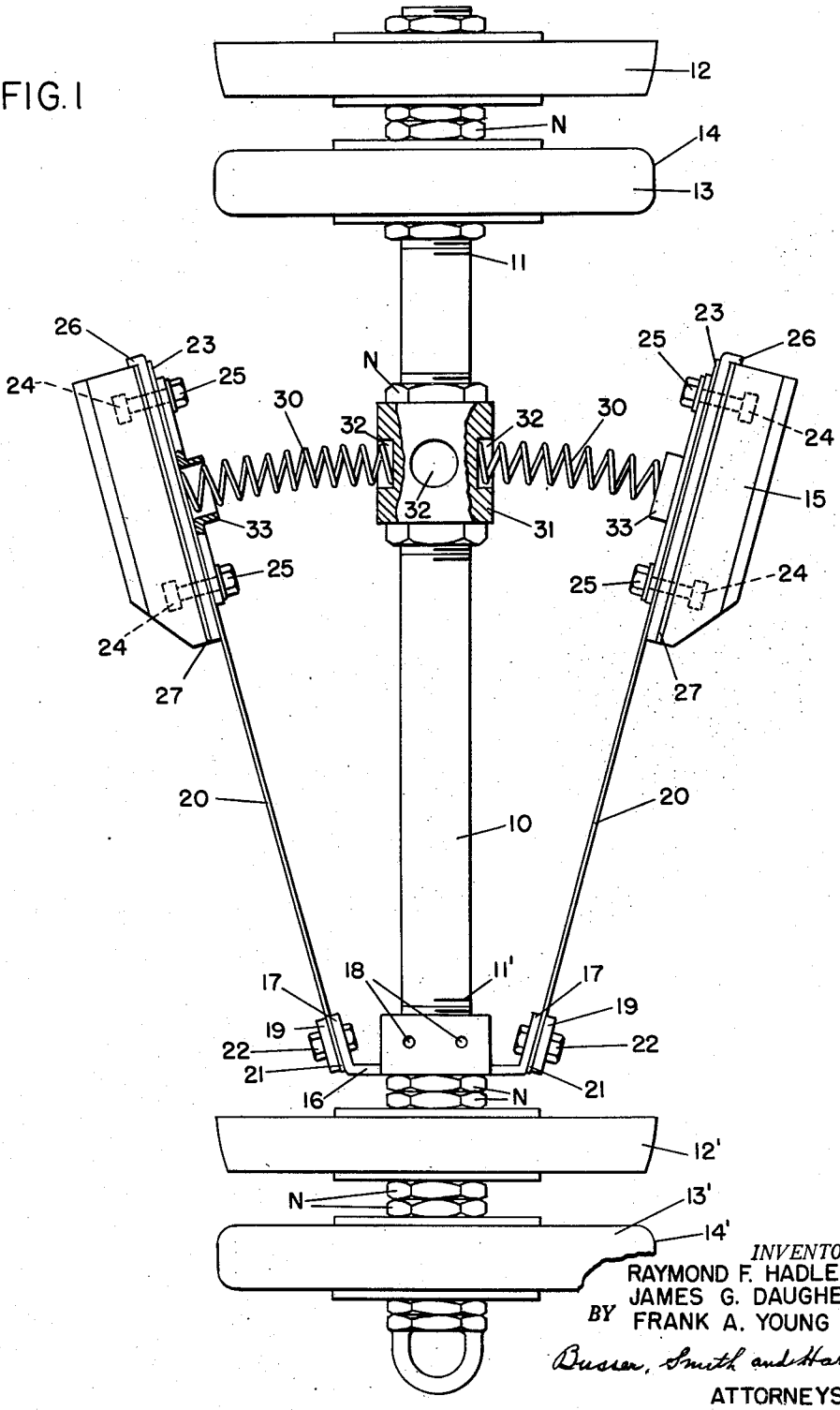
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PIPELINE CLEANING AND POLISHING DEVICE

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FIG. 1



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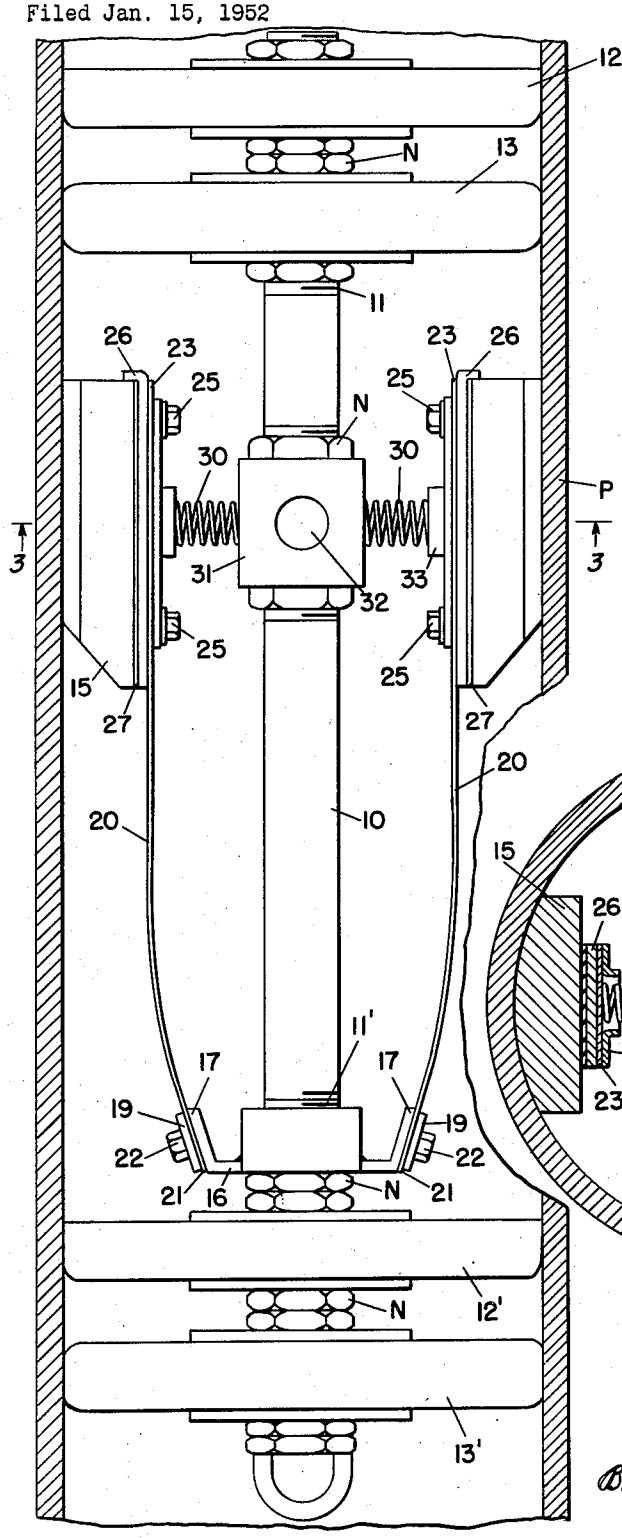
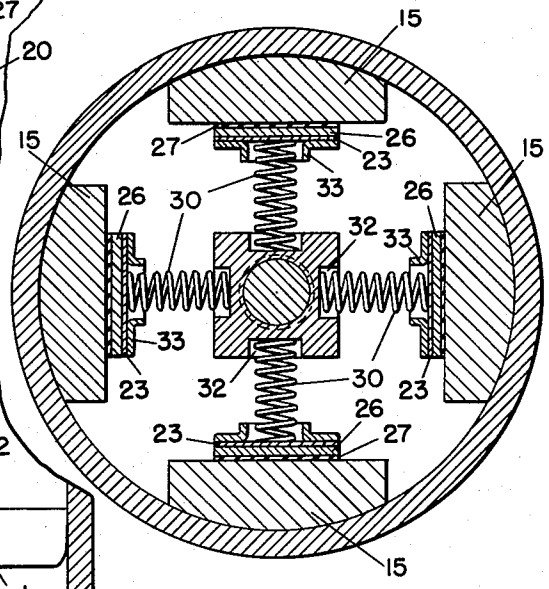


FIG. 2

FIG. 3



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PIPELINE CLEANING AND POLISHING DEVICE

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2 Claims. (Cl. 51—184.2)

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This invention relates to an apparatus for internally cleaning pipelines and is directed particularly to a device which, in addition to removing accumulated matter from the internal surfaces of the pipe functions also to polish the internal surfaces of the pipe so effectively that the walls are made relatively smooth.

The pipeline cleaning art is quite highly developed and various types or assemblies of brush cleaners or knife scrapers have heretofore been used. Both types of cleaning devices have partially solved the problem of scale removal but have not provided for satisfactorily smoothing of the pipeline internal surface.

Usually after a pipeline has been in operation over a period of time its inner surface becomes corroded. In addition scale accumulates on the surface which accentuates the surface roughness of the piping and consequently increases the frictional resistance to the flowing fluids. It is ordinarily impossible to return the piping to its original smoothness by utilizing the brush or knife scrapers of the prior art since, while removing some of the accumulated matter, they have little effect in smoothing out the corroded areas to provide a substantially smooth surface. Past experience has demonstrated the difficulty in reducing the relative roughness of pipelines which have been in use over extended periods of time by the ordinary brushing and scraping operations.

It is the practice in cleaning pipelines to utilize the force of the fluid being conveyed through the line to propel the cleaning devices therethrough, between differently located stations, and the motivation of the device is accomplished by means of pressure discs against which the force of the fluid or liquid in the line is exerted.

The present invention contemplates the utilization of cleaning or scraping elements formed of a particular material and which are arranged to maintain constant frictional contact with the inner surface of the pipeline in order to remove contaminants therefrom and additionally exert a polishing action thereon to provide a relatively smooth surface and hence reduce the relative roughness of the inner surface of the piping to a minimum with the resultant increased economic pipeline operation.

A more detailed explanation of the invention may be had by reference to the accompanying drawings which form a part of the application and in which:

Figure 1 is a side elevational view of the apparatus with some elements removed in order to better show the general arrangement of the elements used in the device.

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Figure 2 is a view similar to Figure 1 showing the apparatus positioned for use within a pipeline.

Figure 3 is a view taken along the line 3—3 of Figure 2.

Referring to the drawings the cleaning or scraping apparatus comprises a central shaft 10 having generally similar elongate threaded areas 11 and 11¹ at each end thereof for removably assembling on the shaft in their cooperating relation the various operating elements of the device.

In order to force the device through a pipeline by the force of the fluid conveyed therethrough a circumferential pressure disc of strong but flexible or pliable material is secured about the shaft and is of slightly larger diameter than the line piping in order to provide therewith a pressure seal. As indicated it is preferred to use a pair of such discs 12 and 12¹ or more may be used if desired and positioned on either threaded end portion of the shaft in order to insure propulsion of the device through the line and also to center the device during its movement through the line.

After the device has been in use over extended periods of time the pressure discs 12 or 12¹ may become worn about their peripheries resulting in a reduction of propulsion force and allowing the apparatus to be propelled through the pipeline in a somewhat off-center condition. In order to provide for continued use of the apparatus there are preferably provided additional centering elements 13 and 13¹ which may take the form of flexible wheels, spiders or brushes to supplement the centering function of the discs 12 and 12¹ or to cooperate therewith to provide for effective centering of the device during its movement through the pipeline. The centering elements 13 and 13¹ will be substantially of the same diameter as that of the inner diameter of the pipeline and preferably have flattened outer peripheries 14 and 14¹ in order to provide greater surface contact with the pipeline inner wall with the resultant proper centering over extended periods of use before the necessity of removal or replacement of parts.

The various elements of the device are removably secured on the shaft 10 by the utilization of a plurality of similar nuts which are designated generally by the letter N. The pressure discs 12 and 12¹ and the centering elements 13 and 13¹ are disposed about shaft 10 by means of the nuts

N in desired spaced relation to effect their proper functioning. It will be appreciated that the utilization of nuts N permits the ready assembling of the device upon the threaded shaft 10 and its redismantling therefrom.

The principal feature of the invention resides in an assemblage for effecting the cleaning or polishing operation which provides not only for the complete removal of accumulated matter from the pipe walls but also for additionally smoothing out corroded or pitted areas to a degree that the inner wall of the pipeline presents a generally uninterrupted smooth surface and reduces the frictional resistance to the fluid flow. It will be understood from a further description of the apparatus that the cleaning or polishing assemblage is also secured about the shaft 10 by means of nuts N in order to provide for the complete dismantling of the various cooperating elements of the device.

Referring again to Figure 1 the cleaning and polishing elements are each indicated by the numeral 15 since they are constructed of the same material and are generally similar in design. The members 15 are constructed of abrasive material and are in the form of blocks or shoes of substantial length and width with curvilinear upper working surfaces to contact the inner surface of the pipe and expedite the cleaning and polishing function. Spring means are provided to maintain the members 15 in constant contact with the inner walls of the pipeline while permitting some retraction of the members to pass through obstructions such as valves which are located within the pipeline.

A collar 16 is secured about the shaft 10 and held in position by nuts N. The collar is provided with a plurality of flanges or plates 17 each of which is apertured at 18 for the reception of apertured cooperating clamping plates 19. A plurality of generally similarly designed leaf springs 20 are provided and each has one end portion 21 clamped and fixed between each cooperating pair of plates 17 and 19 by nut and bolt assemblies generally indicated at 22. The leaf springs 20 extend longitudinally of the shaft 10 and have free end portions 23 spaced laterally from shaft 10 and each end portion 23 is inclined from its fixed end 21 at an angle to the shaft 10 as indicated. The strength of the leaf springs 20 will be sufficient to normally maintain the free ends 23 laterally outwardly from the shaft 10 to such a degree that as the springs are contracted when the device is placed in a pipeline the springs will exert pressure outwardly thereof to maintain considerable frictional contact of the elements 15 with the inner surface or wall of the pipeline.

In Figure 2 the device is shown positioned within a pipeline P and needs no further description since it is in all respects similar to Figure 1.

Referring to Figure 3, the cleaning and polishing assemblage will comprise, for example, four abrasive members 15 each of which is secured to an end portion 23 of a corresponding leaf spring by means of bolt assemblies. The bolt assemblies, by preference, comprise cap screws 24 which are embedded in the body of the abrasive shoes and are secured to the end portion of the leaf springs 23 by nuts 25. Between the end portion 23 of each leaf spring and the abrasive members 15 is provided a flanged mounting plate 26 and a pliable shock absorbing pad 27.

The leaf springs 20 will be of substantial length in order not to exceed the allowable stress of the spring material in bending. It becomes necessary when utilizing the device to bend the springs toward the shaft 10 in order to insert the abrasive members within a pipeline and provide complete surface contact of the members 15 with the inner wall of the pipeline.

In addition to the leaf springs 20 one or more coil springs 30 are provided to exert direct radial or lateral pressure on each of the abrasive members 15 from the shaft 10. To this end a block 31 is secured on the shaft 10 by means of nuts N and is provided with recesses 32 to receive and maintain the inner ends of each coil spring 30. To cooperate therewith each of the end portions 23 of the leaf springs has provided against its under surface a socket 33 to receive the other ends of the coil springs. It will be understood then as the abrasive members 15 become reduced in thickness because of extended periods of use that the compression force of the coil springs 30 will tend to maintain an adequate surface contact force between the abrasive members 15 and the inner surface of the pipeline.

It will be understood, of course, that any one, any combination, or all of the features of the invention may be utilized to facilitate cleaning or the removal of the deposited material from any type of apparatus or equipment to which the features of the invention may relate or apply.

We claim:

1. A device for cleaning and polishing the inner surfaces of extended lengths of pipeline which comprises a shaft, a plurality of leaf springs, each of said leaf springs having one end secured about one end portion of the shaft and extending longitudinally thereof to have a free end positioned about the other end portion of the shaft, a plurality of scraping elements each having an arcuate outer surface, one of said scraping elements being removably secured to the free end of each leaf spring, pressure discs secured to each end portion of the shaft beyond the ends of the leaf springs, said pressure discs being adapted to cooperate in centering the device within and propel the device through the pipeline under the pressure of fluid in the pipeline and said leaf spring being of sufficient strength to maintain the outer periphery of the scraping elements in contact with the inner wall of the pipeline.

2. A device for cleaning and polishing the inner surfaces of extended lengths of pipeline which comprises a shaft, a plurality of leaf springs, each of said leaf springs having one end secured about one end portion of the shaft and extending longitudinally thereof to have a free end positioned about the other end portion of the shaft, a plurality of abrasive elements each having an arcuate outer surface, one of said scraping elements being removably secured to the free end of each leaf spring, a compression spring positioned between the shaft and the free end of each leaf spring for maintaining the outer surface of each abrasive in contact with the inner surface of the pipeline, pressure discs secured to each end portion of the shaft beyond the ends of the leaf springs, said pressure discs being adapted to cooperate in centering the device within and propel the device through the pipeline under the pressure of the fluid in the pipeline.

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