J. I. SOLOMON.

PROCESS FOR EXAMINING MATTER OR OBJECTS IN QUANTITIES.

APPLICATION FILED NOV. 25, 1907.

928,888. **Patented July 20, 1909.**

2 SHEETS—SHEET 1.

Fig. 1

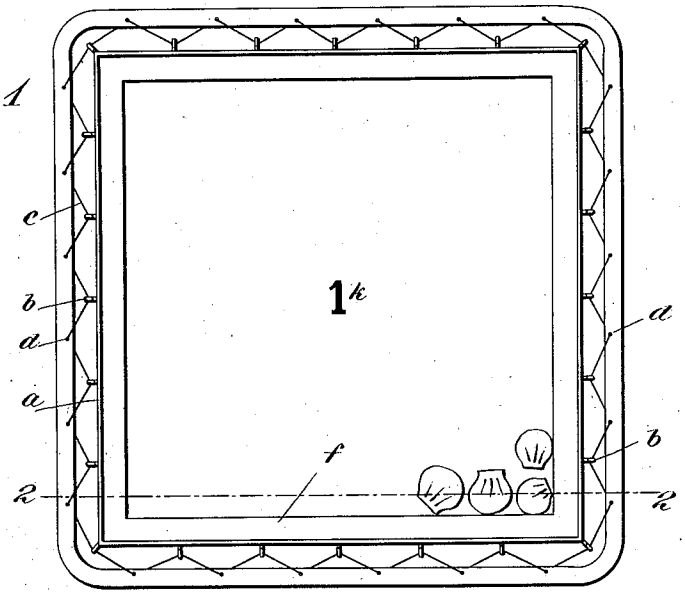


Fig. 2

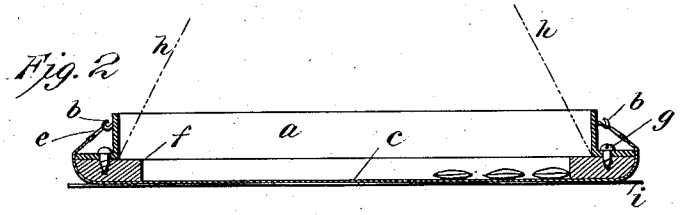
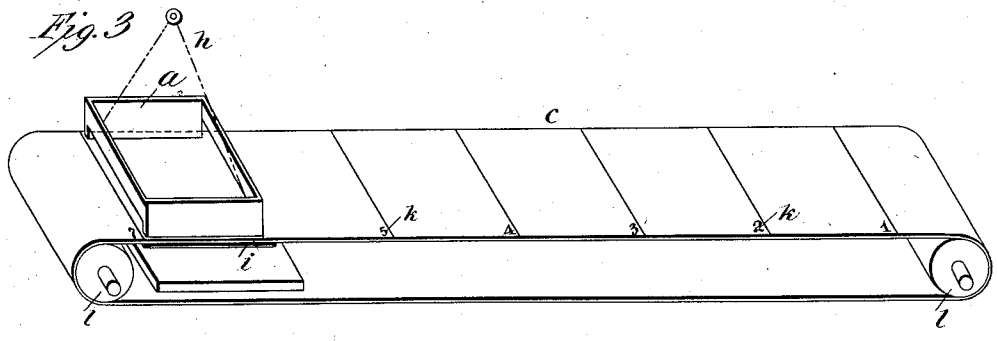


Fig. 3



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2 SHEETS—SHEET 2.

Fig. 4

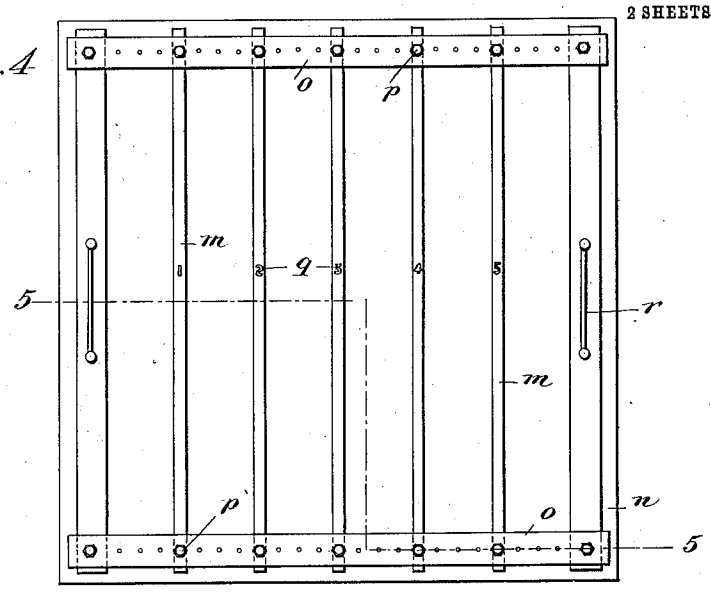


Fig. 5

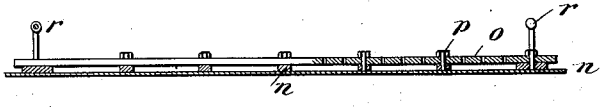
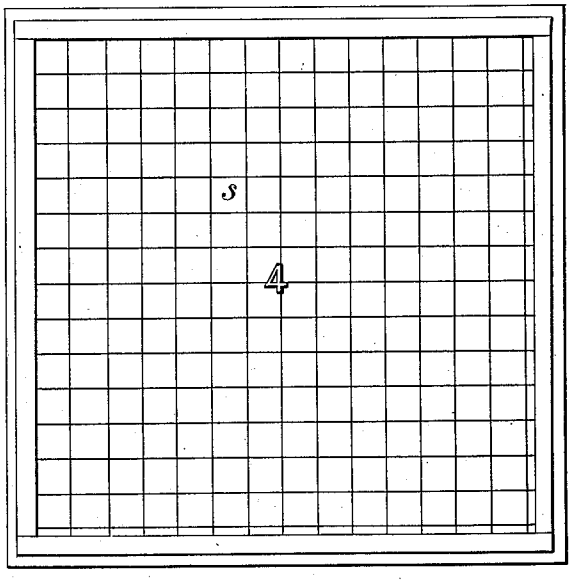


Fig. 6



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UNITED STATES PATENT OFFICE.

JOHN I. SOLOMON, OF NEW YORK, N. Y.

PROCESS FOR EXAMINING MATTER OR OBJECTS IN QUANTITIES.

No. 928,888. Specification of Letters Patent. Patented July 20, 1909.

Original application filed April 24, 1906, Serial No. 313,454. Divided and this application filed November 25, 1907. Serial No. 403,577.

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, county, and State of New York, have invented an Improvement in Processes for Examining Matter or Objects in Quantities, of which the following is a specification.

The object I have in view is the production of a process 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.

This application for patent is a division of an application for patent filed by me April 24, 1906, No. 313,454.

The accompanying drawings illustrate the means whereby my process may be practiced.

Figure 1 is a plan view of a tray for carrying out the process. Fig. 2 is a sectional view thereof taken on the line 2—2 of Fig. 1. Fig. 3 is a view largely diagrammatical showing a modified form of apparatus for carrying out the process. Fig. 4 is a plan view of still another modification. Fig. 5 is a sectional view thereof on the line 5—5 of Fig. 4; and Fig. 6 is a plan view of still another modification.

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

In carrying out my invention I employ a means for supporting the objects in such a manner that a radiographic picture may be taken of them. 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 the X-rays, Roentgen rays or other forms of rays other than light which are used, and will be placed adjacent to a radiographic material such as paper, having a sensitized surface, and between the radiographic material and the source of the rays, and a radiographic picture thereby produced. The supporting medium will preferably contain some designating device, so that the number, letter or other symbol used to indicate the particular object or group of objects will be radiographed at the same time upon the sensitive medium. While the radiographic material is being developed, the supporting means can be put to one side and another supporting means 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 the particular objects on the moving belt or other supporting medium, 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 other material not obstructive to the passage of the rays, or it 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 within the shell fish. The tray will then be placed over a radiographic material and exposed to the effect of the rays. When the radiographic material is being developed the tray containing the shell fish may be placed in water so that the shell fish will remain alive. After the radiographic material is developed the radiographic picture thus produced may be compared with the original shell fish of the particular picture, and the presence, size and other characteristics 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 reëxamined at intervals.

In the drawings, Figs. 1 and 2 represent one form of apparatus which may be used in connection with my process. *a* represents a frame which may be made of metal, and is provided with hooks *b* around its periphery. *c* is a bottom, preferably of canvas or other

flexible material, which has eyelets *d* around its edges. The bottom 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 bottom can be kept stretched and under tension, and yet by casting it off from the hooks the bottom can be left supported upon a firm foundation and the frame removed and used in connection with another bottom. A supplemental wooden frame *f* may be secured to the metal frame *a* by means of the screws *g*. This frame *f* has an opening somewhat smaller than the size of the frame *a*, so that the articles under examination may be kept away from the frame *a* and will never be in such a position that the rays will pass through the objects and be obstructed by the frame *a*.

In carrying out my process, the articles under observation (as shown in Fig. 2) which are shown as shell fish, are placed upon the bottom *c* and within the frame *f*, so as to be subjected to the action of the rays *h*. The radiographic material *i*, which may be held closely against the other side of the bottom *c*, will be acted on by the rays, and a radiographic picture of the shell fish and their contents will thus 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 or other symbol, 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 means for carrying out the process. In this modified means the canvas *c* is in the form of an endless belt. In this modification the frame *a* is fixed, and the belt passes around rollers *l*—*l*. Suitable means is provided for rotating the rollers and moving the surface *c*. The objects to be examined may be placed within the frame *a*, and the radiographic material *i* placed below the canvas *c*. The belt is shown as divided into sections with distinguishing devices *k* at each end, so that the separate pictures may be distinguished. In the modification of the process used in connection with this means, the objects may be placed within the frame and upon one subdivision of the belt. The radiographic material may then be placed under it, as shown, and a radiograph taken. The belt will then be moved by turning one or both of the rollers, so that the objects will be placed 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 operation will be continued, the radiographs being developed while others are being taken. The conveyer belt should be sufficiently long so that there will be time for the developed radiograph to 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 belt, and the different objects may therefore be readily identified before they change their relative positions.

Figs. 4 and 5 show a means whereby the process may be further modified. In this means the support is in the form of a grid or grating of metal or of 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 or other symbol, may be made by perforating one or more of the bars *m* in the outline of the number, letter or other distinguishing symbol. This is shown at *q*. Handles *r* may be used for the purpose of lifting the grating.

In Fig. 6, a modification of the supporting means is shown, in which the supporting surface is formed of a net-work of wires *s*. The meshes of this net-work are small enough to prevent the smallest object under examination from 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 engage by their edges only. This is for the purpose of preventing a radiograph of a pearl in a shell fish being obscured or obstructed by 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 in this construction the shell fish may be placed upon the netting without regard to the position of the wires.

It is to be understood that the process can be carried out with any 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 mate-

rial. 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. Canvas-duck also may be made water-proof when used in place of the other materials above enumerated for protecting the sensitized radiographic material from the action of water.

The apparatus herein described is not claimed in this application but forms the subject matter of an application for patent filed by me the 24th day of April, 1906, Serial No. 313,454.

In accordance with the provisions of the patent statutes, I have described the principle of my invention, together with the process which I now consider to represent the best embodiment thereof, but I desire to have it understood that the process shown is merely illustrative and that the invention can be carried out in other ways.

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

1. The process of examining separated matter or different objects in quantity, which consists in first placing the objects in a predetermined order on a movable support, then placing the support within a fixed source of rays penetrating matter opaque to light, and a radiographic material, then removing the support without changing the position of the objects and developing the radiograph, then repeating these operations with other supports and radiographic materials while the first radiograph is being developed, then comparing the objects on the support with the radiograph, and finally comparing successive radiographs with their respective subjects.

2. The process of examining shell fish to ascertain the presence and other characteristics of pearls, which consists in first placing the shell fish in a predetermined order on a support, then placing the support between a source of rays penetrating matter opaque to light, and radiographic material, then removing the support without changing the position of the objects and developing the radiograph, then placing the support in water to keep the shell fish alive, then repeating these operations with other supports and radiographic materials until the first radiograph is developed, then comparing the objects on the supports with the radiograph, and finally comparing the successive radiographs with their respective subjects.

3. The process of examining separated matter or different objects in quantity, which consists in first placing the objects in a predetermined order on a movable support, then placing the support within a fixed source of X-rays or Roentgen rays, and a radiographic material, then removing the support without changing the position of the objects and developing the radiograph, then repeating these operations with other supports and radiographic materials while the first is being developed, then comparing the objects on the support with the radiograph and finally comparing successive radiographs with their respective subjects.

4. The process of examining shell fish to ascertain the presence or other characteristics of pearls, which consists in first placing the shell fish in a predetermined order on a support, then placing the support between a source of X-rays or Roentgen rays and radiographic material, then removing the support without changing the position of the object and developing the radiograph, then placing the support in water to keep the shell fish alive, and repeating these operations with other supports and radiographic materials until the first radiograph is developed, then comparing the objects on the supports with the radiograph, and finally comparing the successive radiographs with their respective subjects.

5. The process of examining separated matter or different objects in quantity, which consists in first placing the objects in a predetermined order on a movable support, then placing the support within a fixed source of X-rays or Roentgen rays and a radiographic material and removing the support without changing the position of the objects and developing the radiograph, finally comparing the objects on the support with the radiograph.

6. The process of examining shell fish to examine the presence or other characteristics of pearls, which consists in first placing the shell fish in a predetermined order on a support, then placing the support between a source of X-rays or Roentgen rays and the radiographic material, then removing the support without changing the position of the objects, and developing the radiograph, then placing the support in water to keep the shell fish alive, and finally comparing the objects on the support with the radiograph.

7. The process of examining separated matter or different objects in quantity, which consists in first placing the objects in a predetermined order on a movable support, then placing the support within a fixed source of rays penetrating matter opaque to light and a radiographic material, then removing the support without changing the position of the objects and developing the radiograph, finally comparing the objects on the support with the radiograph.

8. The process of examining shell fish to ascertain the presence and other character-

istics of pearls which consists in first placing the shell fish in a predetermined order on a support, then placing the support between a source of rays pen trating matter opaque to light, and the radiographic material then removing the support without changing the position of the objects then developing the radiograph, then placing the support in water to keep the shell fish alive, and finally comparing the objects on the support with the radiograph.

This specification signed and witnessed this 14th day of November, 1907.

JOHN I. SOLOMON.

Witnesses:
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