

G. W. PICKARD.
OSCILLATION DEVICE.
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933,263.

Patented Sept. 7, 1909.

Fig. 1.

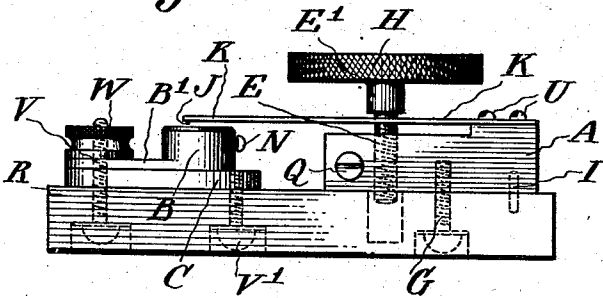


Fig. 2.

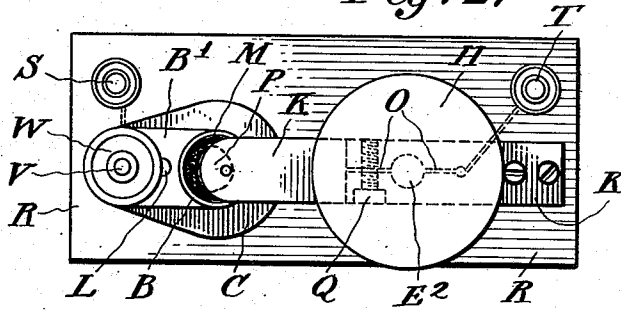


Fig. 3.

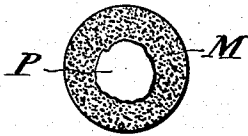
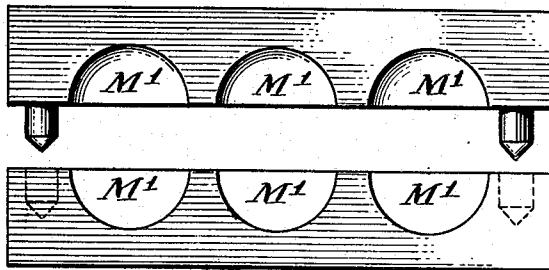


Fig. 4.



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UNITED STATES PATENT OFFICE.

GREENLEAF WHITTIER PICKARD, OF AMESBURY, MASSACHUSETTS.

OSCILLATION DEVICE.

933,263.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GREENLEAF WHITTIER PICKARD, a citizen of the United States of America, and a resident of Amesbury, Massachusetts, have invented certain new and useful Improvements in Oscillation-Detectors, the principles of which are set forth in the following specification and accompanying drawing, which disclose the form of the invention which I now consider to be the best of the various forms in which the principles of the invention may be embodied.

This invention relates to improvements in oscillation detectors of the rectifying type employing substantial perfection of circuit contacts with the rectifying conductor.

The object of the invention is to obtain a device which shall be very stable, electrically or mechanically, and preferably both, in addition to being sufficiently sensitive for all practical purposes.

The invention consists of the novel features of the subject matter hereinafter disclosed, and illustrated in the accompanying drawings of an exemplification embodiment, which drawings are drawn to scale.

Of the drawings, Figure 1 is an elevation of the complete device lacking only the rectifying element; Fig. 2 is a plan of the complete device including the rectifying compound mechanical element shown also in plan in Fig. 3; and Fig. 4 is a plan of the mold for producing the element of Fig. 3.

The operating parts may be mounted on the hard rubber base R, suitably formed, as shown in dotted lines, to receive and retain them. The detector may be connected by the binding posts S, T (Fig. 2) in any desired oscillation circuit, such for example, as those used in receiving installations of radio telegraphy and telephony. The binding post S is connected, as shown, to the contact-location-adjusting portion of the device, (at the left, Figs. 1 and 2), including the metallic sur-base C, the cup B with adjusting screw N, the clamping post and screw V, W, and the retaining screw V¹ for base C. The binding post T is connected, as shown in Fig. 2, to the contact-pressure-adjusting and maintaining portion of the device, (at the right, Figs. 1 and 2), including the support A for the steel spring K carrying brass point J above cup B, and the adjusting screw E. The conducting point J (as of a metal, as brass, Fig. 1), is to make substantially perfect and minute

but light contact with the rectifying conductor P (Fig. 2), but the point J is to be restrained from doing certain other things, as will be specified.

All the parts of Fig. 1 are of brass, except the steel spring K, the rubber base R, and the rubber head H of the adjusting screw E.

The principal features of the invention comprise an oscillation detector comprising a crystallized iron pyrite element, and a peculiar combination of this particular rectifying conductor with certain means for obtaining and maintaining an operative contact adjustment, especially devised to be adapted to certain peculiarities of said rectifying conductor.

I have found that while an iron pyrite crystal, or a fragment, is in some cases a very efficient rectifier, yet it not only generally has very few sensitive spots, but that a contact adjustment like that employed for other rectifiers is so unstable that the substance as so used seemed to have little practical value in a detector. Continued investigation, however, showed that this instability was due to the effect of mechanical rather than electrical disturbances, and finally I discovered that when provision was made to guard against the various adverse conditions of contact-variation by mechanical shocks, as by the construction to be described, this substance developed a totally unexpected property, not only of mechanical stability, but also of electrical stability, such as not to be affected by the most severe neighboring electrical disturbances. In the first place the iron pyrite frequently requires a very light, although substantially perfect, contact between its bright clear surface and the point J. This pressure is as low as fifty to a hundred grams, and sometimes even less, although of course, the highest permissible pressure is accompanied by the greatest mechanical stability. The iron pyrite is also extremely sensitive to the slightest changes in contact pressure, so much so in fact, that it is not practicable to employ any spring which cannot be very accurately controlled, and within very narrow limits of pressure variation. In accordance with my invention, therefore, not only is the delicately adjustable leaf-spring K employed and in the manner shown, and not only has the adjusting screw E very fine and accurately-made threads, (sixty to eighty per inch), but the

screw E, in connection with spring K and support A, has the greatest possible rigidity and permanency of adjustment. Of course, support A is firmly secured to base R by screw G and pin I, and the right end of spring K is firmly secured to support A by screws U arranged and located as shown, (Fig. 1). But also the threaded left end of sur-base A (shown in dotted line in Fig. 2) is slotted at O, and provided with a screw Q (Figs. 2 and 1) for tightening A around screw E to hold the latter from any possible loosening or movement by mechanical jars. Thus the contact pressure will remain constant, and the fairly stiff (but delicately adjustable) spring K will cooperate with the other parts to tend to prevent even any vibration of the point J by mechanical shocks. Also, even if point J should vibrate a little, it must return to rest at the same adjusted position by virtue of other features to be described, and that position will be on the same point of the pyrite P, (Fig. 2), because that is held absolutely stationary.

In investigating the causes of instability I found that the iron pyrite was not only extremely sensitive to variations in contact pressure, but also to lateral variations of the contact point J. Hence not only is the leaf spring K, which is presented broadside to iron pyrite P, designed to have considerable width, as shown in Fig. 2, but the screw E slides freely through unthreaded hole E² in steel spring K and engages the spring only by a shouldered part E¹. Thus the point J, riveted or soldered to the left end of spring K, can be adjusted to pyrite member P with the greatest nicety of perfect contact through the cooperation of the elasticity of the spring K and the fineness of the threads of screw E, and concurrently, this delicate adjustment is maintained by the rigidity of cooperation of parts A, K and E, irrespective of mechanical jars to the entire holder.

The fragment of iron pyrite crystal is preferably so disposed that a fracture face shall be exposed to the point J, in order to obtain maximum sensitiveness. This is not so much to obtain a rough surface to present minute contact points, (in fact the most efficient fracture face usually consists of smoothly curving brilliant surfaces), as it is to obtain a fresh clean surface in order to secure substantial perfection of contact with point J, which should also be bright and clean, to the same effect. Preferably the surface of the fracture face is as smooth as possible; and if desired the surface may be a polished surface.

The mechanical stability of this iron pyrite detector is such that its operation seems independent of all ordinary vibrations to which it may be subjected, even including gun-fire on battle-ships. Its electrical stability is such that apparently it need be

neither disconnected from radio telegraph circuits nor short circuited or otherwise protected, when transmitting, and that it is not disturbed or put out of adjustment by the most severe atmospheric discharges of electricity. I do not know the reason for this electrical stability, and I do not know why the most effective contact between the clean surfaces requires the low pressure specified. My hypothesis as to the latter is that the comparatively low resistivity of the particular rectifying conductor, iron pyrite, is such as to require a greater constriction of current path to obtain efficient rectifying action, such restriction being obtained here by the smaller contact area which in turn is obtained by lower contact pressure.

The above features of the invention relate to the iron pyrite detector or to detectors employing rectifying conductors having specific properties like iron pyrite. The invention relates also to other improvements, described below, which are employed with the iron pyrite detector, but which may also be employed with other rectifying substances as elements of detectors.

The cup B (empty in Fig. 1) is adapted to receive the molded block M of Fig. 3, as shown in plan in Fig. 2. This block M is made in numbers in molds such as that of Fig. 4, similar to the old-fashioned bullet molds, except that the block M is preferably cylindrical, to fit nicely in the cup B. The flasks of Fig. 4 are preferably of steel, so that at least the surfaces of the molds M¹ may be of steel so as not to be wetted by the fluid metal, which is preferably any readily fusible alloy, termed "soft metal", as well known. Before the metal has set in the mold, the rectifying conductor P is placed in it so as to be permanently incorporated with the block M of the soft metal.

The compound rectifying element of Fig. 3 is of importance in that it not only provides a convenient form for shipment of the replacement part, which form is also adapted for direct use in the detector holder of Fig. 1, but also that it, as a replacement part, is entirely independent of any permanent part of the holder, and is therefore freely removable from the holder without removing the cup B. The molded junction of rectifier P with block M provides the requisite extended and substantially perfect contact which cooperates with the minute contact of P with J to produce the rectifying action. The good and extended contact which I have heretofore obtained between the soft metal and the cup by molding directly and permanently in the cup, is obtained by the cup-screw N (Fig. 1), whereby the block M is tightly pressed to the left against the inner wall of the cup B. The inner diameter of cup B is preferably only a thirty-second of an inch larger than the outer diameter of

block M. As shown in Fig. 2, the flange B¹ of cup B is slotted at L to embrace post V, so that the cup B may be adjusted in a horizontal plane by partial oscillation and also by radial movement over the right-hand enlarged surface of metallic sur-base or support C. The screw W serves to clamp flange B¹ to sur-base C and thereby obtain good circuit connection of conductor P with a wire under binding screw S (Fig. 2).

Iron pyrite of the exposed effective area illustrated in Fig. 2, and of the particular samples so far employed by me, usually has only two or three spots of marked efficiency, these being of small area and each including only a few contact points. In operation, it may require several minutes to find the best spot and the best adjustment of screw E for the best point of contact in that spot. The advantage of the device however, including the combination of the iron pyrite with the special contact adjustment means disclosed, is that when once that proper adjustment is obtained, it will remain constantly operative for indefinitely long periods. Prior to my improvements, the benefit of the electrical stability of this conductor was not had or recognized, because ordinary mechanical shocks and jars completely impaired the mechanical adjustment, both directly and laterally, so as to make the conductor practically inoperative, and to make it impossible to observe whether or not it possessed any valuable electrical stability.

This detector is more efficient than any other known to me, as to rectifying oscillations received from a nearby or powerful transmitter, and is therefore particularly adapted for short distance communication, of the order of tens or hundreds of miles, as distinguished from thousands of miles; particularly when, as usual, the place of use is subject to mechanical vibrations and electrical disturbances. It is also most useful for long distance work, (as it is extremely sensitive), particularly by reason of its electrical stability, thus adapting it for use by those not skilled in the art. Thus this detector will frequently stand direct connection to the transmitting antenna without disturbance of its operative adjustment. In this connection, the value of this detector at times and seasons of atmospheric disturbance will be readily understood.

The expression "iron pyrite", used in the claims, refers to crystallized or any operative iron pyrite, not only to a complete crystal but to a fragment, as disclosed.

I claim:

1. An oscillation detector, which comprises the iron pyrite P, means for holding it stationary, the steel leaf spring K fixed near one end to be presented broadside to pyrite P, the metal point J attached to the lower side of the other end of spring K to

engage the surface of pyrite P, and the adjusting screw E passing freely through hole E² in spring K and having shoulder E¹ engaging said spring.

2. An oscillation detector, which comprises a fragment of iron pyrite, a support therefor, a leaf-spring presented broadside to the contact surface of the pyrite, an adjusting screw passing freely through a hole in said spring, said screw having a shoulder engaging the spring, and a common support for the spring and screw.

3. An oscillation detector, which comprises a fragment of iron pyrite, a support therefor, a leaf spring presented broadside to the contact surface of the pyrite, a threaded support, and an adjusting screw passing freely through a hole in said spring and engaging the threads of said threaded support, said screw having a shoulder engaging said spring.

4. An oscillation detector, which comprises a fragment of iron pyrite, means for holding the same stationary, a leaf-spring arranged to present its broadside to the surface of the pyrite, and an adjusting screw for said leaf-spring.

5. An oscillation detector, which comprises a fragment of iron pyrite, means for holding the same stationary, a leaf-spring arranged to present its broadside to the surface of the pyrite, an adjusting screw for said leaf-spring, and means for holding said adjusting screw stationary in its adjusted position.

6. An oscillation detector holder, which comprises a metallic support, a flanged cup adjustable upon said support, a screw clamping the flange of said cup to the support, a contact member carried opposite the support, by a leaf-spring which is flexible to and from the support, a screw for adjusting the spring, and a clamp to hold the screw in its adjusted position.

7. An oscillation detector holder, which comprises a metallic support, a metallic cup having a slotted flange, a post engaging the slot in the flange, and a screw operating on the post to clamp the cup-flange to the support.

8. An oscillation detector, which comprises a fragment of iron pyrite, means for holding the same stationary, a delicately adjustable spring flexible toward the effective surface of the pyrite, a delicately threaded adjusting screw for said spring, and means for clamping said screw in its adjusted position.

9. An oscillation detector, which comprises a fragment of iron pyrite, a leaf-spring arranged to present its broadside to the effective surface of said pyrite, a delicate adjusting screw for said spring, and means for holding said adjusting screw in its adjusted position.

10. An oscillation detector, which comprises a fragment of iron pyrite, means for holding the same stationary, a delicately adjustable spring flexible toward the effective surface of the pyrite, a delicately threaded adjusting screw for said spring, and means for holding said adjusting screw in its adjusted position.

11. A holder for a rectifying oscillation detector, which comprises a support for the rectifying conductor, a delicately adjustable spring flexible toward the surface of said conductor, a delicately threaded adjusting screw for said spring, and a threaded clamp engaging the spring and adjustable to hold said spring in its adjusted position.

12. A holder for a rectifying oscillation detector, which comprises a support for the rectifying conductor, said support being radially and circumferentially adjustable in the plane of the surface of the rectifying conductor, and means for fixing said support in its adjusted position.

13. In an oscillation detector, the combination with a rectifying conductor; of a conducting base; a conducting holder for said rectifying conductor, said holder being adjustably movable on said base; means for securing said holder in any of its adjusted positions and in good contact with said base; a leaf-spring carrying a contact member cooperating with said rectifying conductor, said spring being flexible with respect to

said rectifying conductor; and means for adjustably flexing said spring.

14. As an element of an oscillation detector, the chemical compound crystallized iron pyrite, substantially as described.

15. In a rectifying oscillation detector, the combination of a metallic cup, of a compound mechanical element in the cup and comprising a rectifying conductor embedded in a mass of metal, and a screw in the cup pressing said element in contact with the cup.

16. In an oscillation detector, the combination with a rectifying conductor having a considerable effective contact surface; of a conducting support therefor which is freely adjustable in a plane parallel to that of the effective surface of said conductor; means for securing said conductor in its adjusted position and in good circuit contact; a leaf-spring flexible to and from the effective surface of said rectifying conductor and its plane of adjustment, said spring carrying a contact member cooperating with said surface of said conductor; a screw and screw-support for delicately varying the flexure of said spring; and means for securing said screw in its adjusting position.

GREENLEAF WHITTIER PICKARD.

In presence of—

EDWARD H. ROWELL,
MYRA S. ROWELL.