M. ROBINSON.

OUTLET OR SWITCH BOX.

APPLICATION FILED JULY 22, 1911.

1,121,291. Patented Dec. 15, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

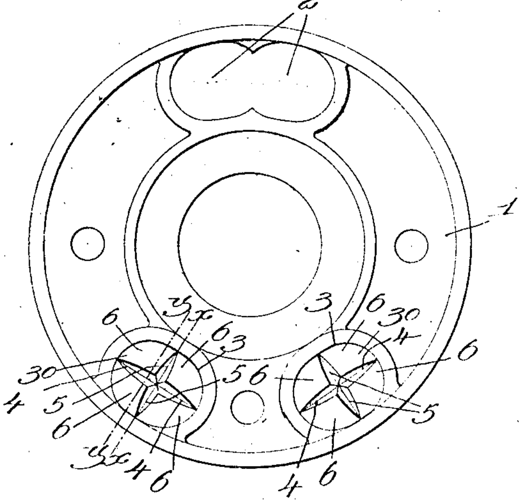


Fig. 2.

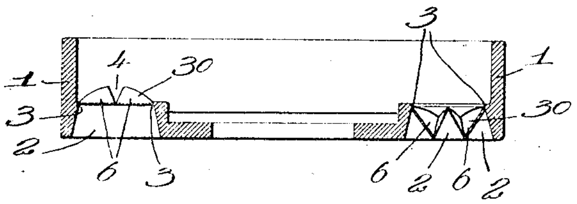


Fig. 5.

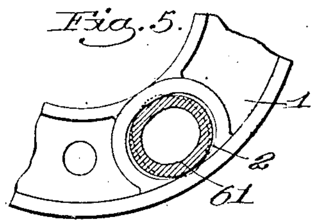


Fig. 3.

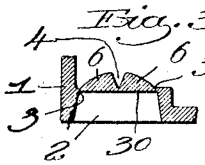


Fig. 4.

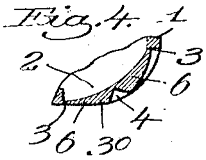
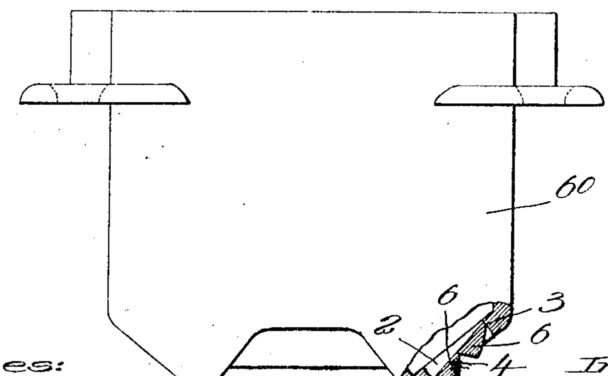


Fig. 6.



Witnesses:
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2 SHEETS—SHEET 2.

Fig. 7.

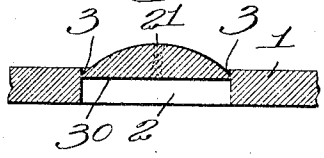


Fig. 8.

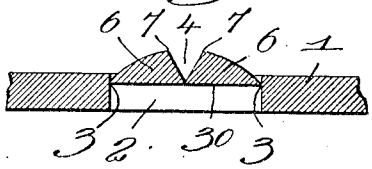


Fig. 9.

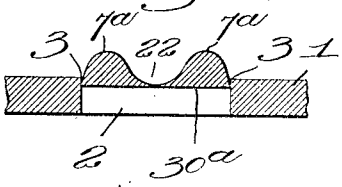


Fig. 10.

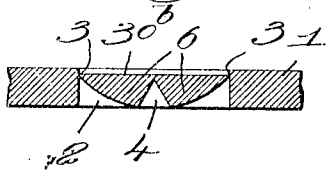


Fig. 11.

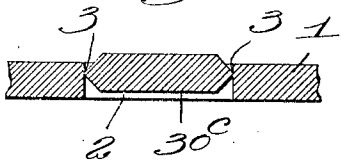


Fig. 12.

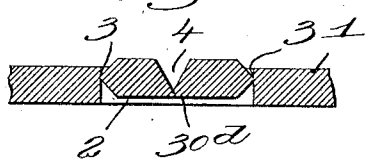


Fig. 13.

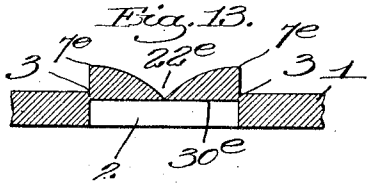


Fig. 14.

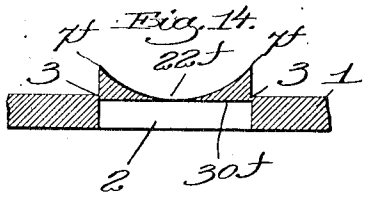


Fig. 15.

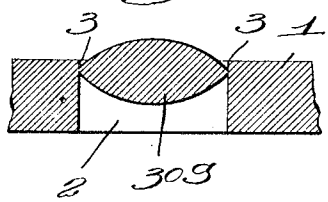
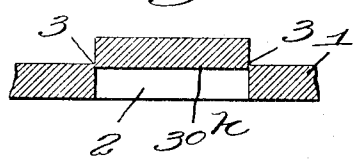


Fig. 16.



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UNITED STATES PATENT OFFICE.

MINER ROBINSON, OF NEWTON, MASSACHUSETTS.

OUTLET OR SWITCH BOX.

1,121,291. Specification of Letters Patent. Patented Dec. 15, 1914.

Application filed July 22, 1911. Serial No. 640,027.

To all whom it may concern:

Be it known that I, MINER ROBINSON, a citizen of the United States, residing at Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Outlet or Switch Boxes, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to switch, outlet, or junction boxes for electrical wiring purposes. These boxes are commonly made with a so-called knock-out or sealed portion, that is, with an aperture or partially-formed aperture through the wall of the box which is closed by a seal or knock-out portion so connected with or sustained by the box that it can be knocked out by a blow thereby to leave an aperture for the insertion of a conduit. Some boxes are made of steel while others are made of cast iron.

It has heretofore been proposed to make the knock-out portion in a cast-iron box by casting said box with a recess on both the inside and outside of the wall thereof thereby to leave a thin flat web which can be broken by a blow. Such knock-outs have not been entirely satisfactory, however, partly because they are very apt to break along a ragged line, thus leaving the conduit-receiving aperture with a jagged edge, and partly because if they are made very thin they will not cast well, while if they are made thick enough to cast well they cannot be broken out except by a comparatively heavy blow which is liable to crack the walls of the box. Moreover, the present rules concerning outlet boxes require that the seal or knock-out portion shall have a thickness as nearly equivalent to that of the walls of the box as possible, and this rule prevents the use of a cast iron box having knock-out portions which are made thin as above described. It has also been proposed to make the knock-out portion of a cast-iron box with a thin connecting web joining the same to the adjacent walls of the box, but with this construction the knock-out portion can be broken from the box only by delivering upon it a blow of considerable strength which is liable to crack or otherwise injure the box.

My present invention has for its general object to provide a knock-out portion for a cast metal switch, outlet or junction box, which is free from the disadvantages inherent in the knock-out portions of prior cast metal boxes, and which can be readily broken out by a light blow and yet comply with all the necessary requirements relating to knock-out portions.

More specifically the objects of my invention are to provide a novel knock-out portion in a cast metal box which can be readily broken out with a blow of a hammer or other implement without danger of cracking or breaking the surrounding walls of the box; to provide a knock-out portion which will break out in a manner to leave a clean-cut hole without ragged edges; to provide a knock-out portion of such a construction that it will receive the blow of the hammer or other implement even though said blow is not delivered accurately thereby avoiding any danger of breaking the box by an improperly-delivered blow to provide an outlet box having a conduit-receiving opening which will facilitate the insertion of a so-called insulating loom conduit thereinto and will operate to grip the conduit when inserted and hold it in place, and to otherwise improve outlet or switch boxes, all as will be more fully hereinafter described and then pointed out in the claims.

In order to provide a construction in which the seal or knock-out portion will be broken out by a relatively light blow, I form said seal or knock-out portion with a weak or easily-frangible portion near the center thereof and with transverse lines of weakness which extend from or near the center to the edge thereof, and I also preferably provide said knock-out portion with a weak or easily-frangible portion at the edge thereof. With this arrangement when a blow is struck on the knock-out portion the latter will first crack along the transverse lines of weakness after which the separate pieces are very readily broken along their peripheral line of weakness and a comparatively light blow will accomplish the result.

In the preferred embodiment of my invention the knock-out portion is formed so that portions thereof will project above the circumjacent walls of the box, thus insuring that said knock-out portion will be struck

by the hammer even though the blow is not accurately delivered. This construction has the further advantage that if the hammer which is used to knock out the knock-out portion has a head larger in diameter than the opening, the blow of the hammer will be delivered on the knock-out portion instead of on the walls circumjacent the opening.

In the illustrated embodiment of my invention the conduit-receiving opening is oval in shape and has a greater length and less width than the normal diameter of the insulating loom to be inserted through the conduit. The advantage of this is that when the insulating loom is inserted into the conduit it will be distorted somewhat in cross sectional shape and thus firmly held.

Referring now to the drawings in which I have shown some embodiments of my invention, Figure 1 is a view of a circular outlet box having my improved knock-out; Fig. 2 is a sectional view of an outlet box embodying my invention showing a box having knock-out portions on opposite sides with one of the knock-out portions being broken out, the sections through the knock-out portions being taken on a line corresponding to the line *x*—*x*, Fig. 1; Fig. 3 is a section on the line *y*—*y*, Fig. 1; Fig. 4 is a sectional view similar to Fig. 3 showing a knock-out portion adapted to be broken out by a blow from the outside of the box; Fig. 5 is a fragmentary view showing the manner in which the conduit is locked in the aperture; Fig. 6 shows a switch box provided with my improved knock-out portion; Figs. 7 to 16 show different forms which my invention may assume.

1 indicates a circular cast metal outlet or junction box which is provided with a plurality of sealed openings 2. The seals or knock-out portions 30 of these openings are cast integral with the box and may be arranged so that they can be driven out by means of a blow delivered either from the outside of the box or from the inside thereof. In Figs. 1 and 2 the seal is arranged to be broken out by a blow delivered from the inside of the box while in Fig. 4 a construction is shown in which the seal may be broken out by a blow delivered from the outside of the box. My improved seal is constructed to have a line of weakness at its periphery 3 where it joins the walls of the opening 2 and I may form this line of weakness by making the seal either thinner, or more brittle, or both, at its edges.

It is well known when molding gray or cast iron that wherever the opposite sides of the mold of sand or other suitable material, come very close to each other as compared to the general or average thickness of the pattern, the metal at these thin parts becomes much harder and more brittle, undoubtedly due to the much more rapid cooling, thus forming what is known to the trade as a "chill" or "cold-shot." Sometimes the metal at these points is so hard and brittle that it can hardly be acted upon by a sharp file. When my improved seal is made thinnest at its edges the above phenomenon takes place and the thin edges are very hard and brittle. The weakness at the edges of my improved seal may thus be partly due to the fact that the seal is thin at this place, and partly due to the fact that it is brittle at this place. It is not essential to my invention, however, how the line of weakness at the edges of the seal is formed.

While the seal in a cast metal box which is thus made thinnest at its edges to provide a line of weakness 3 where it joins the box will break out more or less readily, yet I prefer to make the seal with a weakened portion near the center also so that when the blow is struck it will crush down from the center as it were, and I also prefer to form the seal with transverse lines of weakness which will preferably, although not necessarily, extend radially from the center to the periphery of the seal. These ends can be secured by casting the seal with the diametrically-extending grooves 4 and 5 at or near the center of the seal, said grooves being of such a depth as to leave comparatively little metal at the bottom of the groove. These grooves thus constitute lines of weakness because of the thinness of the metal at the bottom thereof, and if the metal at the bottom of the grooves "chills" or "cold shots" when the casting is poured, the brittleness of the metal thus caused constitutes an additional element of weakness. Where these grooves are thus formed a blow struck on the center of the seal will first cause it to fracture along the radial lines 4 and 5, thus leaving a plurality of separate sector-shaped pieces 6, each of which is integrally connected with the wall of the aperture by the thin edge 3 and can be broken off at said edge with very little force, as will be perfectly obvious. With this arrangement, therefore, a comparatively light blow will not only fracture the seal from the center along the radial lines 4 and 5, but will also at the same time break the seal out along the weakened edge 3, and leave an aperture with a clear-cut edge.

In striking the seal a blow to break it out, it is not always easy to hit the seal squarely and workmen frequently hit the circumjacent wall of the box instead. If the box is a cast metal box a blow of this nature may crack or fracture the box. In order to provide a construction wherein a blow will be sure to hit the seal, even though it is not accurately delivered or the head of the ham-

mer is large, and also to afford a construction whereby as much of the total area of the seal and knock-out portion as possible can be maintained at a thickness substantially equivalent to that of the walls of the box, I form the seal with thickened raised portions which extend above the circumjacent walls of the box and can therefore be conveniently hit with a hammer.

There are various shapes that the seal may have and yet be provided with the raised hammer-receiving portions and with the lines of weakness above referred to, and in Figs. 7 to 16, I have illustrated a few constructions embodying my invention. Each of these figures is an enlarged section taken through a sealed opening of a box.

Fig. 8 shows the construction illustrated in Figs. 1–3, wherein one side of the seal is made convex in shape and the seal as a whole is placed near one edge of the opening 2 with the convex side projecting above the edge of the opening. The grooves 4 and 5 and the convex side of the seal form a plurality of projections or raised portions 7 which stand above the surrounding walls of the box and can consequently be readily hit with a hammer without danger of striking the walls of the box.

In Fig. 7 an embodiment of my invention is shown in which the transverse or radial lines of weakness are formed by making the seal with brittle streaks 21 without forming the grooves 4 and 5. These brittle or easily-frangible portions can be made by "water crossing" the sand mold or in any other well known way.

In Fig. 9 a seal 30^a is shown having the raised portions 7^a situated near the edge thereof and with a concavity 22 in the center. These raised portions will preferably be separated by radial lines of weakness.

In Fig. 10 I have shown an embodiment of my invention having all the features thereof illustrated in Figs. 1–3 with the exception of the raised portions which stand above the circumjacent walls of the box. In this embodiment the seal 30^b is plane on its upper face and convex on the lower face, but neither face projects above or beyond the circumjacent walls of the box. The seal, however, has the weakened edge 3 and the transverse lines of weakness 4 and 5, so that the seal can be readily broken out by a light blow of the hammer.

In Fig. 11 I have shown a seal 30^c, both sides of which are plane or flat, but which is so situated in the opening 2 that one side thereof projects above the circumjacent walls of the aperture. This seal is also provided with the weakened edges 3 where it joins to the walls of the box, the weakened edges being provided by making them thinner than the body of the seal.

In Fig. 12 a seal 30^d is shown similar to that shown in Fig. 11 with the exception that the projecting face of the seal is provided with transverse or radial lines of weakness 4 and 5 formed by making transverse or radial grooves.

In Fig. 13 I have shown a form of seal in which the projecting hammer-receiving portions 7^e are at the edges of the seal. This seal is somewhat similar in shape to that shown in Fig. 9 except that the raised portions 7^e are at the extreme edge of the seal. This seal has the central concavity 22^e to form a weakened portion at the center of the seal and the raised portions 7^e can be separated by thin portions to form radial lines of weakness.

In Fig. 14 I have shown another embodiment of my invention wherein the seal 30^f is provided with a concavity 22^f in the center and with the thickened portions 7^f adjacent the edges of the seal. This seal and also that shown in Fig. 13 is joined to the walls of the box by thin portions 3 which form annular lines of weakness around the seal.

In Fig. 15 I have shown a double convex seal 30^g, both sides of which are convex and which is joined to the walls of the box by the annular line of weakness 3.

In Fig. 16 I have shown a seal 30^h having plane or flat sides one of which is situated above the circumjacent walls of the box thereby to form a hammer-receiving surface. This seal can be provided with central and transverse lines of weakness either by making the seal with brittle portions or streaks or by making the seal with grooves. The seal is joined to the walls of the box by an annular line of weakness 3 as above described.

There are various other shapes which a seal embodying my invention might assume, but having suggested the above shapes I do not regard it as necessary to illustrate other possible varieties.

In all of the above embodiments of my invention the seal is connected to the walls of the box by a weakened portion which will be readily broken when the seal is struck a light blow thereby to leave a clean-cut opening. In the preferred embodiments of my invention the seal is also provided with transverse or radial lines of weakness which may be either secured by making the seal with brittle or easily-frangible lines or by making the seal with transverse grooves.

In Fig. 6 I have shown a switch box 60 having my improved seal therein, said seal having the characteristics above described.

Where the outlet box is to be used with a non-metallic conduit of that type commonly known as the "loom" type, or as flexible insulating loom, it is an advantage to make the conduit-receiving openings of non-circular form and of such dimensions that they

will have lesser width and greater length than the normal diameter of the insulating loom. The advantage of this construction will be apparent from an inspection of Fig. 5, for upon referring to said figure, it will be seen that in order to insert the loom into the opening it is necessary to flatten the loom somewhat, and after the loom has been inserted and is thus flattened, then if it is turned on its axis the bulged portions of the loom are carried around against the flattened sides of the conduit so as to cause an increased gripping engagement at this point. The conduit is thus firmly anchored in the opening. Under some circumstances I may place two of the conduit-receiving openings in such position relative to each other that they will intersect each other, as shown at the top in Fig. 1, thereby providing a double-conduit-receiving opening.

It will be noted from an inspection of Figs. 2 and 3 that the conduit-receiving openings 2 have tapered walls. The inner terminus of the opening is made of a greater length and lesser width than the normal diameter of the loom 61, as clearly seen in Fig. 5, and the tapering walls of the opening are of very great advantage in facilitating the insertion of the loom into the oblong opening. It will be readily perceived that if the opening was of the size shown in Fig. 5 throughout its entire length, it would be somewhat difficult to insert the loom therethrough, for the loom would have to be compressed by hand to fit the opening before it could be inserted thereinto. Where the opening has the tapering walls or funnel shape seen in Figs. 2 and 3, the operation of inserting the loom in the opening requires no manipulation of the loom other than a forcing of it longitudinally through the funnel-shaped opening, for the size of the opening at the lower end is sufficient to receive the loom without distorting it, and as the loom is inserted it becomes forced into its elliptical shape by engagement with the tapering walls.

The double conduit-receiving opening shown at the top of Fig. 1 has the advantage that when two insulating loom conduits are inserted thereinto they will wedge against each other and thus serve to bind each other in the opening. My improvements are applicable not only to outlet boxes, but to so-called junction boxes and switch boxes and the like, and by the term "outlet box" as used in the appended claims I intend to include any box of this nature whether it is a junction box, switch box, or so-called outlet box.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A cast metal outlet box having cast integral therewith a knock-out portion, the periphery of which is joined to the walls of the box by a thin web and which is made thin along a line extending transversely thereof, and some portion of which stands above the circumjacent walls of the box.

2. A cast metal outlet box having cast integral therewith a knock-out portion which is easily frangible along a line extending transversely thereof and which has a portion extending above the circumjacent walls of the box.

3. A cast metal outlet box having cast integral therewith a knock-out portion which is easily frangible along two intersecting transversely-extending lines and which has a portion extending beyond the circumjacent walls of the box.

4. A cast metal outlet box having cast integral therewith a knock-out portion which is easily frangible along lines extending both transversely and circumferentially thereof and which has a portion extending above the circumjacent walls of the box.

5. In an electric switch box, the combination with the flexible tubular insulating loom, of a box having wire openings therein of lesser width and greater length than the normal outside diameter of the loom.

6. The combination with flexible tubular insulating loom, of an outlet box having funnel-shaped conduct-receiving openings therein, the smaller end of which are of lesser width and greater length than the normal outside diameter of the loom.

7. The combination with flexible tubular insulating loom, of a switch or outlet box having a conduit-receiving passage extending through the wall thereof, which passage is provided with inclined walls and has a greater diameter at the outer end than at the inner end thereof, said inner end of the passage being of greater length and lesser width than the normal outside diameter of the loom.

8. The combination with flexible tubular insulating loom, of an outlet box having two intersecting conduit-receiving openings, each having a greater diameter and a lesser length than the normal outside diameter of the loom.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

MINER ROBINSON.

Witnesses:

LOUIS C. SMITH,

BERTHA F. HEUSER.

Correction in Letters Patent No. 1,121,291.

It is hereby certified that in Letters Patent No. 1,121,291, granted December 15, 1914, upon the application of Miner Robinson, of Newton, Massachusetts, for an improvement in "Outlets or Switch Boxes," an error appears in the printed specification requiring correction as follows: Page 4, line 96, for the compound word "conduct-receiving" read *conduit-receiving;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of January, A. D., 1915.

[SEAL.] R. F. WHITEHEAD,

Acting Commissioner of Patents.