J. I. SOLOMON.

APPARATUS FOR EXAMINING MATTER OR OBJECTS IN QUANTITIES.

APPLICATION FILED APR. 24, 1906.

961,322. Patented June 14, 1910.

2 SHEETS—SHEET 1.

Fig. 1

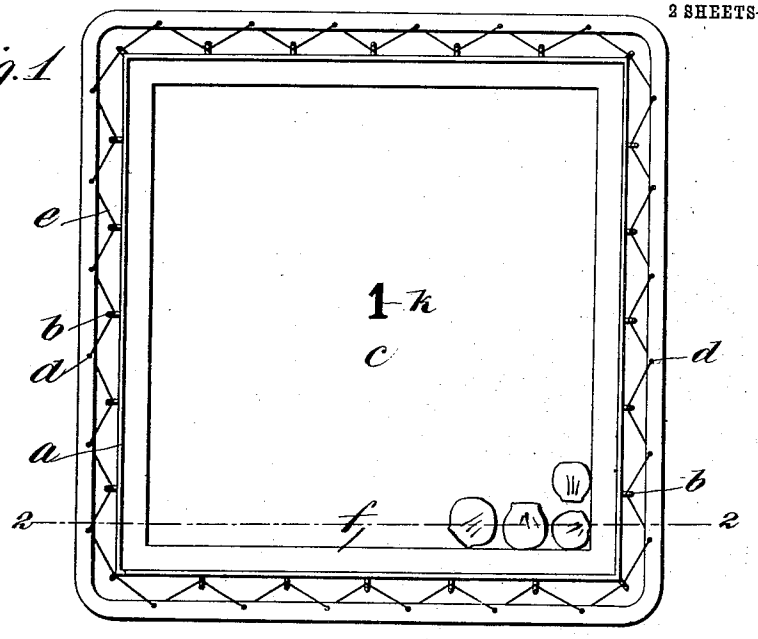


Fig. 2

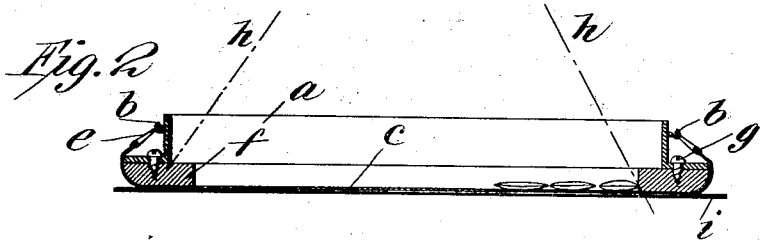
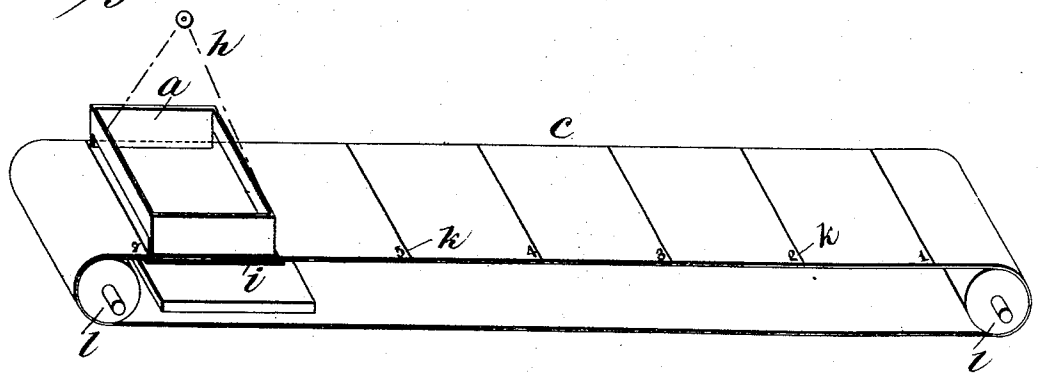


Fig. 3



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2 SHEETS—SHEET 2.

Fig. 4

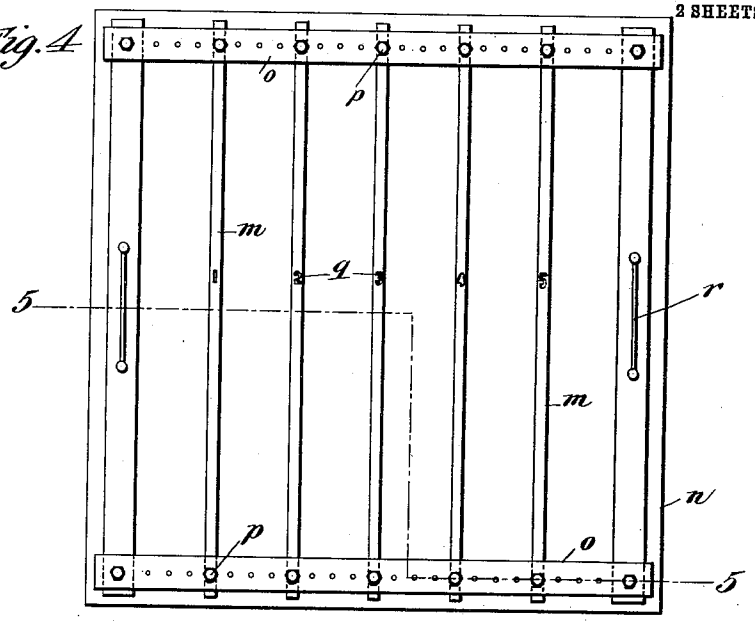


Fig. 5

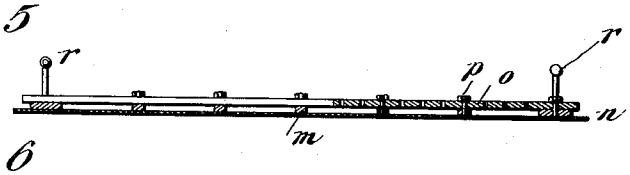
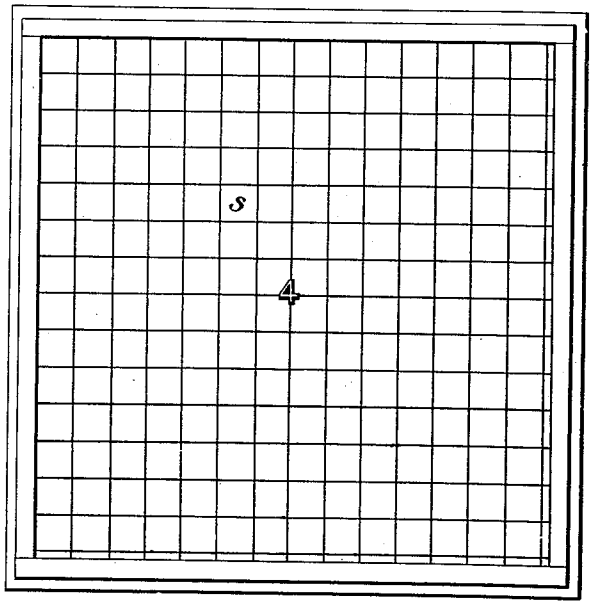


Fig. 6



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR EXAMINING MATTER OR OBJECTS IN QUANTITIES.

961,322. Specification of Letters Patent. **Patented June 14, 1910.**

Application filed April 24, 1906. Serial No. 313,454.

To all whom it may concern:

Be it known that I, JOHN I. SOLOMON, a citizen of the United States, residing in the borough of Manhattan, city of New York, State of New York, have invented a certain new and useful Apparatus for Examining Matter or Objects in Quantities, of which the following is a description.

The object I have in view is the production of means whereby objects in quantity or separate pieces of matter may be examined and their contents ascertained.

The invention is particularly designed for ascertaining the presence and the character of pearls in pearl oysters, mussels and other shell fish without injury to the shell fish; but the invention is not limited to the character of objects under consideration, as it may be used in connection with any object which it is desirable to examine.

The accompanying drawings illustrate means for carrying out the invention.

Figure 1 is a plan view of a tray embodying the invention, and Fig. 2 a sectional view thereof taken on the lines 2—2 of Fig. 1; Fig. 3 is a view, largely diagrammatical, showing a modified form of apparatus; Fig. 4 is a plan view of still another modification, and Fig. 5 is a sectional view thereof on the lines 5—5 of Fig. 4; Fig. 6 is still another modification.

In all of the several views like parts are designated by the same reference characters.

The invention comprises means for supporting the objects in such a manner that a radiographic picture may be taken of them, or they may be observed through the agency of the fluoroscope. This means may be in the form of a tray, pan, moving belt or other medium, and may be made of material which is not opaque to the passage of X-rays, Roentgen rays or other forms of rays other than light which are used, and will be placed adjacent to the sensitized surface and between the sensitized surface and the source of the rays, and a radiographic picture produced, or be placed between the source of rays and the fluoroscope when the latter is used. The supporting medium will preferably contain some designating device, so that the number, letter or other device used to indicate the particular object or group of objects will be radiographed at the same time upon the sensitive medium. While the sensitized medium is being developed, the supporting medium can be put to one side and another supporting medium with fresh objects may be subjected to the action of the rays and radiographed. When the radiographic picture has been developed, it may be compared with the objects in that particular tray or upon that particular portion of the moving belt, and the characteristics sought to be found in the objects can be positively ascertained.

In connection with pearl oysters, mussels or other shell fish, they may be supported upon a tray, which may be formed of canvas or any other material not obstructive to the passage of rays, or may be formed of a grid or network of material which does not obstruct the passage of the rays, but with the supports so arranged as not to affect the observation of pearls. The tray can be placed over a sensitized surface and exposed to the effect of the rays. When the sensitized surface is being developed, the tray containing the shell fish may be placed in water so that the shell fish will remain alive. After the sensitized surface is developed, the radiographic picture may be compared with the original shell fish of the picture, and the presence, size etc. of the pearls ascertained. This examination can be made without injuring the shell fish. After examination, the shell fish may be opened, or returned to the sea, or replanted. When replanted, they may be kept in such position as to be readily accessible and re-examined at intervals.

In the drawings, Figs. 1 and 2 represent one form of apparatus for carrying out the invention. *a* represents a frame, which may be made of metal and is provided with hooks *b* around its periphery. *c* is a canvas bottom, which has eyelets *d* around the edges. It is secured to the frame by means of a lacing *e* which passes through the eyelets and around the hooks. This lacing is so arranged that the canvas can be kept stretched and under tension, and yet by casting it off from the hooks, the canvas can be left supported upon a firm foundation and the frame removed and used in connection with another canvas. A supplemental wooden frame *f* may be secured to the metal frame *a* by means of screws *g*. This frame *f* has an opening somewhat smaller than the size of the frame *a*, so that the articles under examination will be kept away from the frame

a and will never be in such a position that rays will pass through the objects and be obstructed by the frame *a*. The outer edges of the frame *f* are rounded as shown, so that the canvas can be stretched around them without injury. As shown in Fig. 2, the articles under examination, which are shown to be shell fish, are placed upon the canvas and within the frame *f*, so as to be subjected to the action of the rays *h*. The sensitized surface *i*, which may be held closely against the other side of the canvas, will be affected by the rays, and a radiographic picture of the shell fish and their contents may be taken upon the sensitized surface. In order to distinguish the particular tray which is the subject of a picture, a device consisting of a number, letter, etc., such as *k*, made of a material which will obstruct the passage of the rays, is provided. This device *k* is preferably attached to the canvas, and it is to be understood that a different distinguishing mark is to be provided for each separate piece of canvas.

Fig. 3 shows a modification of the invention, in which the canvas *c* is in the form of an endless belt. Here the frame *a* is fixed, and the belt passes around rollers *l l*. Suitable means are provided for rotating the rollers and moving the surface *c*. The objects to be examined may be placed within the frame *a*, and the sensitized surface *i* placed below the canvas *c*. The canvas is shown as divided into sections with distinguishing devices *k* in each one, so that the separate pictures may be distinguished. In the operation of this modification, the objects may be placed within the frame and within one subdivision of the conveyer. The sensitized medium may then be placed under it, as shown, and a radiograph taken. The conveyer will then be moved by turning one or both of the rollers, so that the objects will be moved to one side and an uncovered portion of the conveyer exposed. More objects may then be placed within the frame and a second radiograph taken. This will be continued, the radiographs being developed while others are being taken. The conveyer belt should be sufficiently long so that the developed radiograph will be secured and compared with the corresponding objects without disturbing the continuity of action of the machine. Each radiograph will have printed upon it the distinguishing character of that portion of the conveyer, and the different objects may be identified before they are disturbed.

Figs. 4 and 5 show a further modification of the invention, in which a grid or grating is formed of metal or other material which may obstruct the passage of the rays. This grid is formed of bars *m m* which are connected to a frame *n*. The frame *n* carries cross-bars *o* having a series of holes therein. The bars *m* are carried between the frame *n* and cross-bars *o* by means of bolts or screws *p* which pass through the openings in the cross-bars and also through openings in the bars *m*. By the means shown, the position of the bars *m* may be adjusted so as to accommodate objects of different sizes and shapes. A distinguishing means, consisting of a number, letter, symbol, etc., may be made by perforating one or more of the bars *m* in the outline of the number, letter or distinguishing symbol. This is shown at *q*. Handles *r* may be used for the purpose of lifting the grating.

In Fig. 6 a modification is shown in which the surface is formed of a network of wires *s*. The meshes of this network are small enough to prevent the smallest object under examination passing through. In the device shown in Figs. 4 and 5, the objects, if they be shell fish, are placed upon the grid, the spaces between the bars *m* being so adjusted that the shell fish will be supported by engagement of their edges only. This is for the purpose of preventing a radiograph of a pearl in a shell fish being obscured by a picture of one of the bars *m*. In the device shown in Fig. 6 the wires which constitute the netting may be made so small that their presence may be disregarded, and the shell fish may be placed upon the netting without regard to the position of the wires.

It is to be understood that the invention is to be used in connection with means for producing X-rays, Roentgen rays, or any other rays penetrating matter opaque to light. The material of which the tray may be formed may, in addition to canvas, be of cork, fiber, wood, fabrics of all kinds, aluminum, celluloid, vulcanized rubber, or any other suitable material. Canvas duck is preferred, for the reason that it can be used without warping or distortion when subjected to the action of moisture, and also for the reason that it is cheap and durable.

A further modification of the invention may be made by utilizing the principles of the fluoroscope. In this form, in place of the sensitized medium, would be used the ordinary fluoroscope screen formed of any suitable material, as for instance the tungstate of barium or of strontium in crystallized form or barium platinum cyanid. The means supporting the objects should in this case be placed between the X-ray tube and the fluoroscope. The process herein disclosed is not claimed in this application, but forms the subject matter of my Patent No. 928,888, dated July 20th, 1909.

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

1. An apparatus for examining separated matter or different objects in quantity which comprises a fixed source of rays penetrating

matter opaque to light and a radiographic material, there being between the source of rays and the radiographic material a support for a plurality of objects under observation, such support being movable in relation to the source of rays, and being of such a character that the objects may be brought into the path of the rays and examined and removed from such path without changing their relative position, whereby the configuration, identity and contents of the objects may be observed.

2. An apparatus for examining separated matter or different objects in quantity which comprises a fixed source of rays penetrating matter opaque to light and a radiographic material, there being between the source of rays and the radiographic material a support for a plurality of objects under observation, the support comprising a frame with a movable bottom, so that the objects may be left upon the bottom without changing their relative position, such support being movable in relation to the source of rays, and being of such a character that the objects may be brought into the path of the rays and examined and removed from such path without changing their relative position, whereby the configuration, identity and contents of the objects may be observed.

3. An apparatus for examining separated matter or different objects in quantity which comprises a fixed source of rays penetrating matter opaque to light and a radiographic material of such a character that a permanent radiograph may be obtained, there being between the source of rays and the radiographic material a support for a plurality of objects under observation, the said support carrying means made of a material which obstructs the passage of the rays for indicating the identity of the particular support, such support being movable in relation to the source of rays, and being of such a character that the objects may be brought into the path of the rays and examined and removed from such path without changing their relative position, whereby the configuration, identity and contents of the objects may be observed.

This specification signed and witnessed this sixteenth day of April, 1906.

JOHN I. SOLOMON.

Witnesses:

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JOHN L. LOTSCH.