

April 29, 1952

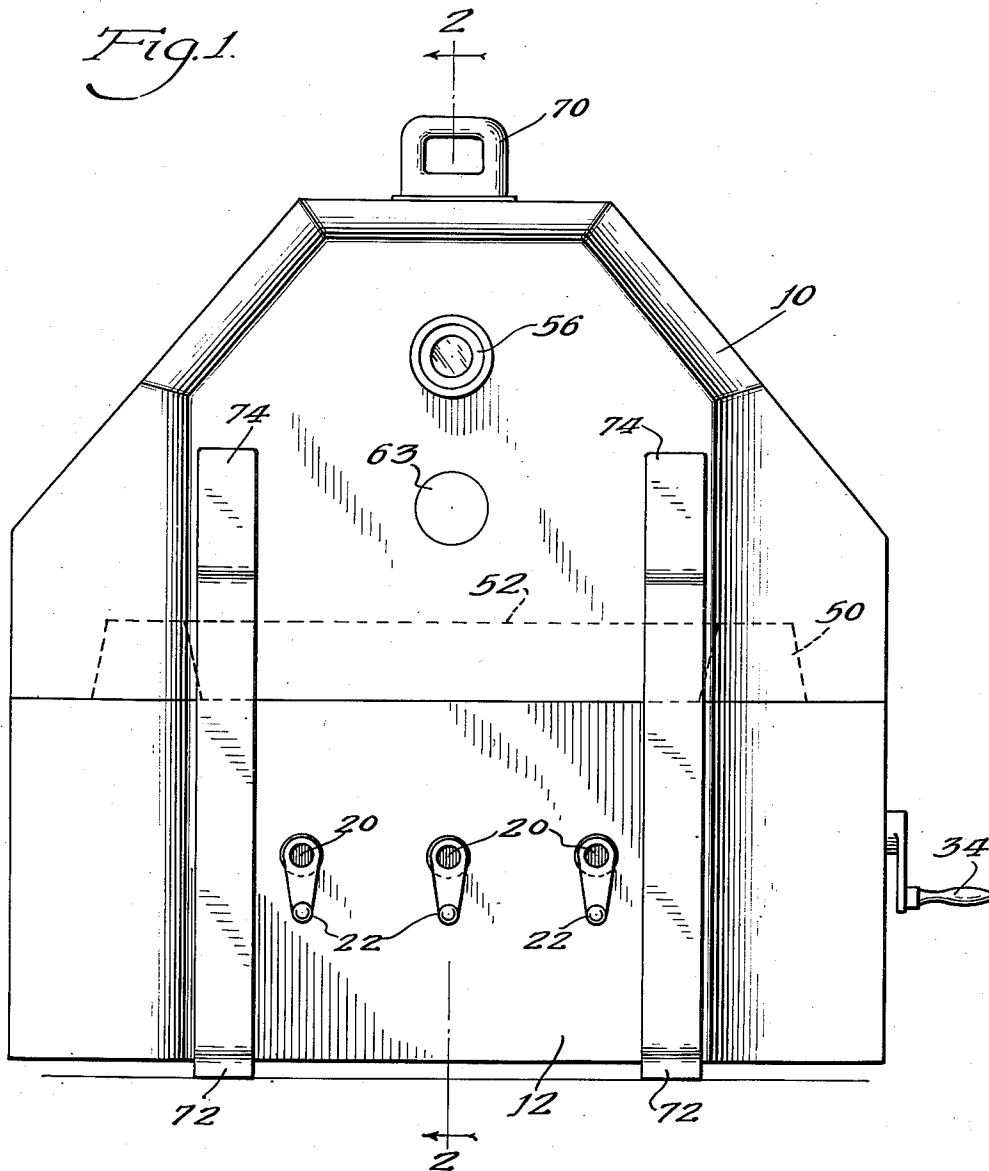
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2,594,970

VIEWING DEVICE FOR RADIOACTIVE MATERIALS

Filed Dec. 31, 1946

3 Sheets-Sheet 1



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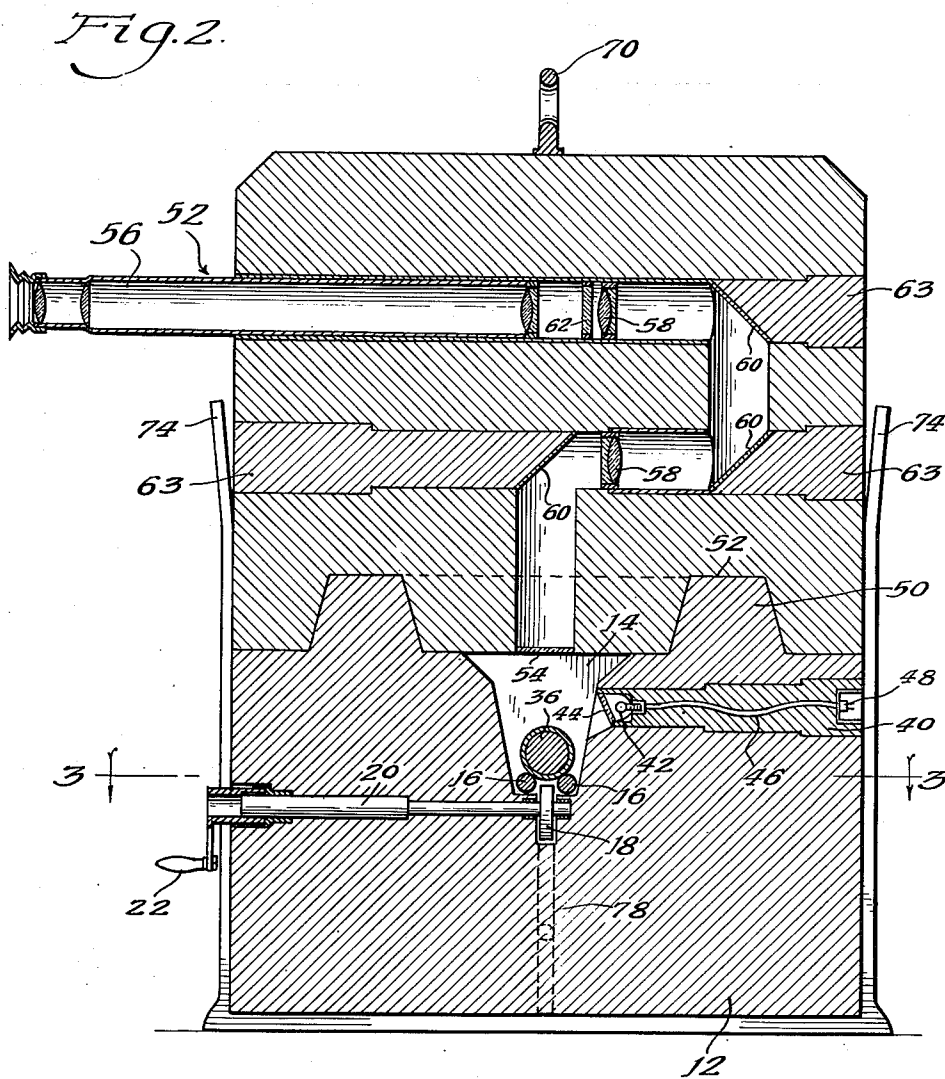
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Fig. 3.

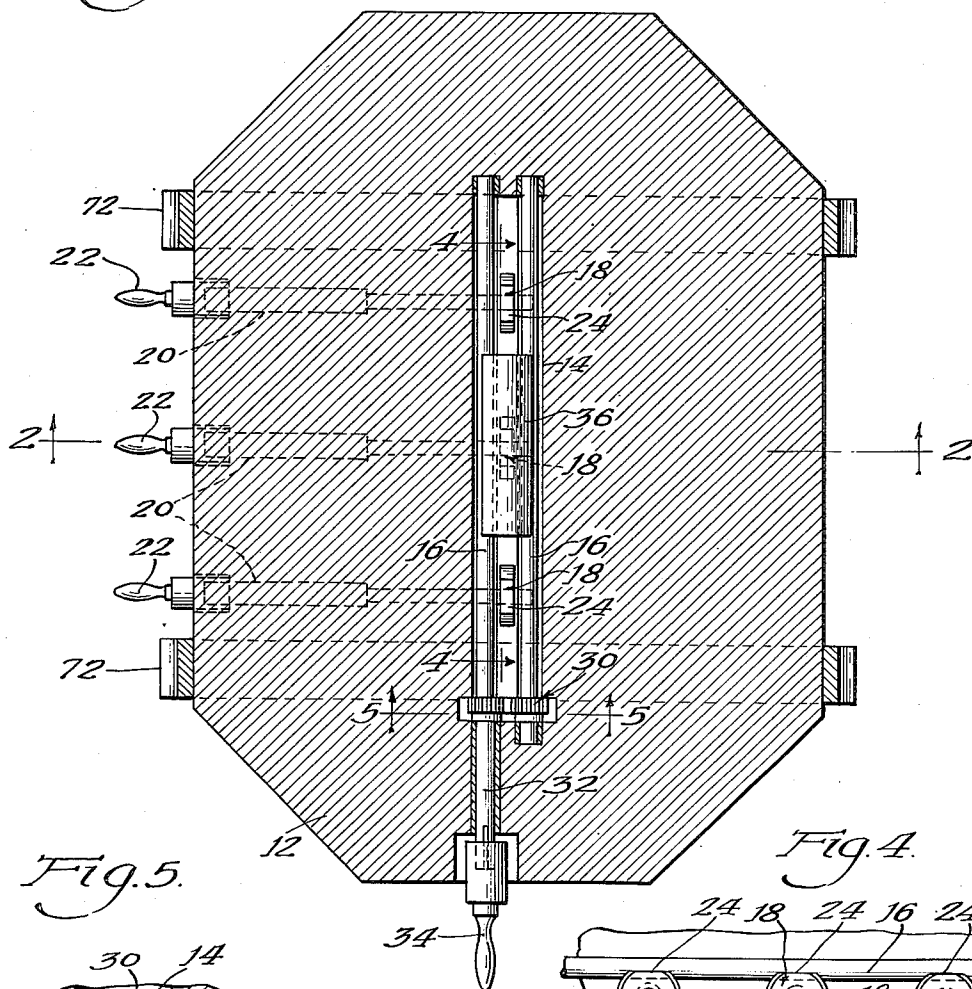


Fig. 5.

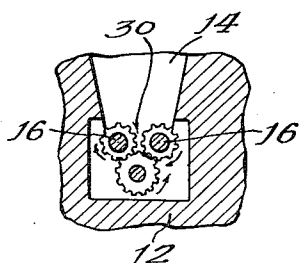
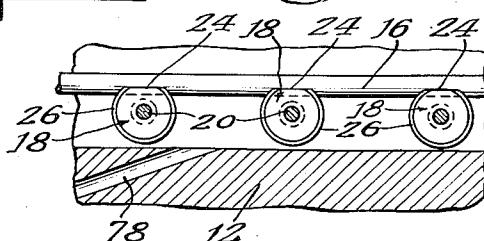


Fig. 4.



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UNITED STATES PATENT OFFICE

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VIEWING DEVICE FOR RADIOACTIVE MATERIALS

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4 Claims. (Cl. 250—108)

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This invention relates to a novel apparatus for visual inspection of radioactive materials.

It is frequently necessary to examine radioactive materials visually. This necessity is particularly common in connection with the operation of a neutronic reactor wherein, as is well known, materials are subjected to the intense neutron flux which exists in the interior and become highly radioactive. It is, for example, necessary to examine on occasion the jackets of "slugs" of fissionable material which have been removed from the reactor in order to determine the presence of defects and the extent to which the container for the fissionable material has withstood the conditions existing in the reactor. Such slugs are extremely radioactive.

It is common to unload such materials from the reactor into a body of water of such depth that the water above the radioactive materials constitutes a shield preventing the existence of dangerous radiation at the surface of the water or in the surrounding area. In the processing of such materials they are handled by remote controls and automatic devices behind heavy shields of radiation absorbing material to prevent the existence of dangerous conditions for personnel. The visual examination of such highly radioactive materials has heretofore been extremely difficult. Two alternative methods were used. In one, a shielding box, commonly of lead, was lowered into the body of water and the cylindrical slug was deposited in the box; the box was then closed, lifted out of the water and transported to a shielded area; then the box was opened by remote controls and the slug viewed through a periscope. In the other method, the area surrounding the body of water was vacated by all personnel, and the slug was removed by remote control to a shielded area where it was then viewed by means of a periscope.

The object of this invention is to provide a novel viewing box for radioactive materials, simplifying the visual inspection thereof.

A further object of the invention is to provide an improved mechanical system for moving radioactive materials within a viewing box.

For an understanding of the invention, reference is made to the drawing in which:

Fig. 1 is a front elevation of a viewing box for radioactive materials;

Fig. 2 is a vertical cross sectional view of the viewing box taken along the line 2—2 of Fig. 1 in the direction indicated by the arrows;

Fig. 3 is a horizontal cross sectional view of the viewing box taken along the line 3—3 of Fig. 2 in the direction indicated by the arrows;

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Fig. 4 is a fragmentary cross sectional view of a portion of the interior of said viewing box taken along the line 4—4 of Fig. 3 in the direction of the arrows, showing certain apparatus for manipulating the radioactive material as described below; and

Fig. 5 is a fragmentary cross sectional view taken along the line 5—5 of Fig. 3.

The viewing box is generally divided into two portions, a top generally designated by the numeral 10 and a bottom portion generally designated by the numeral 12. The bottom portion 12 of the viewing box is a substantially rectangular block of a material of high atomic weight such as lead. In the top surface of the bottom 12 is a longitudinal cavity 14. The cavity 14 has sloping sides adapted to guide an object placed therein to the bottom thereof. At the bottom of the cavity 14 are a pair of longitudinal rollers 16, for example, of brass. Between the rollers 16 are a plurality of wheels 18 parallel thereto and in a vertical plane.

The wheels 18 are spaced along the length of the rollers 16. Shafts 20 connect the wheels 18 to cranks 22 on the front face of the box. The wheels 18, as more clearly shown in Fig. 4, have flat portions 24. On the perimeters of the wheels 18 other than at the flat portions 24 are rubber friction surfaces 26 fastened, for example, by cement. The rollers 16 are connected by gears 30 and a shaft 32 to a crank 34 outside the box. Upon actuation of the crank 34, the rollers 16 both turn in the same direction. Thus by actuation of the crank 34, a cylinder 36 of radioactive material may be rotated around its axis. However, such rotation is impeded if the cylinder 36 is resting on a friction surface 26 of one of the wheels 18. Therefore, when the crank 34 is being rotated, the cranks 22 are in such position that the flat sides 24 are uppermost. In this position of the cranks 22 there is no contact between the cylinder 36 and the wheels 18, and the cylinder 36 is rotated freely by rotation of the roller 16. When a crank 22 is actuated, the cylinder 36 is moved longitudinally along the rollers 16.

A lead plug 40 extends from the back of the bottom 12 to the cavity 14. Within the inner end of the lead plug 40 is a light bulb 42 and covering the inner end of the plug 40 is a water-tight transparent window 44, for example, of methacrylate polymer. Longitudinally through the lead plug 40 extends a substantially helical aperture 46 containing the connecting wires for the light bulb 42. At the outer end of the plug 40 is an electrical connector 48 adapted to be connected to a power source (not shown) for the

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light bulb 42. On the upper surface of the bottom portion 12 of the box and integral therewith is a protruding rectangular key 50 adapted to mesh with a recessed keyway in the top 10. Thus, there is no unshielded direct path from the cavity 14 to the exterior.

The top portion 10 of the box, likewise of lead, contains an optical system adapted to permit viewing of a radioactive cylinder 36 which is contained in the cavity 14 of the bottom portion 12. The optical system consists of a periscope generally designated by the numeral 52 and a water-tight window 54 through which the cylinder 36 is viewed. The periscope 52 consists of a telescope 56 and lenses 58 and mirrors 60. The telescope 56 is removable. It is separated from the lenses 58 by a water-tight window 62 preferably of methyl methacrylate polymer. The mirrors 60, which are preferably of stellite, are mounted on the inner ends of lead plugs 63, which extend from the outer surface of the box. It may be seen that the water-tight windows 54 and 62 seal the lenses 58 and the mirrors 60 as a water-tight optical unit. The plugs 63 may be fused to the top 10 at the outer surface thereof.

The cranks 22 and 34 in the bottom portion 12 are preferably removable and keyed to the shafts 20 and 32, respectively. Preferably, there are at least 6 inches of lead on any direct line from the cavity 14 to the exterior, thus making it safe for an operator to manipulate the cranks and view the cylinder 36 without hazard. The top 10 is provided with a handle or hook 70.

In operation, the box illustrated in the drawing, is used as follows: The bottom 12 is lowered into the body of water in which radioactive cylinders 36 are disposed. Preferably, the protruding cranks 22 and 34 and the telescope 56 are first removed to prevent damage to them. By conventional hoist means a cylinder 36 to be examined is picked up and dropped into the cavity 14. The top 10 is then lowered onto the bottom 12 by the hook 70 and is guided thereon by guide straps 72 which have flared portions 74 at the upper end thereof. The box is then removed from the water and may safely be taken anywhere desired for examination of the cylinder 36 after replacement of the telescope 56 and the cranks 22 and 34.

The box preferably has an aperture 78 adapted to drain the cavity 14 of water. The drain aperture 78 must have a bend therein in order to prevent a direct path of radiation from the cavity 14 to the interior. The connector 48 is connected to a power source so that the light bulb 42 illuminates the interior of the cavity 14.

Equivalent apparatus for the inspection of radioactive materials will readily be devised by persons skilled in the art having the benefits of the teachings of this invention. Likewise, persons skilled in the art will find other uses and variations of the novel system for moving the slug as described above.

What is claimed is:

1. A viewing box for radioactive materials comprising, in combination, a bottom portion comprising a block of lead having in the top thereof a substantially rectangular recessed cavity having sides sloping inwardly, two spaced parallel rollers longitudinal of said cavity at the bottom thereof, a wheel mounted parallel with said rollers and having a flat portion on the perimeter thereof, a portion of the perimeter being between said rollers, the rounded portion of said wheel having a friction shoe thereon, ex-

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ternally operated means for rotating said rollers and externally operated means for rotating said wheel, and a removable top portion comprising a block of lead adapted to be placed on said bottom portion and having a periscope therethrough adapted for shielded external viewing of a material contained in said cavity, said periscope comprising an objective portion enclosed in said top portion by water-tight windows and an eye-piece portion adapted to be removed from said top portion.

2. A viewing box for radioactive materials comprising, in combination, a bottom portion comprising a block of material of high atomic number, a recessed cavity in the top thereof, spaced parallel horizontal rollers at the bottom of said cavity, said cavity having sloping walls adapted to guide a cylinder placed therein to said rollers, a wheel mounted parallel with said rollers and having a flat portion on the perimeter thereof, at least the top portion of the perimeter being between said rollers, externally operated means for rotating said rollers and externally operated means for rotating said wheel, and a removable top portion comprising a block of material of high atomic number adapted to be placed on said bottom portion and having a periscope through said top portion adapted to permit external viewing of a material contained in said cavity, said periscope having a fixed water-tight portion and a removable portion.

3. A viewing box for radioactive materials comprising, in combination, an enclosed chamber including a bottom portion and a top portion, a periscopic viewer extending through the top portion, two spaced substantially parallel horizontal rollers at the bottom of said chamber, a wheel rotatable between said rollers on an axis below and approximately perpendicular to the rolling axes of said rollers, said wheel having a flat portion on the perimeter thereof, means external to said chamber for simultaneously rotating said rollers in the same direction and means external to said chamber for rotating said wheel.

4. A viewing box for radioactive materials comprising, in combination, an enclosed chamber including a bottom portion and a top portion, a periscopic viewer extending through the top portion, a pair of substantially parallel horizontal rollers in said chamber adapted to rotate a workpiece having a curved convex surface and a third roller between said pair of rollers rotatable on a horizontal axis below and perpendicular to the horizontal axes of said pair of rollers and adapted to move a workpiece longitudinally along said pair of rollers.

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