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S. P. LYON

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INSIDE RIVET INSPECTION DEVICE

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T2270

X2187

X2566

X2170

X2260

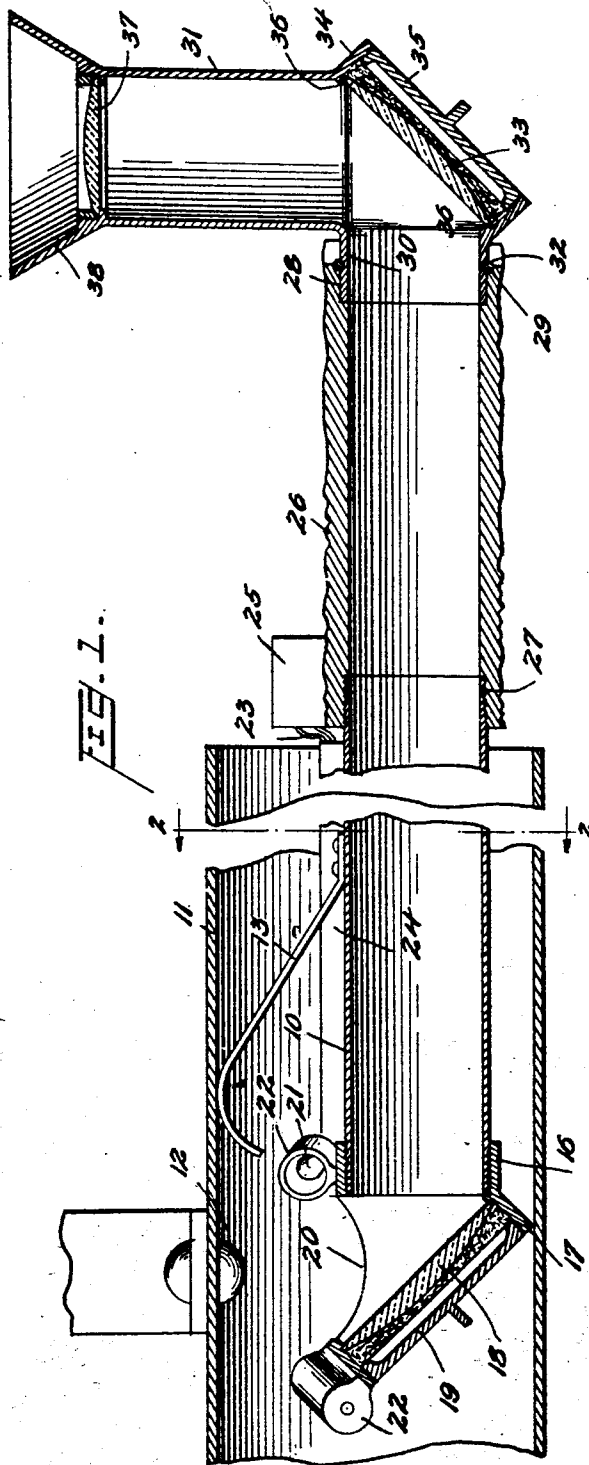
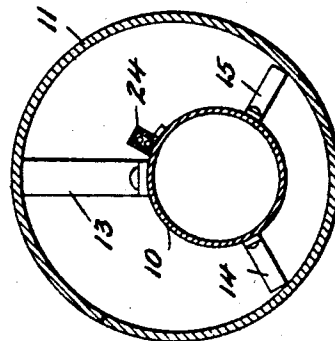


FIG. 2.

Inventor
S. P. Lyon.R. C. H. H. H. H.
Attorney

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SIDNEY P. LYON, OF DAYTON, OHIO.

INSIDE-RIVET-INSPECTION DEVICE.

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This invention relates to a device for use in inspecting inside rivets of the structural tubes of an airplane, boiler or the like.

The primary object of the invention is to provide a device whereby the inner rivets of a tubular connection or other obscure location may be conveniently inspected in order to ascertain the character of the riveted joint. The invention is particularly applicable to an annular row of rivets since a part of the device may be turned so as to bring all of the rivets of the row within the field of view with a single setting of the instrument.

Other objects of the invention consisting of novel features of construction and arrangement of parts will become apparent as the description proceeds. The invention is hereinafter described in connection with the accompanying drawings, in which:

Figure 1 is a longitudinal vertical section through the device, and

Figure 2 is a transverse section on the line 2—2 of Fig. 1.

A tube 10 forms the body of the inspection instrument. This tube is adapted to be inserted within a larger tube or hollow body 11 which may be part of an airplane frame, a boiler tube, or the like. Two tubes may be secured together by riveting or another element may be riveted to the tube 11 as indicated at 12. In order to support the tubular body 10 in spaced relation to the walls of the body 11, a number of spring fingers, three as shown on the drawing and designated 13, 14, 15, are each fastened at one end to the tubular body 10 and bear at the other end upon the inner wall of tube 11. One of these springs, the spring 13, as herein shown, extends laterally to a greater distance and is stronger than the other springs so that the tube 10 is held eccentrically with relation to the axis of body 11 for a purpose which will hereinafter appear.

An attachment 16 is threaded on one end of the tube 10. This attachment is formed with a part 17 angularly disposed in relation to the axis of tube 10, preferably at an angle of 45°. A mirror 18 is placed in a plug 19 which detachably engages said part 17 so that the mirror is set at an angle of 45° to the axis of the tube. An objective opening 20 is formed through the wall of the attachment 16 vertically above the mirror 18 so that light rays from the illuminated

rivet heads in tube 11 may be reflected by said mirror through the tube 10. For illuminating the rivet heads or other objects, electric light bulbs 21 are mounted in sockets carried by the attachment 16 at opposite sides of the opening 20. Shields 22 forming part of these sockets prevent light rays from passing from said bulbs directly to the mirror. Conductors 23 pass from the bulbs 21 through a housing 24, preferably attached to tube 10, to a plug 25 which is carried by a knurled grip 26 secured at one end to the tube 10.

The tubular grip 26 extends beyond the threaded end 27 of tube 10, and is formed at the other end with an interior annular recess 28 having an annular groove 29 communicating therewith. In the recess is inserted an annular flange 30 forming part of a laterally extending eye piece 31. This flange is also provided with an annular groove which is adapted to register with the groove 29 for the purpose of receiving a wire 32 or other retainer which will permit the grip 26 and tube 10 to have rotational movements independent of the eye piece tube 31, but restrain the eye piece tube and grip from relative lateral movement. For the purpose of assembling the wire 32 within the grooves, the end of the grip may be made in sections one of which is detachable, as indicated in Fig. 1, by the part of the grip not section-lined, the detachable part not being shown. The eye piece proper is angularly disposed preferably at an angle of 90°, in relation to the flange 28 thereof, and a mirror 33 is located in a frame at the juncture of said eye piece tube and flange, so as to be disposed at an angle of 45° with the longitudinal axis of tube 10. This frame is integral with the eye piece tube and consists of an annular flange 34 in which the mirror is supported by a detachable plug 35 and lugs 36. A magnifying lens 37 is located at the outer end of the eye piece tube 31 and an outwardly flaring eye shield 38 is associated therewith.

Assuming that the plug 25 is properly connected to a source of electric current and it is desired to inspect rivet heads within the body 11; tube 10 is inserted into the hollow body until the opening 20 comes opposite one or more rivets. Light bulbs 22 illuminate the rivet heads and the rays of light from the latter are reflected by mirror 18 to mirror 33 and thence to the magnify-

ing lens 37 where the observer sees a magnified image of the rivet heads and can clearly ascertain the condition of the riveted connection. If an annular row of rivets are under examination the observer grasps the grip 26 and turns it and tube 10, the eye piece meanwhile remaining stationary whereby all of the rivets are brought successively into the field of view. The spring fingers place the tube 10 so that the objective opening 20 is spaced a considerable distance from the rivets under inspection whereby a distinct view thereof may be obtained. This device is portable and adapted to be readily connected to any convenient lighting circuit in order to inspect the interior condition of a hollow body which may be of other form than tubular.

I claim:

1. A device for inspecting the interior of a hollow body, comprising a tube, means for slidably supporting the tube in said body in spaced relation to the walls thereof, means carried by said tube for illuminating portions of the walls of said body, said tube having an objective opening therein, an eye-piece connected to said tube so as to permit independent rotation of the latter, and an optical system for transmitting rays of light from the illuminated wall of said hollow body to said eye piece.

2. A device for inspecting the interior of a hollow body, comprising a tube, means for slidably supporting the tube in said body in spaced relation to the walls thereof, electric bulbs carried by said tube for illuminating portions of the walls of said body, said tube having an objective opening therein, an eye piece connected to said tube having a magnifying optical system, and mirrors for reflecting the rays of light from the illuminated walls of said body to said magnifying optical system.

3. A device for inspecting the interior of a hollow body, comprising a tube, means for slidably supporting the tube in said body in spaced relation to the walls thereof, electric bulbs carried by said tube for illuminating portions of the walls of said body, said tube having an objective opening therein, an eye piece connected to said tube so as to permit independent rotation of the latter, a grip for holding said eye piece stationary during the rotation of said tube, and an optical system for transmitting rays of light from the illuminated walls of said hollow body to said eye piece.

4. A device for inspecting the interior of a hollow body, comprising a tube, means for slidably supporting the tube in said body in spaced relation to the walls thereof, electric bulbs carried by said tube for illuminating portions of the walls of said body, said tube

having an objective opening therein, an eye piece connected to said tube, and mirrors angularly disposed for reflecting the rays of light from the illuminated walls of said body to said eye piece.

5. A device for inspecting the interior of a hollow body, comprising a tube, means for yieldably supporting the tube in said body eccentrically rotatable with relation to the longitudinal axis of the body, said tube having an objective opening adapted to be located within said body, means for illuminating portions of the walls thereof, an eye piece situated without said body, and an optical system for transmitting rays of light from the illuminated walls of said body through said tube to said eye piece.

6. A device for inspecting the interior of a hollow body, comprising a tube, means for slidably and yieldably supporting the tube in said body in spaced relation to the walls thereof and rotatable in said body eccentrically with respect to the longitudinal axis thereof, electric bulbs carried by said tube for illuminating portions of the walls of said body, said tube having an objective opening therein, an eye piece connected to said tube having a magnifying optical system, and mirrors for reflecting the rays of light from the illuminated walls of said body to said magnifying optical system.

7. A device for inspecting the interior of a hollow body, comprising a tube, means for slidably and yieldably supporting the tube in said body in spaced relation to the walls thereof and rotatable in said body eccentrically with respect to the longitudinal axis thereof, electric bulbs carried by said tube for illuminating portions of the walls of said body, said tube having an objective opening therein, an eye piece connected to said tube so as to permit independent rotation of the latter, a grip for holding said eye piece stationary during the rotation of said tube, and an optical system for transmitting rays of light from the illuminated walls of said hollow body to said eye piece.

8. A device for inspecting the interior of a hollow body, comprising a tube, means for slidably and yieldably supporting the tube in said body in spaced relation to the walls thereof and rotatable in said body eccentrically with respect to the longitudinal axis thereof, electric bulbs carried by said tube for illuminating portions of the walls of said body, said tube having an objective opening therein, an eye piece connected to said tube, and mirrors angularly disposed for reflecting the rays of light from the illuminated walls of said body to said eye piece.

In testimony whereof I affix my signature.

SIDNEY P. LYON.