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PIPE LINE SCRAPER

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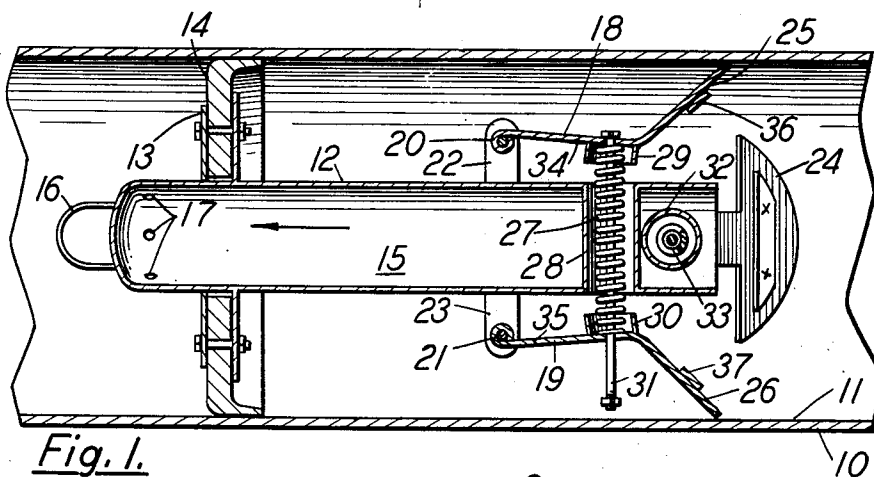


Fig. 1.

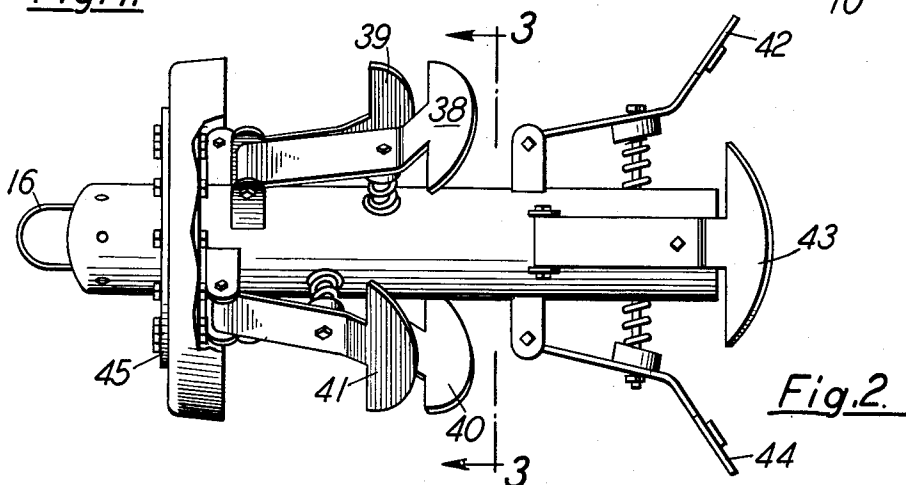


Fig. 2.

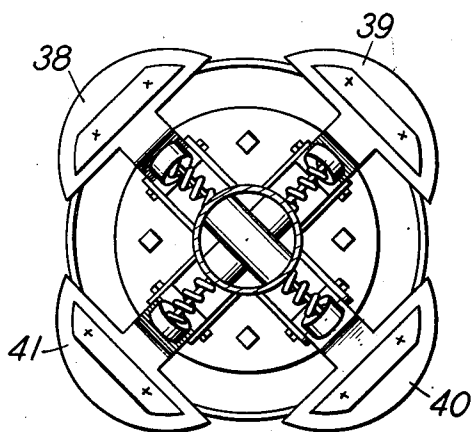


Fig. 3.

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PIPE LINE SCRAPER

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4 Claims. (Cl. 15—104.06)

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The present invention provides a device for scraping and cleaning the interior of a pipeline. The force required for the operation of the device is provided by gas or liquid pressure admitted to the pipeline. The pressure built up back of a piston member is sufficient to move the scraper through the pipeline, thereby performing its scraping operation. Broadly, this type of device is not new. The features provided by the present invention are centered principally in the manner of suspending the scraping mechanism so that the axial stability of the entire unit is maintained while at the same time providing a uniform force urging the scrapers into engagement with the pipe. This axial alignment is maintained by the combined action of the scrapers and the piston member or by the scrapers alone, rather than by a pair of axially displaced piston members.

The scraping mechanism comprises a series of blade elements disposed about the axis of the device. These blade elements are of such a number and location that the sum of the angles between them about the axis exceeds 180 degrees. The blades are pivotally mounted upon a central structure of the device, and the point of engagement of the blades with the pipeline is preferably at a considerable distance to the rear of the pivot point with regard to the direction of movement. In this manner, a rotation about the pivot point causes the blades to come into and out of engagement with the surface of the pipeline. This arrangement establishes a pivoted mounting for the blades permitting rotation in a plane generally parallel to the axis of the piston member and consequently parallel to the axis of the pipeline. Preferably, this plane of rotation should include the axis of the pipeline.

The blades themselves are arcuate in form and follow a section of the interior of the pipe. With the blades arranged to occupy more than 180 degrees of the pipe, and with the blades mounted for rotation only in the planes mentioned above, it will be seen that the device can not be moved laterally in the pipeline without causing an inward movement of at least one of the blade elements. The stability of the device is assured by providing a biasing action to the blades sufficient to generate the required scraping pressure, and this same biasing action coupled with the geometry of the blade mounting system creates the necessary directional stability. In this manner, the blades may be considered as floating; and the pressure of the same against the pipe walls will not be modified or controlled by the presence of piston members causing a fixed relationship of the structure with the axis of the pipeline.

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This invention also provides for the suspension of the blades in such a manner as to generate a very favorable scraping action independent of the stabilizing function. While the preferred form of the invention includes the use of the blades both in a stabilizing and a scraping function, it is entirely possible to eliminate the stabilizing feature of the present device and utilize merely the blade suspension system and its consequent advantages for the application of a more uniform scraping force. The elimination of the stabilizing feature of the blade suspension system can be obtained by providing a second piston member axially displaced from the first piston member, and the blade system is thereby relieved of the duty of maintaining the directional alignment. Due to the problems involved in following turns in a pipe, however, a double-piston system is not to be considered the preferred form of the present invention.

The several features of the present invention will be discussed in detail by and analysis of the particular embodiments illustrated in the accompanying drawings. In these drawings:

Figure 1 shows a sectional elevation through the axis of a pipe in which a scraping device provided by the present invention is positioned.

Figure 2 shows a device generally similar to that shown in Figure 1 except for the provision of an added group of scraping elements.

Figure 3 is a section taken on the plane 3—3 of Figure 2, and illustrates the device in its "free" form before insertion in a pipe.

Referring to Figure 1, a section of a pipeline is generally indicated at 10. The interior surface 11 of the pipe 10 is acted upon by the scraper unit generally designated as 12. A piston member 13 is preferably disposed at the forward end of the device, with the direction of movement being as indicated by the arrow. The piston member includes suitable plates transversely arranged with respect to the pipe and a conventional sealing element 14 adapted to contact the surface 11 and prevent the passage of gas or liquid, and thereby permit the building up of sufficient pressure to move the device through the pipeline. A central beam 15 is formed as a hollow tube, and is provided at its forward end with a ring 16 to permit the assembly to be pulled into engagement with the pipe at the beginning of its passage. When the device is used with gas-conducting pipelines, a series of vents indicated at 17 is preferably provided to blow away accumulations of particles in front of the device to aid in the cleaning operation. The rear of the tube 15 is open, and the gas pressure flowing through the

openings 17 is carried through the interior of the beam tube 15.

The scraper members 18 and 19 are arranged considerably to the rear of the piston member 13, and are pivoted at 20 and 21 upon the brackets 22 and 23 which are firmly secured to the tube 15. The scraper members 18 and 19 are diametrically arranged with respect to the axis of the device. Another set of oppositely disposed scraper members is provided, the blade of one of these members being indicated at 24. The blades 25 and 26, together with the blades 24 and the blade opposite thereto serve to cover the entire area of the surface 11.

The blades are urged outwardly against the surface 11 by means of the biasing system including the spring 27 and the components serving to position it. A transverse guide tube 28 is provided in the central tube 15, and is of such a diameter as to permit the free passage of the spring 27. Cup-shaped spring seats 29 and 30 are provided on the scraper members to confine the ends of the spring 27, and a restraining rod 31 limits the outward movement of the scraper members when the device is not in position in the pipeline. The assembled position of the spring 27 is thereby maintained. The transverse tube 32 houses the spring 33 acting upon the blade 24. It will be noted that to avoid interference the tube 32 is positioned to the rear of the tube 28. The scraping members 18 and 19, and those not shown in full detail in Figure 1, comprise the arm sections 34 and 35 acting as a support for the blade sections 25 and 26. The stiffeners 36 and 37 are preferably welded across the blade sections to give the necessary rigidity. The blade edges themselves may be formed of non-hardened material in order to permit the blades to wear into exact conformity with the curvature of the pipe.

With the arrangement outlined above, it will be seen that the hinge axes of the scraper elements create a rotation of these elements in a plane containing the axis of the entire device. As these scraper members move into engagement with the surface 11 under the urging of the spring 27, it will be seen that the rear portion of the device may not be displaced from alignment with the axis of the pipeline without causing certain of the scraper members to become forced more closely together. Since the scrapers are located on opposite diameters, they tend naturally under the biasing action of the spring 27 to assume a position as far apart as possible which will of course be on a diameter of the pipeline. Any displacement in this position will be resisted by a compressing action against the spring 27. In this manner the axial alignment of the device is maintained without the necessity of a second piston member similar to the member 13.

Referring to Figure 2, a device is shown having a series of groups of scraper members such as the one group indicated in Figure 1. The device includes the forward group including the blades 38, 39, 40, and 41. The rear group of blades includes blades 42, 43, 44, and a blade shown directly opposite to the blade 43. Preferably, the two groups of blades are disposed at an angle with respect to each other so that one blade does not operate directly behind the other. The remainder of the structure shown in Figure 2 is essentially similar to the device shown in Figure 1. A piston member generally indicated at 45 provides a block to the flow of liq-

uid or gas pressure, and results in the generation of sufficient pressure to urge the device through the pipeline.

The particular embodiments which have been shown in the accompanying drawings and discussed herein are for illustrative purposes only and are not to be considered as a limitation upon the scope of the appended claims. In these claims it is the intent of the inventor to claim the entire invention to which he is entitled in view of the prior art.

I claim:

1. A scraper for the inside of a pipeline, said scraper comprising beam means; piston means mounted on said beam means at one position substantially perpendicular thereto and adapted to cooperate with said pipeline; a plurality of sets of two scrapers, each of said sets having scrapers on opposite sides of the axis of said piston means, said sets being angularly displaced about said axis, and each of said scrapers having blades shaped to contact a section of the inside of said pipeline; pivot means mounted on said beam means and supporting said scrapers for rotation in substantially radial axial planes; and biasing means including continuous spring means acting at the opposite ends thereof respectively against the opposite scrapers of each of said sets and urging said blades outwardly from said axis.

2. A scraper for the inside of a pipeline, said scraper comprising beam means having transverse holes; piston means mounted on said beam means at one position substantially perpendicular thereto and adapted to cooperate with said pipeline; a plurality of sets of two scrapers, each of said sets having scrapers on opposite sides of the axis of said piston means, said sets being angularly displaced about said axis, and each of said scrapers having blades shaped to contact a section of the inside of said pipeline; pivot means mounted on said beam means and supporting said scrapers for rotation in substantially radial axial planes; and biasing means operating in said transverse holes and including continuous spring means acting at the opposite ends thereof respectively against the opposite scrapers of each of said sets and urging said blades outwardly from said axis.

3. A scraper for the inside of a pipeline, said scraper comprising beam means having transverse holes; piston means mounted on said beam means at one position substantially perpendicular thereto and adapted to cooperate with said pipeline; a plurality of sets of two scrapers, each of said sets having scrapers on opposite sides of the axis of said piston means, said sets being angularly displaced about said axis and each of said scrapers having a supporting arm and blades shaped to contact a section of the inside of said pipeline; pivot means mounted on said beam means and supporting arm and mounting said scrapers for rotation in substantially radial axial planes; continuous helical compression spring means operating in said transverse holes and acting at the opposite ends thereof respectively against the opposite scrapers of each of said sets and urging said blades outwardly from said axis; and means forming a spring-locating seat on said supporting arms receiving the ends of said helical compression spring means.

4. A scraper for the inside of a pipeline, said scraper comprising: beam means; piston means mounted on said beam means at one position

substantially perpendicular thereto and adapted to cooperate with said pipeline; at least three scrapers, said scrapers being angularly displaced about said axis, and each of said scrapers having blades shaped to contact a section of the inside of said pipeline, the total action of said blades acting over substantially all of the interior of said pipeline; pivot means mounted on said beam means and supporting said scrapers for rotation in substantially radial axial planes; and biasing means including continuous spring means acting at the opposite ends thereof respectively against certain of said scrapers and urging said blades outwardly from

said axis, all of said scrapers being provided with biasing means.

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