Aug. 5, 1941. F. HUNTSINGER 2,251,739

METHOD AND APPARATUS FOR INSPECTING TUBING

Filed May 4, 1938 2 Sheets-Sheet 1

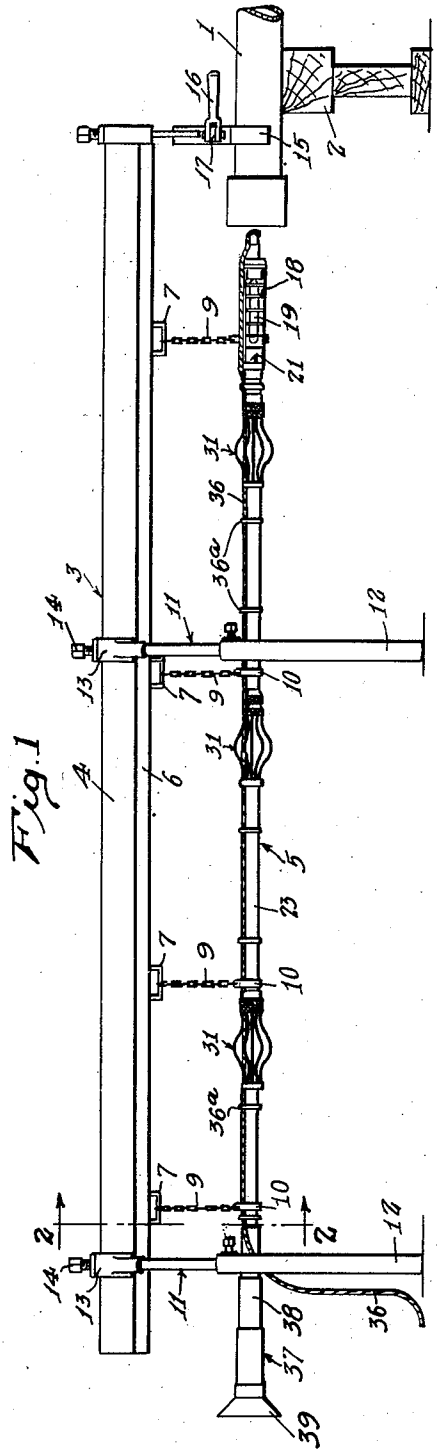


Fig. 1

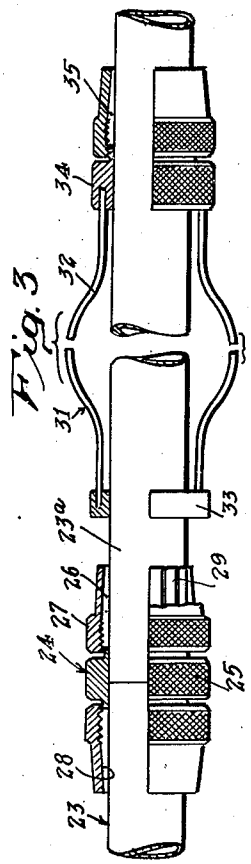


Fig. 3

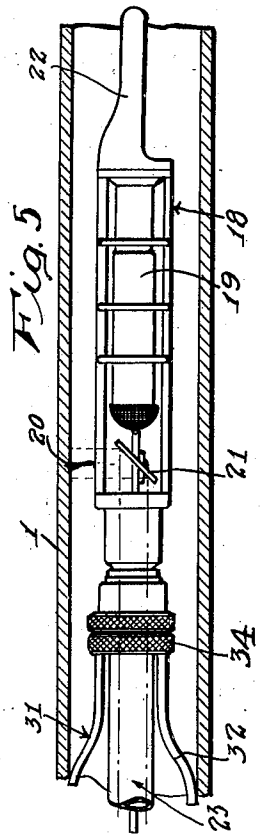


Fig. 5

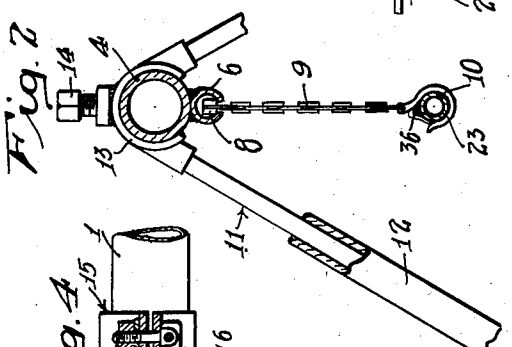


Fig. 2

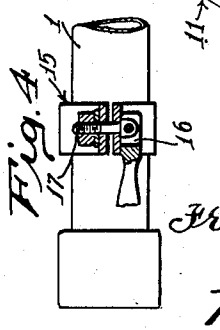


Fig. 4

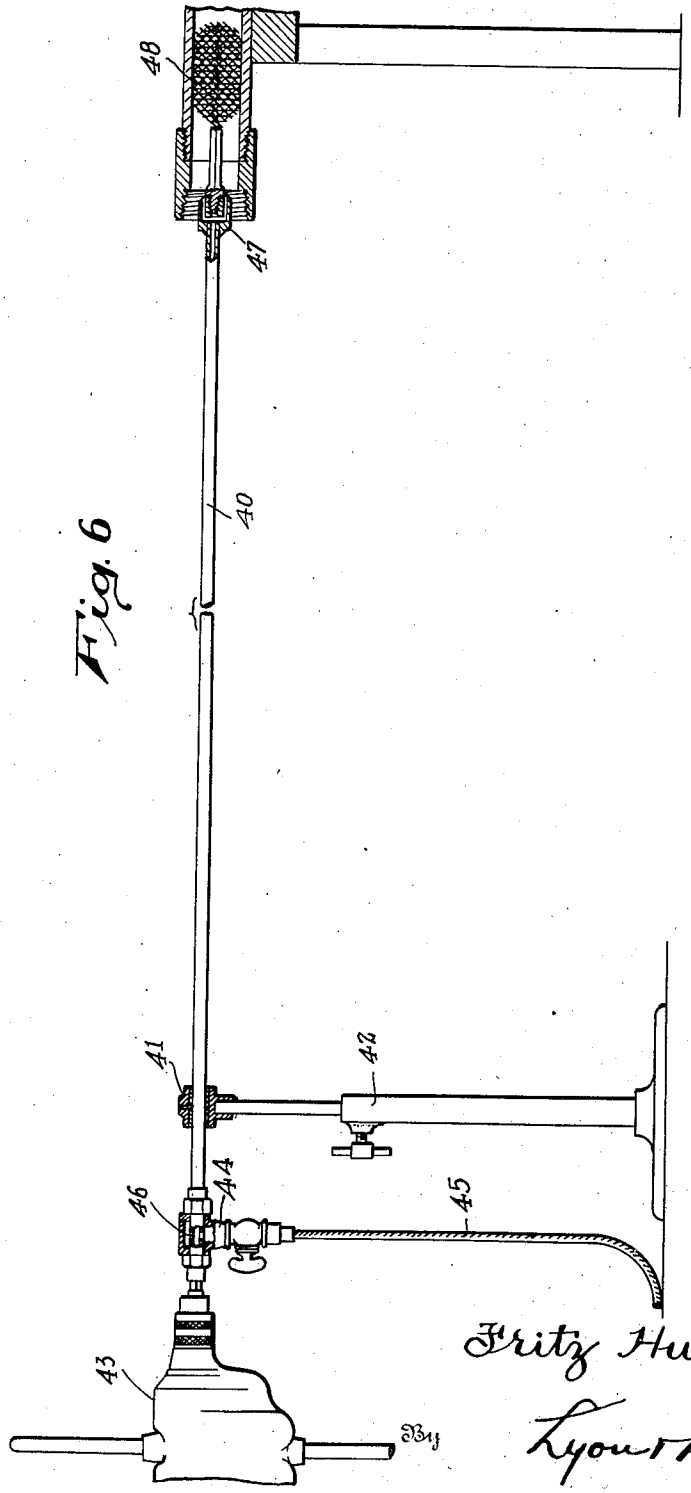
Inventor
Fritz Huntsinger
By Lyon & Lyon
Attorneys

Aug. 5, 1941. F. HUNTSINGER 2,251,739

METHOD AND APPARATUS FOR INSPECTING TUBING

Filed May 4, 1938 2 Sheets-Sheet 2

Fig. 6



Inventor
Fritz Huntsinger
By Lyon & Lyon Attorneys

Patented Aug. 5, 1941 2,251,739

UNITED STATES PATENT OFFICE

2,251,739

METHOD AND APPARATUS FOR INSPECTING TUBING

Fritz Huntsinger, Ventura, Calif.

Application May 4, 1938, Serial No. 205,963

9 Claims. (Cl. 88—71)

This invention relates to apparatus for examining the interior of tubing to ascertain its physical condition and the invention is particularly useful in inspecting tubing used in drill strings employed in rotary drilling.

It is, of course, the present practice to inspect all drill tubing before using it for drilling purposes, but heretofore there has been no means for inspecting the interior of tubing to discover flaws and defects in the same that would be hidden to the usual inspection service. On account of the impossibility of discovering these defects, many twist-offs occur due to defective tubing, resulting in a considerable loss of time and money in "fishing" jobs at the wells.

An object of this invention is to overcome this difficulty and to provide a simple method and apparatus for enabling defects in tubing to be readily discovered.

The preferred apparatus for practicing the invention involves the use of an elongated member carrying a reflector and lamp at its inner end that is advanced into stands of drill tubing consisting of several sections connected together, and one of the objects of the invention is to provide simple means for guiding the lamp and reflector past the joints of the stand and for centering the reflector and lamp in the tube.

Such tubing is usually piled in horizontal stacks before inspection. One of the objects of this invention is to provide simple means for supporting and guiding the telescope apparatus that is employed in order to facilitate running it in and out of the stands of tubing in making the inspection.

Further objects of the invention will appear hereinafter.

The invention consists in the novel method and in the novel parts, and combination of parts, to be described hereinafter, all of which contribute to produce an efficient method and apparatus for inspecting tubing.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawings:

Figure 1 is a side elevation of apparatus involving my invention and illustrating the end of a stand of tubing into which the viewing apparatus is about to be run.

Figure 2 is a vertical section upon an enlarged scale taken about on the line 2—2 of Figure 1, certain parts being broken away. This view particularly illustrates the supporting and guiding means for the viewing means.

Figure 3 is a side elevation and partial section illustrating a joint formed in sections of the barrel and also illustrating a centering sleeve such as is preferably employed.

Figure 4 is a fragmentary detail plan and partial section of a clamping device that I may employ for supporting the forward end of the frame on the adjacent end of the tubing.

Figure 5 is a section through a portion of the tubing broken away, and showing a portion of the forward end of the viewing apparatus to illustrate the manner in which it is employed to discover an inner defect in the tubing.

Figure 6 is a side elevation and partial section illustrating the cleaning apparatus in operation.

Before proceeding to a more detailed description of this invention, it should be stated that in practicing the invention as employed for inspecting tubing stacked in horizontal rows, I provide a frame that can be readily brought into alignment with the tubing to be inspected. This frame carries the viewing apparatus, the inner end of which, carrying a reflector and lamp, is run into the tubing. However, before doing this, it is necessary to thoroughly clean the interior of the tubing. This is accomplished by means of metal brushes and a compressed air blast. For this purpose boiler tube cleaning apparatus may be employed.

The viewing apparatus is suspended by a plurality of chains from trolleys guided in the frame, and as the viewing apparatus is run in, the chains are unhooked from it. In this way, while the rear end of the viewing apparatus is supported on the frame, the forward end of it is supported centered within the tubing.

The reflector, held at an angle, reflects the image of the wall illuminated by the lamp so that it can be clearly seen by the inspector whose eye is applied to an eye-piece of a telescope means at the outer end.

Referring more particularly to the parts, 1 indicates the end of a stand of pipe which may be supported on a pipe rack 2 in a substantially horizontal position.

In front of the tubing 1, I set up a frame 3 consisting of a strong-back 4 that may be made of a piece of pipe sufficiently strong to support the viewing apparatus 5.

The strong-back supports a guide in the form of a track 6 carrying a plurality of trolleys 7 preferably having rollers 8 (see Figure 2) that roll along the track.

In the present instance the track 6 is of tubular form with a bottom slot in which the trolley hangs so as to support a cord or chain 9. Each chain has a hook 10 at its lower end for supporting the viewing apparatus.

The frame 3 also includes means such as A-frames 11 for supporting the strong-back, and these A-frames may have adjusted legs 12 for regulating the level of the viewing apparatus 5. The upper ends of the legs may be received in saddles 13, each of which is clamped in position on the strong-back 4 by a set screw 14.

The inner end of the frame is preferably provided with means such as a rest or clamp 15 for supporting the same on the adjacent end of the tubing 1 that is to be inspected. In this way the viewing apparatus 5 is aligned with the tubing and prepared to be run in.

The clamp 15 may be in the form of a collar made of two sections clamped on the pipe 1 at will by means of a lever with a cam-head 16 connected to a tightening bolt 17 for the clamp. By throwing this cam-head into different positions of course the sections of the clamp can be drawn together or loosened up (see Figure 4).

The forward end of the viewing means comprises a lighting head or guard 18 in the form of a cage to protect an electric lamp 19, the rays from which may illuminate a defect such as a crack 20 (see Figure 5) lying opposite to a reflector 21 disposed at an angle, for example, 45°, to the longitudinal axis of the tubing. The guard cage 18 may have a guide horn 22 at its forward end for guiding it through the joints of the tubing.

The body of the viewing apparatus 5 may be in the form of an elongated member, preferably a barrel 23, composed of barrel sections or tubes 23*a* connected together by a joint clamp 24. The ends of the pieces 23*a* butt together in the joint clamp 24 and each joint-sleeve preferably consists of a body 25 with a split sleeve 26 projecting in each direction to fit over the abutting ends of the barrel sections 23*a*. Coupling nuts 27 are threaded onto these sleeves and have tapered bores 28 to fit over the tapered or conical outer faces 29 of the sleeves. By tightening up these clamping nuts, evidently the barrel sections can be very securely held together.

Just back of the lamp cage 18 for the electric lamp 19, means such as a guide sleeve 31 is provided for centering the barrel 23 within the tubing 1, and a plurality of these sleeves 31 are provided spaced about equidistant along the barrel. These sleeves are of cage type, preferably composed of resilient bars or bows 32. These bows are spaced circumferentially and they slide along the inside of the tubing and readily pass its joints. At one end these bows are secured in a loose collar 33 on the barrel 23, and at the other end they are secured in a collar 34 that is clamped to the barrel. This clamp may, if desired, be constructed like the clamp coupling 24, that is to say, it may include a tapered split sleeve 35 receiving a threaded tightening nut that is threaded onto the sleeve 35.

By rotating the reflector as the viewing device is run in, the entire inner surface of the tubing may be inspected. In the present instance this would be accomplished by rotating the outer end of the barrel 23. As the viewing means is run in, the chains 9 are successively unhooked from the barrel 23 so that the barrel becomes more and more supported on the centering devices 31 within the tubing.

An electric light cord 36 held by clips 36*a* may carry electric current through the barrel 23 to the lamp.

At the outer end of the barrel 23, telescope means 37 may be provided with telescoping sections 38 carrying lenses (not illustrated), and with an eye-piece 39 also carrying a lens (not illustrated) through which the inspector can focus onto the image of the tube's wall reflected on the reflector 21.

Figure 6 illustrates apparatus that may be employed for cleaning the tubing. This preferably comprises a long tube 40 supported in a bearing 41 on an adjustable stanchion 42 and rotated at will by an electric motor 43. A loose air connection 44 is provided for admitting compressed air from a flexible air hose 45 through ports 46. The inner end of the shaft 40 carries an air nozzle 47 back of a stiff wire brush 48 or similar means for brushing or scraping the inner surface of the pipe. The compressed air should be at sufficient pressure to blow all of the dirt out of the pipe and assist in cleaning the pipe wall. The workman at the front end of the shaft 40 guides it into the different tubes to be cleaned. If desired, the supports for the viewing apparatus and this stanchion 42 may be provided with rollers to facilitate their being moved about.

It is understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take, and I do not wish to be limited in the practice of the invention, nor in the claims, to the particular embodiment set forth.

What I claim is:

1. In apparatus for discovering flaws in the inner face of the wall of a rotary well drilling tube, the combination of an elongated barrel, a lamp and a reflector carried by the inner end of the same, means for rotatably supporting the barrel and for guiding the same into the tube to be inspected, yielding sleeves tapered at their forward ends for entering the tube, and for centering the barrel within the tube, and telescope means at the outer end of the barrel for viewing a reflection of the wall face upon the reflector.

2. In apparatus for discovering flaws in the inner face of the wall of a rotary well drilling tube held in a substantially horizontal position, the combination of a substantially horizontal frame to be aligned with the pipe to be inspected, a barrel supported on the frame and guided on the frame so as to enable the same to be run into the tube to be inspected, a plurality of resilient guide sleeves tapered at their forward ends carried by the barrel for entering the tube, and for centering the barrel in the tube, a reflector carried by the barrel, and means for illuminating the wall of the tube adjacent the reflector.

3. In apparatus for discovering flaws in the inner face of the wall of a rotary well drilling tube held in a substantially horizontal position, the combination of a substantially horizontal frame to be aligned with the pipe to be inspected, a barrel supported on the frame and guided on the frame so as to enable the same to be run into the tube to be inspected, a plurality of resilient guide sleeves carried by the barrel for centering the barrel in the tube, a reflector carried by the barrel, a light connected with the barrel for illuminating the wall of the tube adjacent the reflector, means for screening the mouth of the tube from direct rays from the light, the inner end of said frame having means for supportin

itself on the adjacent end of the pipe to be inspected.

4. In apparatus for discovering flaws in the interior of a rotary well drilling tube, the combination of a frame including a plurality of A-frames and a strong-back supported thereby and adapted to be aligned with the pipe to be inspected, a guide supported below said strong-back, a plurality of trolleys running on said guide, a barrel supported on said trolleys and capable of running into the tube, a plurality of centering means carried on the barrel for centering the barrel within the tube, a lamp and a reflector carried by the barrel within the tube, telescope means at the outer end of the barrel, and means for screening the eye-piece of the telescope means from direct rays from the lamp.

5. In apparatus for discovering flaws in the interior of a rotary well drilling tube, a barrel for carrying a lamp and reflector into the tube, in combination with a centering sleeve having a collar at one end to slide freely on the barrel, a second collar with means for clamping the same on the barrel, said sleeve tapered at its forward end to enable it to guide itself into the tube, and having a plurality of longitudinally extending bars connecting said collars.

6. In apparatus for discovering flaws in the interior of a rotary well drilling tube, the combination of a frame having a strong-back with means for supporting the same on the ground, a clamp carried at the inner end of said frame for securing the same to the end of the pipe to be inspected, a barrel suspended below the strong-back to be run into the interior of the tube, a reflector and lamp carried by the inner end thereof, centering means tapered at its forward end so as to guide itself into the tube, and carried by the barrel for centering the same within the tube, and telescope means carried by the outer end of the barrel for viewing the reflection of the wall of the tube upon the reflector.

7. A method of discovering faults and cracks on the inner face of the wall of rotary well drilling tubing held in a substantially horizontally position, which consists in suspending a barrel carrying a lamp and a reflector at a plurality of points from above, moving the barrel into the tube and successively discontinuing the suspending and supporting of the successive portions of the barrel as the same pass into the tube, supporting the barrel within the tube from the wall of the tube at a plurality of points and examining the reflections of the tube wall upon the reflector from a point at the outer end of the barrel.

8. Apparatus for discovering flaws in the interior of a rotary well drilling tube comprising a frame including a horizontal member and legs supporting said member, a guide track secured to said horizontal member, a hollow barrel member, a light and an angularly disposed reflector carried by said barrel member in alignment with the bore thereof, a telescope at one end of said barrel member for viewing the image appearing in said reflector, a plurality of spaced suspension members associated with said guide track and said barrel member arranged and constructed to suspend said barrel member relative to said supporting frame and to permit rotation of said barrel while entering a tube for inspection purposes, said suspension members being further constructed so that they can be successively detached from said barrel member as said barrel member is moved into the tube, and means carried by said barrel member and insertable with said barrel member into said tube for substantially centering said barrel member in said tube.

9. Apparatus for discovering flaws in the interior of a rotary well drilling tube comprising a frame including a horizontal member and legs supporting said member, a guide track secured to the under side of said horizontal member, a plurality of trolleys running on said guide track, a hollow barrel member, a light and a reflector carried by said barrel member in alignment with the bore thereof and at one end thereof, a telescope at the other end of said barrel member for viewing the image appearing in said reflector, a suspension member connected at one end to each of said trolleys and having means connected to its opposite end for supporting said barrel member relative to said supporting frame and in substantial alignment with a tube to be inspected, said suspension members being arranged and constructed to permit rotation of said barrel member and to be successively detachable from said barrel member as said barrel member is moved into the tube to be inspected, and yieldable means carried by said barrel member and insertable with said barrel member into said tube for substantially centering said barrel member in said tube.

FRITZ HUNTSINGER.