G. W. PICKARD.

OSCILLATION DETECTOR.

APPLICATION FILED AUG. 20, 1910.

1,118,228.

Patented Nov. 24, 1914.

Fig. 1.

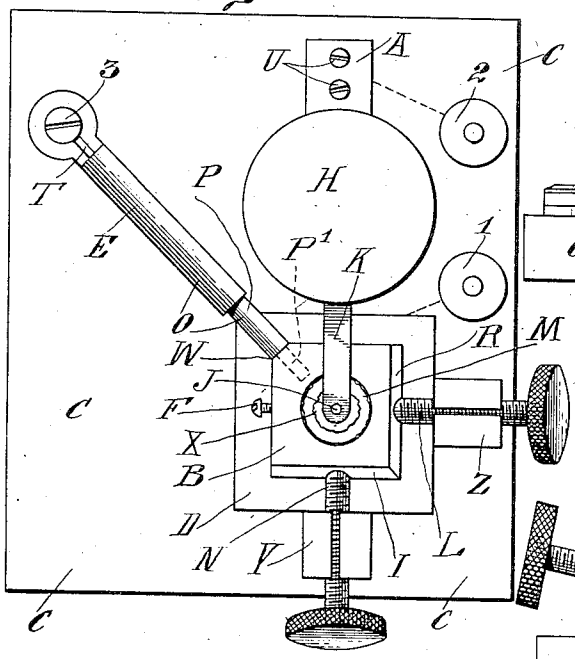


Fig. 2.

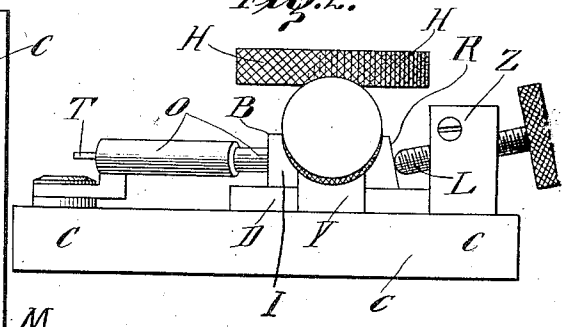


Fig. 3.

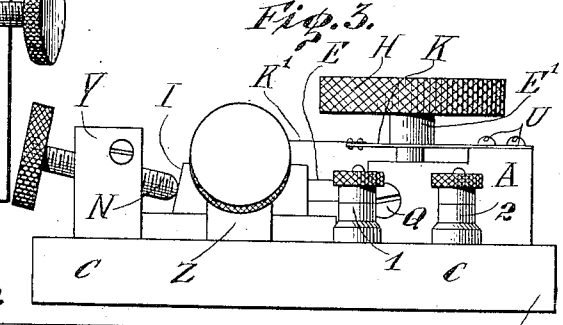


Fig. 5.

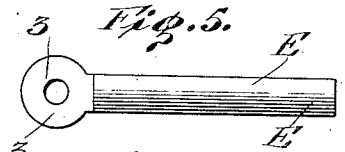


Fig. 6.

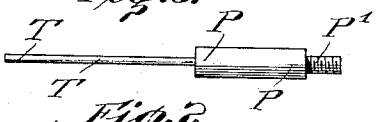


Fig. 7.

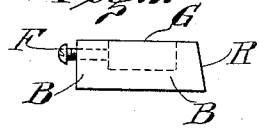


Fig. 8.

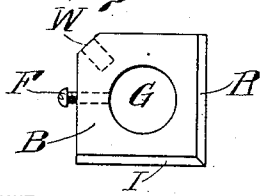


Fig. 9.

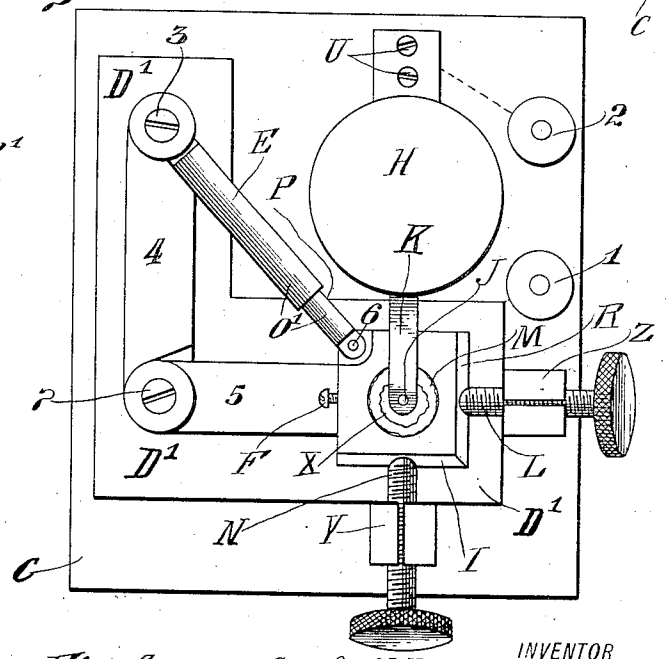
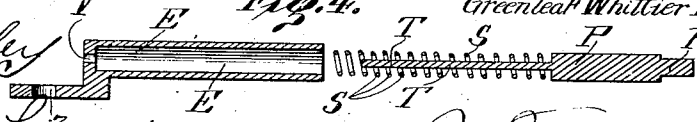


Fig. 4.



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GREENLEAF WHITTIER PICKARD, OF AMESBURY, MASSACHUSETTS, ASSIGNOR TO WIRELESS SPECIALTY APPARATUS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

OSCILLATION-DETECTOR.

1,118,228. Specification of Letters Patent. Patented Nov. 24, 1914.

Application filed August 20, 1910. Serial No. 578,203.

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 drawings, 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 oscillation receivers, or detectors, or mineral rectifiers, used as wireless telegraphy detectors of the type of my prior Patents 877,451; 886,154; 888,191; 904,222; 912,726; 924,826; 933,263; and 963,713.

More particularly, the invention relates to improvements on the type of mechanical device disclosed in my said Patent 933,263, and to specific kinds of rectifying minerals or conductors constituting the detecting agent to be incorporated with said mechanical device or holder or with any suitable holder.

Of the drawings, which are exact copies of complete working drawings to full scale, Figure 1 is a plan of a device embodying the invention; Fig. 2 a front elevation; Fig. 3 a right side elevation of Fig. 1; Fig. 4 is a section of the details of arm O of Fig. 1; Fig. 5 is an elevation of part E of said arm; Fig. 6 is an elevation of part P of said arm O; Figs. 7 and 8 are an elevation and plan respectively of the holder-block B of Fig. 1, for the active detecting agent or conducting mineral or rectifying conductor X; Fig. 9 is a plan like Fig. 1 of a modification.

The detecting agent X may be any of the substances hereinafter specified, but the device here is particularly adapted for use with some such substance as the iron pyrite of my said Patent 933,263. In some cases two of such substances may be employed in series in contact with each other, but in the device as shown, the brass point J is the member in contact with a single substance X. When two detecting agents X are employed in contact with each other, the second one is substituted for the point J or otherwise suitably supported as X here and in my said Patent 933,263 in a fusible metal button combined in any suitable way, as in any of my said prior patents showing holders, with the mechanism here to be described.

The object of this device or holder is to obtain such an accurate adjustment of contact location as I find to be extremely desirable if not absolutely necessary in order to secure maximum efficiency from the various agents X to be specified, and also at the same time to provide adjusting means which shall be economically practicable for use in receiving wireless messages.

The screw H, E^1 Figs. 3, 1 and 2 and its accessories A, Q, U, for the purpose of adjusting contact-spring K, or combined springs K, K^1 (Fig. 3), are combined with insulating base C, and may be duplicates of the corresponding parts in my said Patent 933,263; and likewise with the fusible metal button M containing the detecting agent X, and the use of a holder-block, in general such as B and having a screw F to hold button M rigidly in place in the hollow G, of the block M. But as to those various parts, any suitable substitute may be employed.

The mechanical novelty herein is embodied in the construction of the holder-block B for the button M, and coöperating means for working it to obtain the desired accurate but easy adjustment.

The block B is held in place at three points, Fig. 1, *i. e.*, the two adjusting-screws L, N and the yielding pressure-arm O, the latter pressing block B against said adjusting screws. Arm O has nothing to do with the contact pressure of the rectifying agent X in circuit, that being attended to by spring K. Block B, by means of screws L, N, may be moved about on metal sur-base D which is connected to binding-post 1 as indicated in Fig. 1; the other circuit terminal being binding-post 2 which is connected to support A for contact-adjusting-screw H.

The following construction is adapted to permit block B to be quickly moved about over metal base D so that any point of agent X may be connected in the circuit between spring K and sur-base D and also to keep block B rigidly in a single plane so as not only to keep it in good contact with base D but also to keep it at a uniform height, so that, when the top surface of detecting agent X is level, there will be uniform contact pressure for all adjustments; and also, and particularly, to prevent block B from moving the slightest degree in its plane, after an

adjustment has been made. These objects are accomplished as follows: Block B is provided with sides or lateral portions as at R, I, which are beveled at about eighty degrees to the horizontal, *i. e.*, ten degrees to the vertical, Figs. 3, 7 and 8; the screws L, N being inclined at about ten degrees to bear directly on the sides R, I. The end of part P of arm O is fixed to block B as by threaded extension P^1 (Fig. 1) so that both arm O and block B move together as a unit, the pressure arm O being pivoted at its other end at 3 and being telescopic, so that block B can be adjusted by screws, L, N into any one of an infinitely large number of positions within the limits of the small part of the circumference of a wide circular path having the pivot 3 of an arm O as a center; the width of said path being determined by the extent of the shortest and longest radii of the arm O. Screws L and N are shown as at right angles with each other, but that is not necessary. The precise construction and arrangement of arm O is not of essential importance, providing that it serves its principal function of yieldingly pressing block B against screws L and N. It is clear from the above that the three lateral supports of block B keep it not only in the same plane but also rigidly in any position to which it may be adjusted. In a device accurately constructed, and without lost motion, it is found that a given adjustment will be preserved throughout the most abnormal mechanical disturbances. It is clear that the adjustments are most readily made, by merely turning one or the other or both of screws L, N.

Block B should slide freely over sur-base D, and for best results their contacting surfaces should be truly plane and preferably nickel-plated; and so also with the beveled sides or edges R, I of block B and the contacting ends of screws L, N.

Arm O (Figs. 4, 5, 6) may consist of sleeve E, pivoted at 3 (Fig. 1), and plunger P telescoping inside of E and provided with the threaded projection P^1 (Fig. 6) which is screwed into the corner of block B (Fig. 1).

When that corner of B is beveled, as at W (Figs. 8 and 1), the main part of P may bear as a shoulder against it as shown (Fig. 1). It is not necessary to bevel that corner W at an angle to the vertical, when, as shown, the arm O is held down in its pivoted position by the pivot screw at 3 (Fig. 1), or when the entire arm O is sufficiently rigid to prevent vertical movement at its end which is connected with block B. The screw at 3 is not adjusted so tight as to prevent the movement of arm O about its pivot 3 as a center.

The springs S (Fig. 4) inside sleeve E and around plunger P (Fig. 1), is preferably a stiff steel spring, and should be strong enough to cause arm O to follow exactly the motions of the adjusting screws L, N. The plunger P is preferably formed with a rear projection T, (Figs. 4, 6 and 1) which operates through hole V in sleeve E, and is confined therein to obtain additional rigidity of the assembled parts.

The device of Fig. 1 is extremely accurate in operation, provided that it be constructed with excellent workmanship, and it is then the best form in so far as it is the simplest, as well as accurate. But the device of Fig. 9 is preferable in cases where it is not desired to use as great care in construction as is required by the device of Fig. 1; because in Fig. 9 there is used the steadying means consisting of the jointed arm 4, 5, the part 5 of which forms a continuation of block B, the arm O^1 being simply pivoted to B at 6, so that B moves rigidly with 5 instead of (Fig. 1) with O^1. Part 4 is pivoted at the pivot 3 of part E of arm O^1. Parts 4 and 5 are pivoted together at 7 and that joint is free to move over base D^1 The top of sur-base D^1 and the lower surfaces of 4 and 5 are true planes and are preferably plated as with nickel, in order to preserve the smooth surfaces which allow free movement and accurate adjustments of parts 4 and 5. The motion of block B in Fig. 9 is more complicated than in Fig. 1, because it does not, as there, move about 3 as a center; but on the other hand, it moves about point 7 as a center, that joint being not fixed but moving about 3 as a center.

When the above steadying means is used, it is not so important to construct arm O^1 rigidly as is desirable for arm O in Figs. 1 and 4, and the arm O^1 may lack the parts T and V of Fig. 4.

The simple and accurate adjustment provided by the above mechanism is found to increase the efficiency of any of the rectifying agents hereinafter specified, to a remarkable degree, and in the case of some agents, such as galena and huascolite for example, that adjusting means seems absolutely necessary in order to permit the satisfactory employment of such substances in regular commercial service.

The following substances may be employed in the disclosed or any other suitable device, either individually as members X in contact with the brass point J, or in pairs, any one in contact with any one of the others; and without a local source of E. M. F., or with such local source in accordance with my Patent 912,613: aguilarite, aikinite, alaskaite, algodonite, allemontite, alloclasite, altaite; altaite, aurif.; altaite, selenif.; anatase, andorite, anglarite, animikite, annivite, argentite, argento-bismite, argento-pyrite, argento-tiemannite, argento-whitneyite, argyrodite, arite, arkansite, ar-

querite, arsen-argentite; arsenic, native; arsenio-tellurite, arseno-allemontite, arseno-pyrite, arseno-skutterudite, avaite, beegerite, berthierite, bismuth-galena; bismuth, native; bismuthinite, bismuto-skutterudite, bismuto-smaltite, bjelkite, blatterite, bolivianite, bornite, bournonite; bournonite, ferif.; breithauptite, bröggerite, brogniardite; brogniardite, cuprif.; brookite, calaverite, cantonite, carborundum, carrolite, castillite, chalcocite; chalcocite, ferif.; chalcophanite, chalcopyrite, chanarcillite, chathamite, chilenite, chivatite, chloanthite, clarite, clausthalite, cobaltite, coloradoite, condurite, copper, corynite, covellite, crookesite, cubanite, cupro-geocronite, cupro-plumbite; dalemzinite, cuprif.; danaite, diaphorite; diaphorite, plumbif.; dogsnacskite, domeykite; domeykite, argentif.; dycrasite; dycrasite, argentif.; emplectite, enargite, epiboulangerite; epiboulangerite, bismuthinous; eucairite, famatinite, ferro-ilmenite, ferromiargyrite, ferro-rammelsburgite, ferrotetrahedrite, freibergite; freibergite, argentif.; freieslebenite, frieseite, galena, galeno-bismutite, geocronite, gersdorffite, glaucodot, glauco-pyrite, graphite guadalcazarite, guanajuatite, hattenburgite, hausmannite, henryite, hessite; hessite, aurif.; heteromorphite, horsfordite, hauscolite, huntilite, ilmenite, ilsemannite, inverarite, iron-platinum, iserite, jacobsite, jaipurite, jalpaite, jamesonite, johnstonite, jordanite, joseite, josephenite, klaprotholite, knopite, kongsbergite, krennerite, lantite, lehrbachite. leucopyrite, linnæite; linnæite, ferif.; livingstonite, löllingite, luzonite, magnetite, maldonite, manganeese, manganite, marcassite; marcassite, arsenical; marcylite, mercury, metacinnabarite, miargyrite, millerite, mohawkite, molybedenite, nagyagite, niccolite, nivenite, onofrite, o'rileyite, pentlandite, petzite, plumbo-ferrite, plumbo-stibite, plumbo-tellite, polianite; polianite, ferif.; polyargyrite, polybasite; polybasite, zincif.; polydymite, polymigmite, polytellite, porpezite, proustite, psilomelane, pyrargyrite, pyrite; pyrite, cuprif.; pyrite, nickelif.; pyrolusite, pyrostilpnite; pyrrhotite, cobaltif.; pyrrhotite, rammelsburgite, rathite, redruthite, rittingerite, ruthenite, safflorite, säterbergite, schapbachite, schirmerite, schulzite, schwalzite, selen-tellurium, semseyite, shuvite, siegenite, silaonite, silicon, skutterudite, smaltite, sommarngarite, spathio-pyrite, specular iron, sperrylite, stannite, stephanite, sternbergite, stibio-domeykite, stibio-gersdorffite, stibio-krennerite, stiemannite, stromeyerite, studerite, stützite; stützite, cuprif.; sychnodymite, sylvanite, tennantite; tennantite, antimonial; tetradymite; tetradymite, sulfurous; tetrahedrite, tiemannite, tilkerodita, tin; tin, tellurif.; troilite, ullmannite, umangite, wad, wehrlite, whitneyite; whitneyite, antimonial; wolfachite, zincite; zinc oxid, fused; zinkenite; zinkenite, cobaltif.; zorgite; zorgite, cuprif., and also various other compounds, artificially produced, and having similar properties.

As there are about two hundred and fifty of these substances, as above, which can be employed, (as distinguished from the thousands of other minerals which are not electrical conductors or rectifiers), and therefore many thousands of useful pairs thereof, (each one with any of the other constituting a useful pair), it is impractical to specify here the detailed properties of each pair. Each individual has its general characteristics of direction of rectification, "sensitiveness" or efficiency of rectification, optimum contact pressure, stability, and degree of ease of adjustment, including the number of operative contact points. Each sample of the same substance, of slightly differing degrees of chemical and physical properties, may vary as to the above characteristics, and each substance usually operates slightly differently in various aspects when employed in contact with each of the various other substances. All these may be readily determined by trial. In general, the various substances are to be employed as in my said prior patents, particularly as to the lack of microphonic or imperfect contact. The good or substantially perfect contact which is essential, averages from about a few tenths of a gram to several grams, but the optimum or critical contact pressure for a given substance is readily determined by trial, and a substantially higher pressure will decrease the sensitiveness or efficiency.

The detector art seems to be now educated away from the prior imperfect contact art, by means of my invention of the perfect contact detector, and the above is therefore considered a sufficient instruction.

In general, the contact pressure for many of the substances is less than one or two grams, and for some substances is less than a tenth of a gram, and for some others as high as ten grams or more. But no matter how low the pressure, there must always be enough to prevent microphonic action in order to utilize the rectifying property. In general, the best substances are those which are efficient when the contact pressure is high, in the sense that they are the most stable. But some substances which are best as to some conditions, are very inferior in others, and arbitrary selection and trial under different commercial conditions will indicate the use of substances of different characters best suited for use in the different conditions.

Certain substances operate much better with certain others or classes of others, although the reason for this is as yet obscure. For example, while the rectifying solid oxid

of zinc (or the specific zinc oxid, zincite) is usually operative with any conductor X, yet, as I have found, it operates best with solid chemical compounds of sulfur and copper, and next best with solid chemical compounds of sulfur not containing copper. For example I have found that the following sulfur-copper compounds constitute the most efficient coöperating conductors X with an oxid of zinc, (such as zincite,) the order named indicating the degree of efficiency, based on averages of rectifying power, ease of adjustment and electrical stability:—bornite, chalcocite, stromeyrite, chalcopyrite, cuproplumbite, cubanite, covellite. Of the sulfur non-copper compounds, of less efficiency than the sulfur-copper compounds, but of greater efficiency than non-sulfur compounds, I have found the following to be extremely useful with an oxid of zinc such as zincite:—galena, iron pyrite, molybdenite, etc. Of the substances listed, there are many individually, and many pairs, which average at least as commercially satisfactory as any of those just mentioned by way of illustration. But each individual substance, and each pair of substances, has its own characteristics which it is not here practicable to specify in detail. In general, the attributes of stability, sensitiveness and ease of adjustment are about equally important; although ease of adjustment is not so important where the stability is high, and vice versa; and sensitiveness is not so important, provided it be fairly high, when either ease of adjustment or stability is high.

For example, although a form of oxid of zinc such as zincite, is an excellent and practical material, its sensitiveness and stability are not nearly so high as those of many others of those above listed. But it is very easy of adjustment, *i. e.*, has many sensitive contact points, and its sensitiveness can be improved to a considerable degree by pairing it with the other substances particularly named above as pairs with it. It is not so efficient a rectifier, for strong nearby signals, for example, as the pyrite of my Patent 933,263, and it is more liable than that to have its stability affected by such signals; so that under such conditions it may be preferable to employ such other material. Furthermore, in general, the physical conditions, such as softness, of a given substance which may have all the best properties otherwise, may be such as to make it less desirable for service of a given kind.

All the above various properties of the above various suitable conductors are to be adapted to special conditions by a process of selection by those skilled in the art, and it is impracticable here to specifically enumerate those substances which are best adapted for the various different conditions. But the mechanical device here disclosed is such as to improve the operation of all the various substances.

I claim:—

1. As an element of a device of the class described, the conducting non-copper compound of sulfur, Linnaeite, possessing, when in contact with another electrical conductor, the property of rectifying oscillating currents, substantially as and for the purpose described.

2. As an element of a device of the class described, a conducting compound of sulfur not containing copper, which possesses, when in contact with another electrical conductor, the property of rectifying oscillating currents, substantially as and for the purpose described.

3. The combination with the non-copper conducting metallic compound of sulfur, Linnaeite, of a conducting solid consisting of oxid of zinc, in electrical contact therewith, each of said conductors possessing the property, when in such contact with one another, of rectifying oscillating currents, substantially as and for the purpose described.

4. The combination with a conducting compound of sulfur, not containing copper, of a coöperating electrical conductor in electrical contact therewith, each of said conductors possessing the property, when in such contact, with one another, of rectifying oscillating currents, substantially as and for the purpose described.

5. The combination with a conducting compound of sulfur, not containing copper, of a coöperating electrical conductor in electrical contact therewith, said sulfur compound possessing the property, when in such contact with the electrical conductor, of rectifying oscillating currents, substantially as and for the purpose described.

6. The combination with a conducting compound of sulfur, not containing copper, of a conducting solid consisting of oxid of zinc, in electrical contact therewith, and when in such contact with said sulfur compound, possessing the property of rectifying oscillating currents, substantially as and for the purpose described.

GREENLEAF WHITTIER PICKARD.

Witnesses:
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