 can be manipulated to provide any desired lateral or longitudinal tilting of the pickup box. This universal adjustability and aptitude for various combinations of coils greatly facilitates and speeds up testing of the rails.

We claim:

1. In a rail flaw detecting apparatus, an elongated pickup box aligned with said rail, a cover for the box, a pair of coil supports mounted on the inner face of the cover and capable of longitudinal adjustment relative to one another, and means for mounting a coil on each of said supports.

2. In a rail flaw detecting apparatus, a pickup box aligned with said rail, a cover for the box, a pair of coil supports mounted on the inner face of the cover and capable of longitudinal adjustment relative to one another, and means for mounting a coil on each of said supports, said last named means including means for varying the distance between one of the coils and the cover.

3. In flaw detecting apparatus, a pickup box, a cover for the box, and a coil support mounted on the inner face of the cover, said support comprising a bracket having a plurality of longitudinally spaced vertical legs to which a coil is adapted to be secured in any one of a number of angularly disposed positions.

4. In flaw detecting apparatus, a pickup box, a cover for the box, and a coil support mounted on the inner face of the cover, said support comprising a bracket having a plurality of longitudinally spaced vertical legs to which a coil is adapted to be secured, said legs being arranged and shaped so that they are capable of attachment to coils having cores which make various horizontal and vertical angles with the axis of the box.

5. In flaw detecting apparatus, a pickup box, a cover for the box, and a coil support mounted on the inner face of the cover, said support comprising a bracket having at least four downwardly extending legs, two of which are longitudinally spaced from two others, and the legs of one of the two groups being transversely spaced apart whereby the legs are capable of attachment to coils having cores which make various angles with respect to the longitudinal axis of the box.

6. In flaw detecting apparatus, a detector carriage, a pickup box, a flaw detecting device in the box, and means for supporting the box from the carriage and for adjustably positioning it in various lateral and longitudinal tilting positions with respect to a horizontal plane, and means for adjusting the lateral position of the box relative to the carriage.

7. In flaw detecting apparatus, a detector carriage, a pickup box, a flaw detecting device in the box, and means for supporting the box from the carriage and for adjustably positioning it in various lateral and longitudinal tilting positions with respect to the horizontal plane, and means for adjusting the lateral position of the box relative to the carriage, said means including a pin and slot device.

8. In flaw detecting apparatus, a detector carriage, a pickup box, a flaw detecting device in the box, means for supporting the box from the carriage and for adjustably positioning it in various lateral and longitudinal tilting positions with respect to the horizontal plane, means for adjusting the lateral position of the box relative to the carriage, said means including a pin and slot device, and means for adjusting the vertical position of the box relative to the carriage.

9. In a rail flaw detecting apparatus, a pick-up box aligned with said rail, a cover for the box, a pair of coil supports mounted on the inner face of the cover, guide means for locating the supports in predetermined relationship to the rail, means for moving the supports along the guide means independently of each other, and means upon each support for securing a coil thereto in any one of a plurality of fixed positions between the rail and the cover.

10. In a rail flaw detecting apparatus, a pick-up box having a side aligned with the rail, a guide inside the box aligned with the rail on said side,

a coil support adjustably secured to said side and movable along said guide, means upon the support for securing a coil thereto in any one of a plurality of fixed positions with respect to the rail.

11. In a rail flaw detecting apparatus, a pick-up box, a cover for the box, a pair of coils cooperating with each other to detect flaws in the rail with relatively different flux responsiveness thereto, and means for varying the position of said coils with regard to their angularity and spacing relative to each other and to the rail.

12. In a rail flaw detecting means, a pickup box adapted to be supported in fixed relation to a rail, a cover for the box, a pair of coil supports adjustably mounted on the cover for relative movement with respect to one another, and means for mounting a coil on each of said supports including means for varying the relative positions of the coils on the supports independently of each other in a vertical direction above the rail.

WALTER C. BARNES.
HENRY W. KEEVIL.