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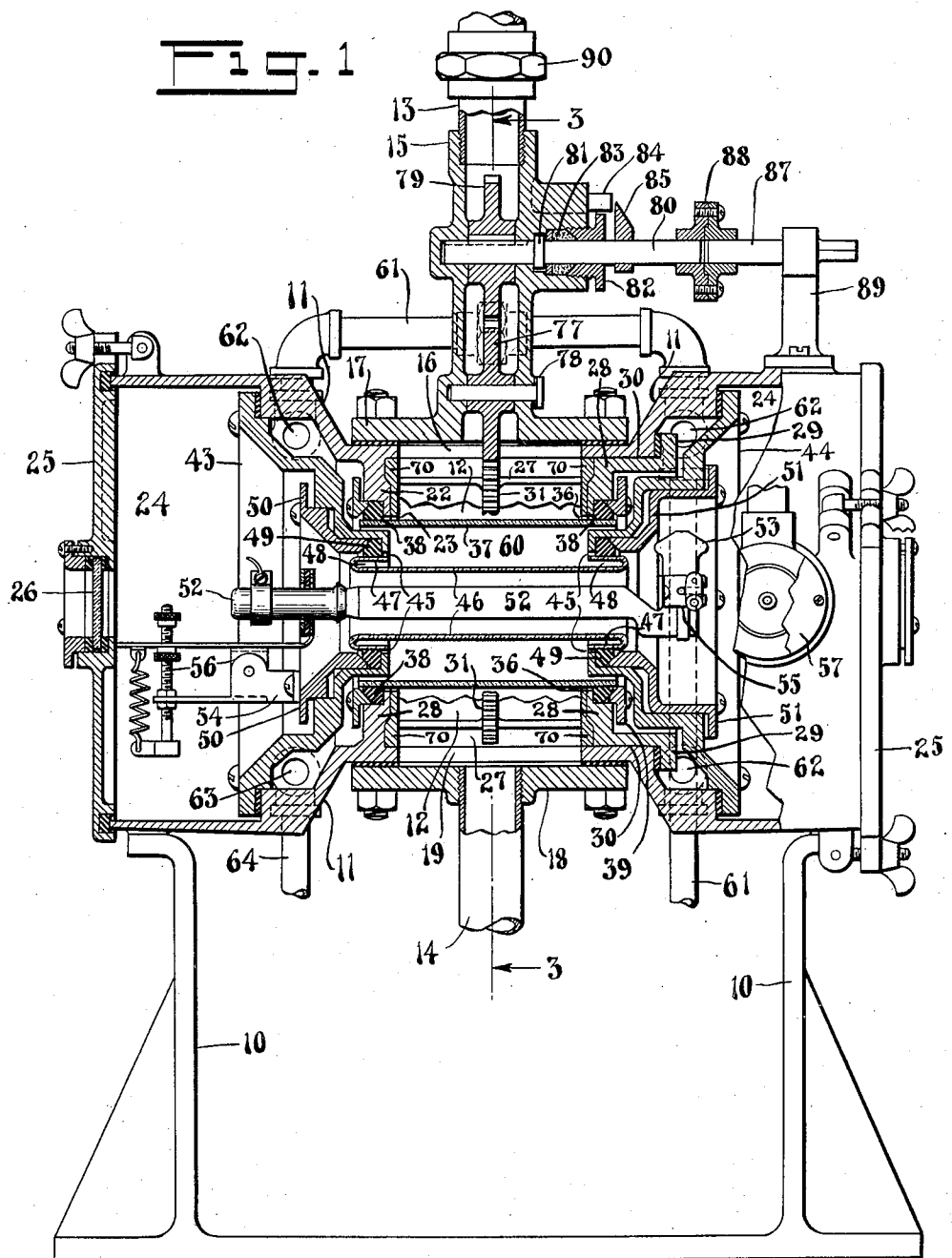
H. M. CREIGHTON ET AL

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ACTIVE RAY TREATING DEVICE

Original Filed Oct. 8, 1931

2 Sheets-Sheet 1



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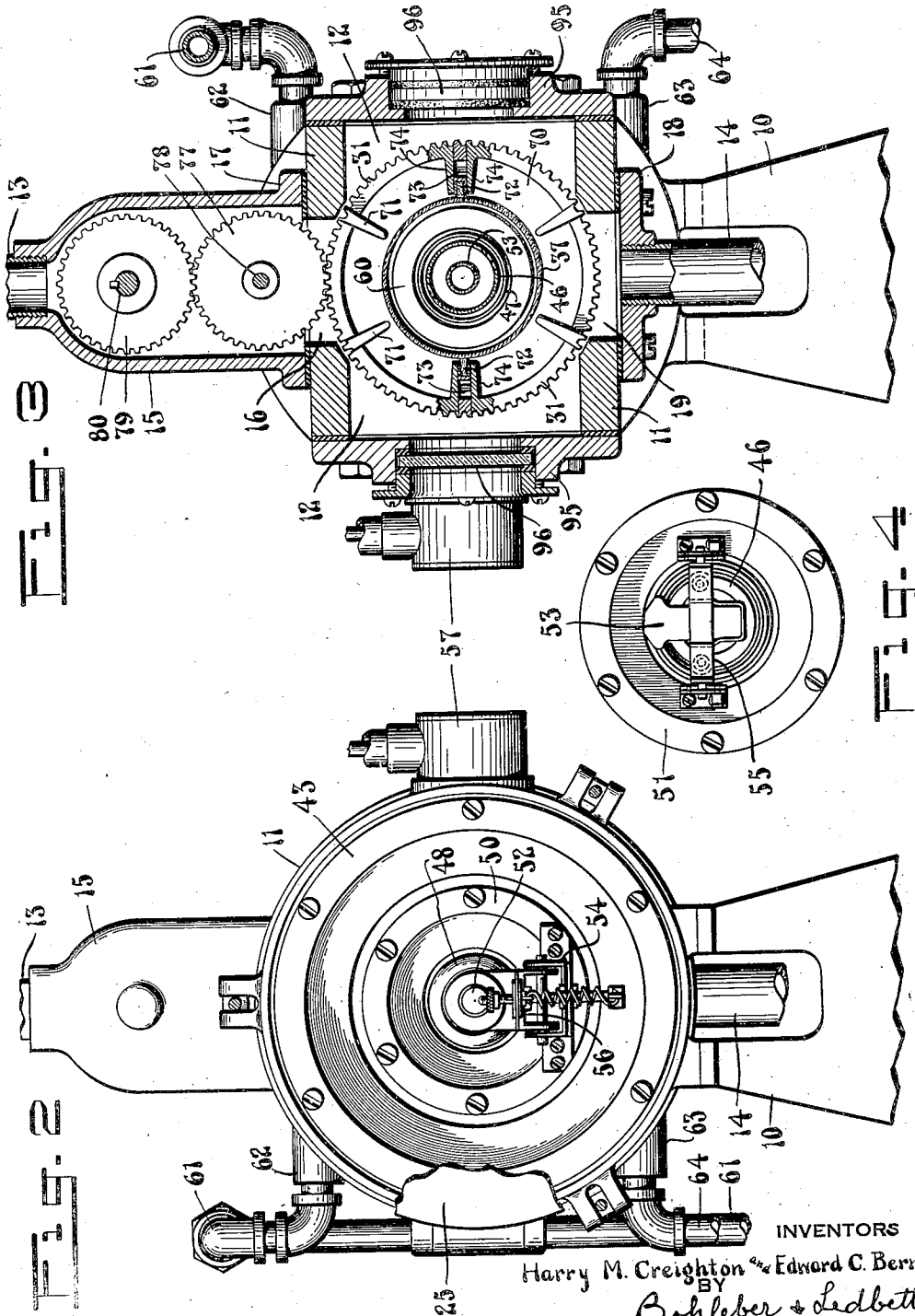
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UNITED STATES PATENT OFFICE

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ACTIVE RAY TREATING DEVICE

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9 Claims. (Cl. 99—2)

This invention comprises improvements in apparatus for treating substances with ultra-violet rays in such a manner that the substances treated shall have imparted thereto or acquire by virtue of such treatment, certain desirable characteristics which are usually those possessed or induced by the rays utilized for the treatment. Particularly, the invention embodies an improved irradiating apparatus constructed within a closed housing forming a treating chamber through which the substance is adapted to pass a source of ultra-violet light surrounded by a transparent tube in combination with means for wiping the surface of the tube to clean off particles of the substance which collect thereon due to the heat generated by the lamp and the action of the light rays emanating therefrom.

Our present invention is directed to improvements in machines such as that illustrated and described in our copending applications Serial No. 336,807 filed February 1, 1929 and Serial No. 418,027 filed January 2, 1930.

One of the objects of our invention is to construct an active ray treating machine having revoluble tube wipers mounted in the treating chamber and adapted to be rotated by gears mounted in a removable casing forming a part of the inlet pipe for supplying substance to the machine.

Another object is to provide for operating the tube wipers from the outside of the treating chamber by means having cooperative portions adapted to operate through the inlet opening of the treating chamber.

Another object is to provide for removing the wipers and the gears by which they are operated so that these parts may be easily cleaned. Another object is to produce a machine in which the course traversed by the substance to be treated is formed in the housing of the machine by removable parts.

Other objects and advantages will either become apparent from the description of our invention or be specifically pointed out hereinafter.

Referring to the drawings which form a part of our specification:

Figure 1 shows a side elevational view partly in section of our active ray treating machine wherein tube wipers are mounted in a revoluble cage carrying a centrally disposed spur gear adapted to be operated by gears mounted in a casing forming an antechamber disposed at the top of the machine outside the treating chamber.

Figure 2 is a front elevation of the machine shown in Figure 1 with a cover plate removed to illustrate the manner in which the front end of the ultra-violet light is mounted in the machine.

Figure 3 is a sectional elevation of the machine taken on line 3—3 of Figure 1 showing the relationship between a quartz tube and a wiper adapted to wipe the outside surface thereof together with means for operating the wiper.

Figure 4 shows an end view of one of the packing glands of the machine and the manner in which the back end of the mercury vapor lamp is mounted thereon.

Referring now to the above described drawings in which reference numerals are employed to designate corresponding parts illustrated in the several figures thereof, and particularly to Figures 1, 2 and 3, it will be seen that our machine comprises a base 10 adapted to rest upon the floor or any suitable mounting and a housing 11, forming a treating chamber 12 to which the substance to be treated may be conducted by a pipe 13 and from which it may be withdrawn, by a pipe 14. As a matter of fact it is immaterial which of the pipes 13 and 14 is used as an inlet and which pipe is used as an outlet for the substance, because the treatment of substances may be effective irrespective of the direction in which it is coursed through the machine. We prefer however for reasons which will be mentioned below, to use the pipe 13 as an inlet and the pipe 14 as an outlet.

The pipe 13 is connected to the treating chamber 12 through a casing 15, which is adapted to fit over and register with an inlet port 16, formed in the upper part of the treating chamber. The casing 15 is secured to the housing 11 by means of a flange portion 17.

The pipe 14 is secured to the housing 11 by a flange 18, corresponding to the flanged portion 17 of the casing 15, and is adapted to receive substances from the treating chamber through an outlet port 19.

The inside portion of the housing 11 is provided with an end wall 22 having a circular opening 23 formed therein. The housing 11 is flared outwardly at each end beyond the treating chamber 12 to form chambers 24 at the front and back of the machine. Doors 25, provided with peep holes 26, are hinged at the front and back of the machine and adapted to be locked or fastened to the housing in any suitable manner for closing the chambers 24 to prevent the accumulation of dust and dirt therein and at the same time permit

one to observe the operation of the machine without opening the doors 25.

A cylindrical cage indicated generally by the numeral 27, is rotatably mounted in the housing 11 between the wall 22 and a gland 28 secured to the housing, at 29. The gland 28 also serves to close an opening 30, in the housing, through which the cage is inserted into the machine. A spur gear 31, having an outside diameter equal to that of the cage 27, is formed about a central diameter of the cage and is adapted to extend into the inlet and outlet ports 16 and 19, respectively.

The gland 28 is provided with a circular opening 36, of the same size and shape as the opening 23, which is coaxially disposed at the opposite side of the housing. A tube 37 is mounted in the wall 22 and gland 29 through the openings 23 and 36 by means of packing rings 38, disposed in counter-bored recesses around the openings, and drawn tightly around the ends of tube 37 by means of packing glands 39.

Hollow tube supports 43 and 44, having their central portions formed to project inwardly in a manner somewhat similar to truncated cones, are provided with coaxially disposed openings 45 located in the planes occupied by the openings 23 and 36, respectively. A tube 46, having its ends flared outwardly and bent back upon itself to form reversely extending collars 47 integral with the tube 46 and spaced therefrom to form a chamber portion 48 between the tube 46 and the collar 47, is mounted in the supports 43 and 44 by means of packing rings 49 held in position by packing glands 50 and 51. It will be seen from Figure 1 that plate 44, and the gland 51 to which it is connected, are slightly different in shape than the plate 43 and the gland 50 in order to provide room for mounting a mercury vapor lamp 52, having an enlarged end 53, within the tube 46.

Inasmuch as the mercury vapor lamp, its operating means, its mounting, and the manner in which electric current is supplied thereto, per se, forms no part of our present invention, we shall not describe it other than to say that it is mounted on horizontal supports 54 and 55 mounted on the glands 50 and 51, respectively. The lamp is equipped, however, with tilting mechanism 56 of any well known type for starting the flow of current or arc through the lamp when it is desired to illuminate it. 57 indicates a junction box through which electric service wires are brought to the lamp 52.

It will now be seen that between the frame 11 of the machine, tube 37, glands 43, 44 and tube 46 is formed a chamber 60 independent of the treating chamber 12 and surrounding the lamp 52. A pipe 61 having three outlet openings 62 is provided for conducting a filtering or cooling medium to the chamber 60 at three different points within the chamber. An opening 63 in the chamber 60 to which a pipe 64 is connected provides means for discharging the filtering medium from the chamber and conducting it back to any suitable source of supply, not shown, and from which it may again enter the chamber 60 through the pipe 61, if desired. By providing for the introduction of a filtering or cooling medium into the chamber 60 at three different points, we are able to keep the medium moving and prevent the formation of still pools in the more remote and inaccessible portions of the chamber.

Referring now to Figures 1 and 3, it will be seen that the cage, which has been referred to above, and generally indicated by the numeral 27, is formed by a pair of spaced rings 70 having

an inside diameter equal to the diameter of the openings 23 and 36. Baffles 71, of a width adapted to extend from the circumference of the rings 70 to a point near the surface of the tube 37 and of a length equal to the length of the treating chamber and adapted to extend parallel to the axis of the machine, are mounted on the rings 70 to direct the flow of substance through the inlet and outlet openings 16 and 19. These baffles are positioned on the rings 70 in pairs so as to register with the ends of the inlet and outlet ports 16 and 19 at the top and bottom of the housing respectively. The inner edges of the baffles 71 are spaced from the tube 37 to permit the passage of substance in proximity to the tube and insure that all portions thereof pass the tube so that the substance is uniformly exposed to the light rays. Wipers 72, provided with means 73 for yieldably pressing them against the tube 37, are mounted between spaced guide plates 74, secured to the rings 70. The gear 31 above referred to, is carried by or formed integral with the baffles 71 and guide plates 74.

A pinion 77, rotatably mounted in the casing 15 on a stud 78, is adapted to be rotated by a pinion 79 carried by the shaft 80 also mounted in the casing 15. The shaft 80 is provided with a thrust collar 81 and is packed in the casing 15 by a gland 82 and packing 83.

The number of teeth in the gear 31 is an even multiple of the number of teeth in the pinion 79 so that when the baffles 71 on the cage 27 are properly located with respect to the openings 16 and 19 the cage 27 may be revolved about the tube and the baffles again positioned properly with respect to the openings by merely counting the number of times the shaft 80 is rotated. In the machine shown in the drawings, the gear 31 has twice as many teeth as the pinion 79 so that when the pinion 79 and shaft 80 are rotated twice the cage 27 will make one complete revolution. The openings 16 and 19, and baffles 71 on the cage 27, are symmetrically located with respect to one another so that when the wipers are horizontally disposed in the treating chamber 12, the baffles will occupy the position shown in Figure 3. If the cage is rotated through a one-half revolution, the baffles shown in Figure 3 at each side of the opening 16 will be rotated to a position at each side of the opening 19, and the baffles at each side of the opening 19 will be moved to a position adjacent the opening 16. To indicate the position of the baffles with respect to the opening when the machine is closed, we provide a fixed point 84 on the casing 15 and an index pointer 85 on the shaft 80 such that when the pointer 85 is brought to register with the point 84, the operator may know that the cage and baffles are properly located with respect to the openings 16 and 19.

An extension shaft 87, connected to the shaft 80 by coupling 88, is mounted for rotation in a bearing 89 secured to the housing 11. The pipe 13 is connected to the casing 15 through a union 90.

It will now be seen that by disconnecting the coupling 88 and union 90, the casing 15 and pinions mounted therein may be removed from the machine as a unit when the flange 17 is disconnected from the housing 11. This will rarely be necessary except for cleaning, although at such time it is possible to place the casing 15 in a bath of boiling water to sterilize it. One of the reasons why it is best to use the port 16 as an inlet port is, that if through inadvertence, 75

the casing 15 and pinions 77 and 79 are not thoroughly cleaned and substance is contaminated during its passage into the machine, it will be sterilized when it passes the light and afterwards pass directly out of the machine without coming into contact with any parts from which it may again be contaminated.

Each side of the treating chamber 12 is closed by cover plates 95 provided with glass covered peep holes 96 through which the operation of the machine may be observed.

An important feature of this invention is the production of a machine having baffles and rotatable tube wipers disposed in a treating chamber of small volumetric capacity and providing means for operating said wipers without providing openings in the treating chamber other than the inlet and outlet openings.

It will be seen that machines constructed in accordance with our invention provide means for mounting baffles and tube wipers in the treating chamber of the machine whereby the benefits derived from such baffles are not sacrificed by the desirability of having a treating chamber of such a construction that it may be completely and readily opened up for inspection and cleaning. Moreover, in constructing a machine in accordance with our present invention, the interior of the machine may be made free from inaccessible corners and crevices.

While we have described what now appears to be a preferred embodiment of the invention, we do not desire to be limited to the construction shown because, obviously, such construction is susceptible of modification without departing from the spirit of our invention nor the scope of the appended claims.

What is claimed is:

1. A machine for treating substances with active rays comprising a treating chamber, a transparent tube mounted in said chamber, a source of active rays mounted within the tube, means providing inlet and outlet openings in the chamber through which the substance is adapted to pass to and from the chamber, in combination with wipers mounted in the chamber and adapted to be revolved about the tube by means extending through the inlet opening, means extending through the inlet opening for revolving said wipers, said means comprising pinions mounted in a removable casing located over the inlet opening.

2. A machine for treating substances with active rays comprising a treating chamber, a transparent tube mounted in said chamber, a source of active rays mounted within the tube, means providing inlet and outlet openings in the chamber through which the substance is adapted to pass to and from the chamber, and removable means located over the inlet opening, in combination with wipers mounted in the chamber and adapted to be revolved about the tube; and mechanism supported in said treating chamber and removable means, comprising portions cooperatively disposed within the inlet opening to revolve said wipers.

3. A machine for treating substances with active rays comprising a treating chamber, a transparent tube mounted in said chamber, a source of active rays mounted within the tube, means providing inlet and outlet openings in the chamber through which the substance is adapted to pass to and from the chamber, in combination with removable baffles in the chamber adapted to direct the substance being treated to a point

near the tube, a wiper adapted to be yieldably pressed against the surface of the tube; and means for revolving the wiper about the tube to wipe a surface thereof without removing the baffles.

4. A machine for treating substances with active rays comprising a treating chamber, a transparent tube mounted in said chamber, a source of active rays mounted within the tube, inlet and outlet means in the chamber having openings through which the substance is adapted to pass to and from the chamber, in combination with a cage mounted in the chamber and adapted to be revolved about the tube; said cage comprising baffles parallel to the axis of the tube and adapted to be respectively positioned at a point adjacent each side of the inlet and outlet means, and a pair of tube wipers adapted to be yieldably pressed against the surface of the tube; and means for revolving said cage to wipe the surface of the tube.

5. A machine for treating substances with active rays comprising a treating chamber, a transparent tube mounted in said chamber, a source of active rays mounted within the tube, inlet and outlet means in the chamber having openings through which the substance is adapted to pass to and from the chamber, in combination with a cage mounted in the chamber and adapted to be revolved about the tube; said cage comprising four spaced baffles parallel to the axis of the tube and adapted to be respectively positioned at a point adjacent each side of the inlet and outlet means, and a pair of tube wipers adapted to be yieldably pressed against the surface of the tube, means for revolving said cage to wipe the surface of the tube, and indexing means for determining the position of the cage and baffles with respect to the inlet and outlet means.

6. A machine for treating substances with active rays comprising an ultra-violet lamp mounted in a treating chamber, a transparent tube rigidly mounted in said chamber surrounding the lamp, inlet and outlet means having openings through which substance is adapted to pass to and from the chamber, in combination with a cage mounted in the chamber and adapted to be revolved about the tube as desired; said cage comprising baffles to direct the flow of substance toward the tube when the cage is stationary, and wipers to clean the surface of the tube when the cage is revolved about the tube; means for revolving the cage; said revolving means comprising a gear mounted on the cage, and adapted to extend into the inlet opening, a casing mounted over the inlet opening, a pinion mounted in said casing and extending into the inlet opening meshing with said gear, and means for rotating said pinion.

7. A machine for treating substances with active rays comprising a treating chamber, a transparent tube mounted in said chamber, a source of active rays mounted within the tube, means providing inlet and outlet openings in the chamber through which the substance is adapted to pass to and from the chamber, in combination with removable baffles in the chamber adapted to direct the substance being treated to a point near the tube, a wiper adapted to wipe the surface of the tube; and means for revolving the wiper about the tube to wipe a surface thereof without removing the baffles.

8. A machine for treating substances with active rays comprising a treating chamber, a transparent tube mounted in said chamber, a source

of active rays mounted within the tube, inlet and outlet means in the chamber having openings through which the substance is adapted to pass to and from the chamber, in combination with a cage mounted in the chamber and adapted to be revolved about the tube; said cage comprising baffles parallel to the axis of the tube and adapted to be respectively positioned at a point adjacent each side of the inlet and outlet means, and a pair of tube wipers adapted to wipe the surface of the tube; and means for revolving said cage to wipe the surface of the tube.

9. A machine for treating substances with active rays comprising a treating chamber, a transparent tube mounted in said chamber, a source of active rays mounted within the tube, inlet

and outlet means in the chamber having openings through which the substance is adapted to pass to and from the chamber, in combination with a cage mounted in the chamber and adapted to be revolved about the tube; said cage comprising four spaced baffles parallel to the axis of the tube and adapted to be respectively positioned at a point adjacent each side of the inlet and outlet means, and a pair of tube wipers adapted to wipe the surface of the tube, means for revolving said cage to wipe the surface of the tube, and indexing means for determining the position of the cage and baffles with respect to the inlet and outlet means.

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