March 17, 1953 J. E. HAUSER 2,631,315

MACHINE FOR CLEANING THE EXTERIOR SURFACES OF PIPES

Filed April 5, 1948 4 Sheets-Sheet 1

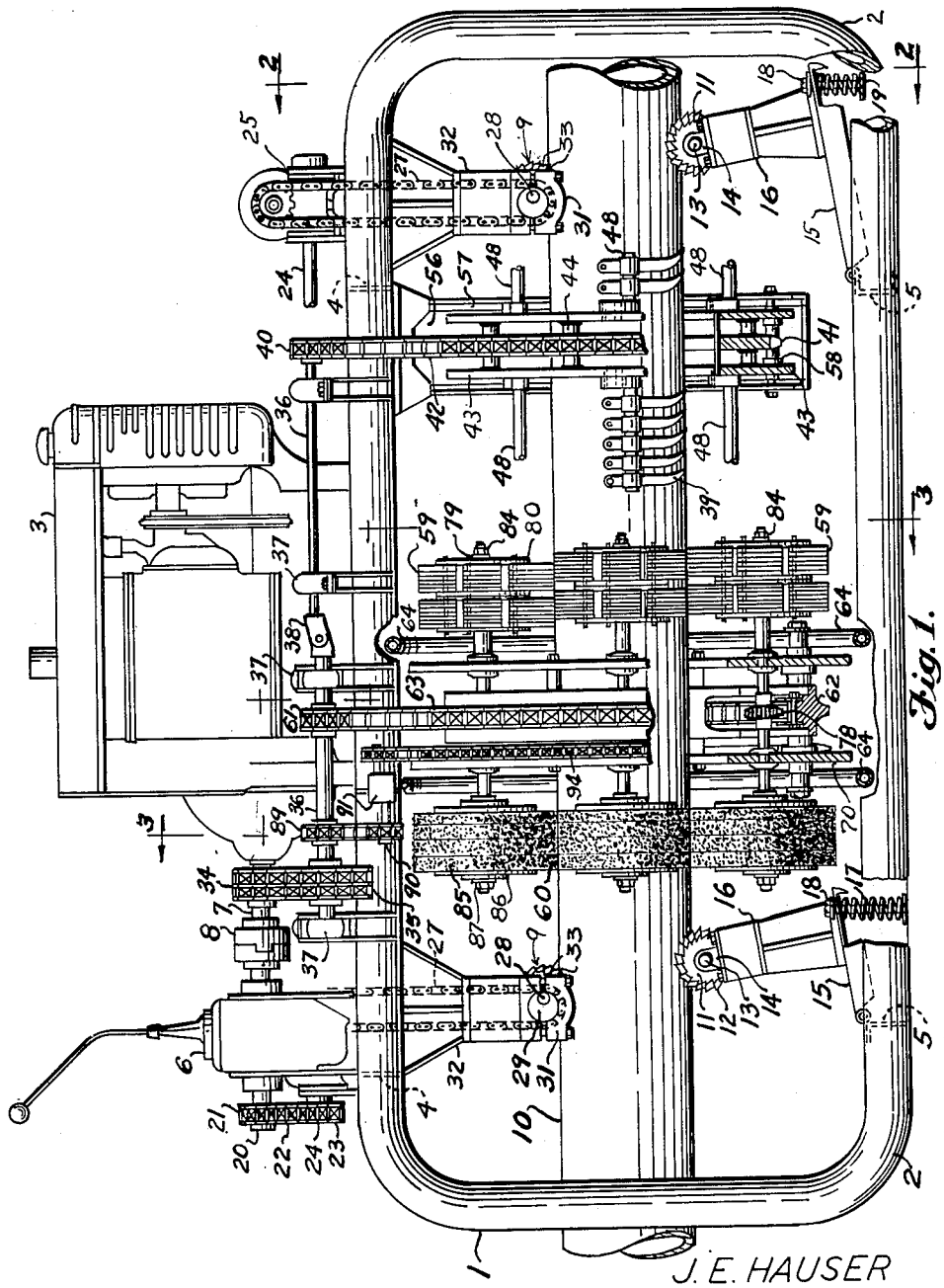


Fig. 1.

J. E. HAUSER
INVENTOR.

BY Herbert J. Brown
ATTORNEY

March 17, 1953 J. E. HAUSER 2,631,315

MACHINE FOR CLEANING THE EXTERIOR SURFACES OF PIPES

Filed April 5, 1948 4 Sheets-Sheet 2

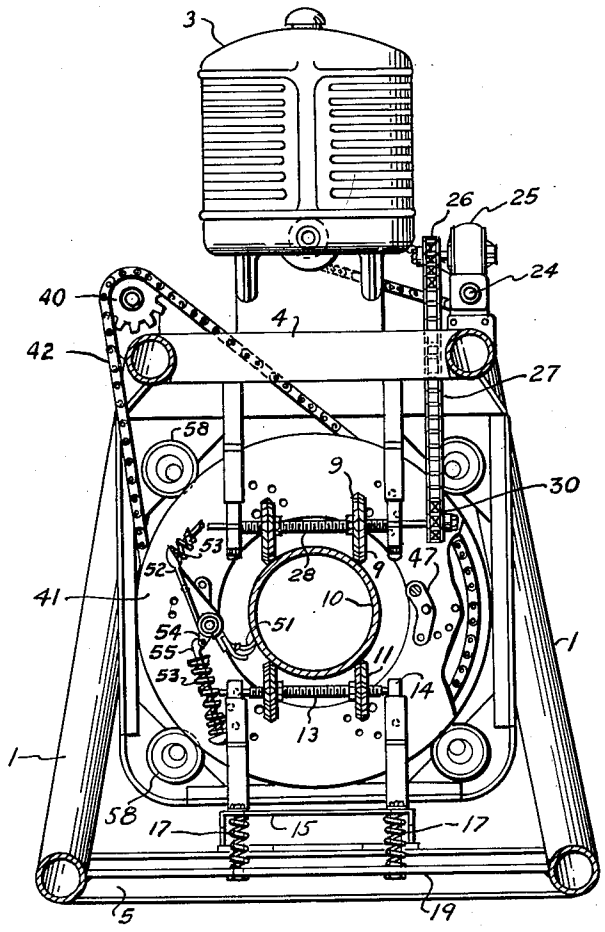


Fig. 2.

J. E. HAUSER
INVENTOR.

BY Herbert J. Brown
ATTORNEY

March 17, 1953 J. E. HAUSER 2,631,315

MACHINE FOR CLEANING THE EXTERIOR SURFACES OF PIPES

Filed April 5, 1948 4 Sheets-Sheet 3

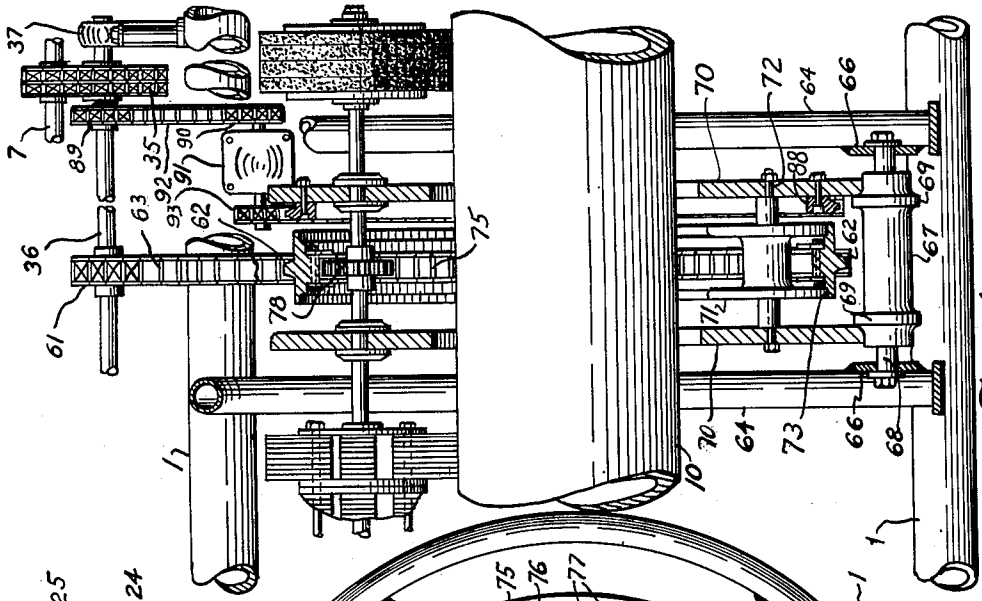


Fig. 4.

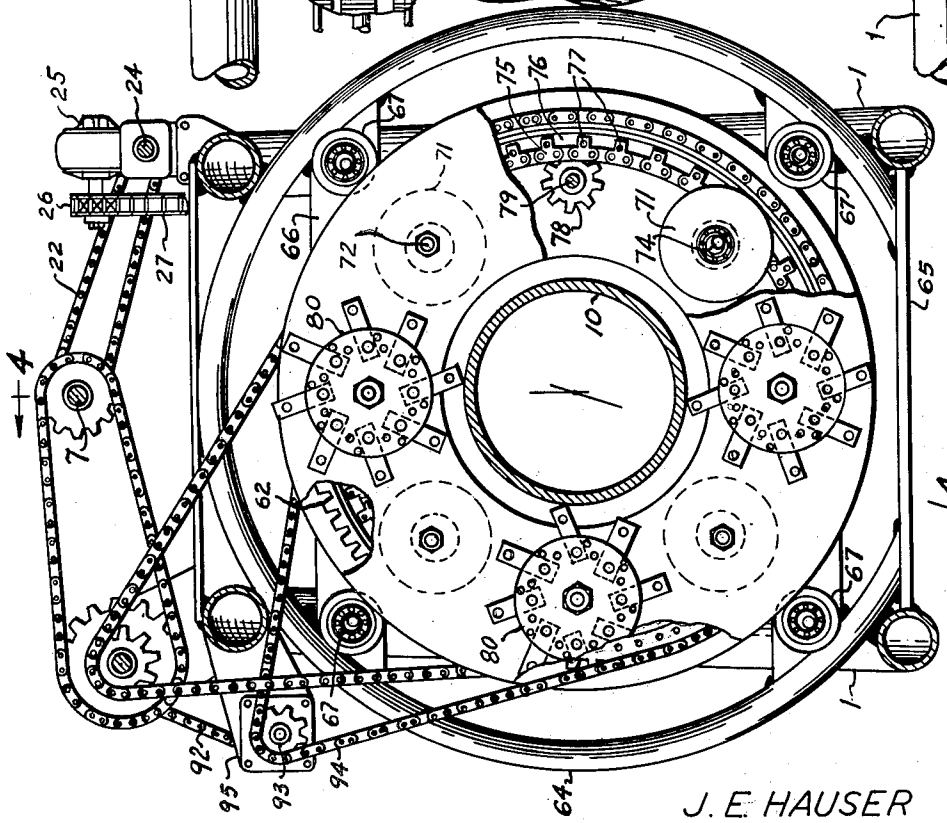


Fig. 3.

J. E. HAUSER
INVENTOR.

BY Herbert J. Brown
ATTORNEY

March 17, 1953 J. E. HAUSER 2,631,315

MACHINE FOR CLEANING THE EXTERIOR SURFACES OF PIPES

Filed April 5, 1948 4 Sheets-Sheet 4

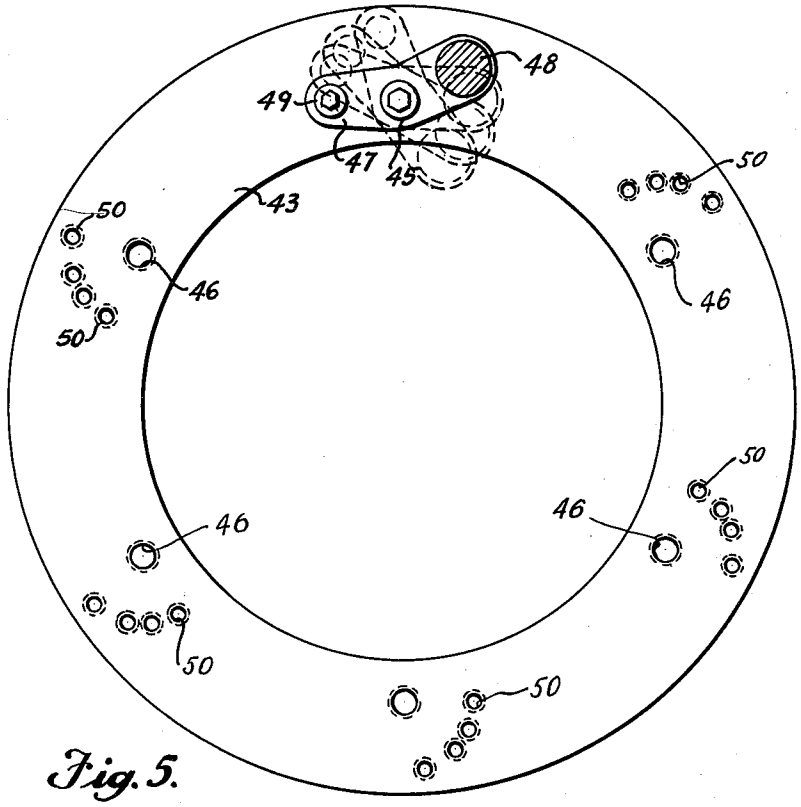


Fig. 5.

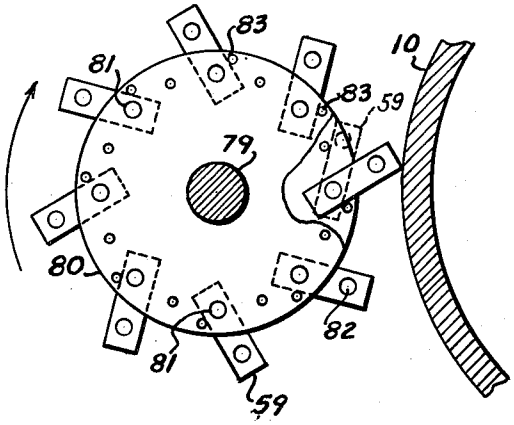


Fig. 6.

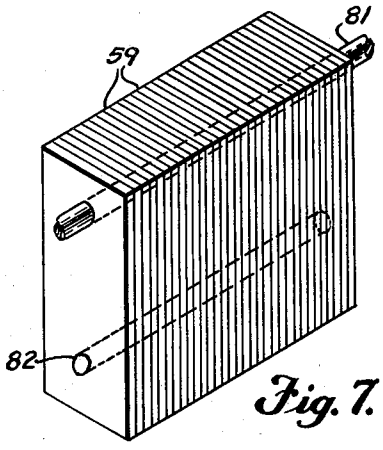


Fig. 7.

J. E. HAUSER
INVENTOR.

BY Herbert J. Brown
ATTORNEY

Patented Mar. 17, 1953 2,631,315

UNITED STATES PATENT OFFICE

2,631,315

MACHINE FOR CLEANING THE EXTERIOR SURFACES OF PIPES

Joseph E. Hauser, Fort Worth, Tex.

Application April 5, 1948, Serial No. 18,891

3 Claims. (Cl. 15—104.04)

1

This invention relates to pipe cleaning machines and has reference to a construction and arrangement for scraping, cleaning, and brushing pipe.

The invention has particular reference to a machine adaptable for operation in oil fields and on pipe lines where casings or pipes are reconditioned for further use. Pipe lines are often coated with a heavy layer of tar-like substance which must be removed in order to inspect the surface; and when there is no protective coating on the pipe, the accumulated rust must be removed. Since the pipes or casings to be cleaned are of relatively large size, it necessarily follows that the pipe cleaning machine must also be comparatively large.

Although machines for the general purpose of cleaning large pipes have been heretofore made, they included massive parts which revolved around the pipe being cleaned and caused the machine to shake violently. Such prior machines were difficult of adjustment, particularly when resetting the machine to accommodate different diameters of pipe. Also, such prior machines did not include the efficient flailing or cleaning operation which is a feature of the present invention.

An object of the invention is to provide a construction and arrangement for cleaning pipe whereby the fast rotation of a large mass around the pipe being cleaned is avoided and thereby reducing the vibration of the machine.

Another object of the invention is to provide a flailing or cleaning assembly in a pipe machine whereby collars and projecting patches of various thicknesses on the surface of the pipe are readily passed through the cleaning head. Heretofore, the shafts carrying rotary cleaning tools were misaligned because of lack of clearance between the tool and the projection on the pipe.

Another object of the invention is to provide a scraper head for a pipe cleaning machine which may be easily and readily adjusted to operate upon various diameters of pipe.

A further object of the invention is to provide a pipe cleaning machine which will operate upon curved or slightly bent lengths of pipe when cleaning and reconditioning the same.

Another object of the invention is to provide a pipe cleaning machine for stationary operation or for gripping the pipe of a pipe line and propelling itself along the length of pipe during its operation.

These and other objects will become apparent from the following description of the accompanying drawings, wherein:

Figure 1 is a side elevational view of a pipe

2

cleaning machine embodying the features of the present invention, with part of the construction broken and in section.

Figure 2 is a sectional end view taken on line 2—2 of Figure 1.

Figure 3 is an enlarged sectional view taken on lines 3—3 of Figure 1, and particularly showing the cleaning head for flailing the pipe after the same has been scraped.

Figure 4 is a broken elevational view taken at a right angle with respect to Figure 3.

Figure 5 is an elevational view of one of the scraper mounting rings and showing one of the scraper adjusting arms mounted thereon.

Figure 6 is an elevational view of one of the flailing heads, shown in broken section, and illustrating the relation of the said head relative to a portion of pipe being cleaned.

Figure 7 is a perspective view of one of the flailing units and particularly showing the arrangement whereby the flails may be reversed on their supporting pins when corresponding ends of the flails have become worn.

The exemplary form of the invention shown includes a pair of rectangular frame members 1 of tubular steel having their corners bent to form curves 2. As shown in Figures 1 and 2, the side members 1 are parallel with respect to each other along their lengths, and are inclined toward each other at their upper ends where they support an engine 3 mounted on cross members 4 secured between the upper portions of the said frame members. The lower portions of the frame members 1 are similarly spaced by cross members 5 secured therebetween. The frame members 1 and cross members 4 and 5 are secured to each other by means of welding, as are other parts to be referred to when the securing means is not otherwise described, or when assembled in a manner obvious to those skilled in the art.

A transmission 6 is connected with the drive shaft 7 of the engine 3 by means of a coupling 8, the purpose of the transmission 6 being to regulate and actuate crawlers 9 for moving the pipe 10 to be cleaned longitudinally through the frame, i. e., between the side members 1 and the cross members 4 and 5 when the machine is stationary. The pipe 10 is supported on freely rotatable crawler wheels 11 which are arranged in pairs beneath the pipe near each end of the described frame assembly. The crawler wheels 11, which have teeth 12 about their peripheries, are mounted in pairs on threaded axles 13, and which axles are smooth at their ends where they are journaled in bearings 14. Each of the two lower frame cross members 5 have hingedly attached platforms 15 having pedestals 16 mounted on

their upper surfaces for supporting the bearings 14 and the crawler wheels 11. The platforms 15 have pairs of compression springs 17 under them for normally raising the crawler wheels 11 and pressing the pipe 10 against the upper or driven crawler wheels 9. The compression springs 17 are retained by mounting the same over bolts 18 having their lower ends secured to cross member 19 which is secured at right angles to the lower portions of the frame members 1. The upper ends of the bolts 18 slidably pass through the referred to plates 15. By means of the arcuate corners of the frame members 1, and the engagement of the crawler wheels 9 on a length of pipe line 10, the machine may be self-propelled as it operates.

The transmission drive 20, by means of a sprocket 21 and chain 22 mounted thereon, drives a sprocket 23 mounted at one end of a shaft 24 which extends to the other forward end of the machine, as particularly shown in Figures 1, 2, and 3. Above each pair of driven crawler wheels 9 there is a speed reducer 25 having a sprocket 26 and chain 27. The speed reducers 25 are mounted on the upper portion of one of the rectangular frame members 1. The driven crawler wheels 9, previously referred to, are mounted in pairs on threaded shafts 28 which have smooth ends where they are journaled in eccentric bearings 29. One end of each shaft 28 has a sprocket 30 and is driven by the chains 27 from the speed reducers 25. The eccentric bearings 29 are mounted in adjustable bearing housings 31 whereby the relative height of each shaft 28 may be varied. The bearing housings 31 are at the lower ends of brackets 32 which depend from the upper cross members 4. The driven crawler wheels 9 have teeth 33 for engaging the pipe 10 and passing the same through the machine over the lower crawler wheels 11. When the machine is used as a mobile unit, the driven teeth 33 provide traction on the pipe 10.

A double sprocket 34 is mounted on the engine drive shaft 7 and is connected with driven sprockets 35 mounted on a shaft 36 supported in bearings 37 on the upper part of one of the side frames 1. The drive shaft 36 is offset intermediate its ends where it is coupled by a universal joint 38. The purpose of the last described arrangement has to do with a convenient manner for driving and rotating scrapers 39 around the pipe 10.

The last mentioned scraping operation is carried out by means of a sprocket 40 on the end of the shaft 36, and which sprocket drives a ring gear 41 for receiving a length of pipe 10 through its center. An endless chain 42 connects the sprocket 40 with the ring gear 41. Concentric scraper mounting rings 43 are spaced from and secured to opposite sides of the ring gear 41 by means of spacers 44 in the form of short lengths of rod which are welded in place. A detail of one of the scraper mounting rings is illustrated in Figure 5. Equally spaced bolts 45 threadedly engage tapped holes 46 in the face of the ring 43 for pivotally supporting arms 47 having stub shafts 48 in corresponding ends. The arms 47 receive other bolts 49 in their other ends which, in turn, may be selectively secured in tapped holes 50 radially disposed about each of the first referred to tapped holes 46. Multiples of the previously referred to scrapers 39 are mounted on each of the stub shafts 48. It is to be noted that the stub shafts 48 project forwardly and rearwardly with respect to the ring gear 41 and their mounting rings 43. Each individual scraper 39 is conventional in construction and is not, therefore, described in detail, be it sufficient to say that each is pivotally mounted on its stub shaft 48 near its center and has its scraper end 51, particularly shown in Fig. 2, positioned for scraping action against the surface of the pipe 10. The end of the scraper 39 opposite the scraper end 51 is in the form of an arm 52 and each group of scrapers 39, lying in a plane parallel to the length of pipe 10 is provided with compression springs 53 in the manner illustrated in Figure 2. Near the shaft 48, each scraper 39 is provided with a projection 54 which pivotally receives a guide 55 over which the springs are respectively positioned to bear against each said projection and an adjacent scraper arm 52. Thus, it may be seen that by locating the bolts 49 at the end of the stub shaft supporting arms 47, the scrapers 39 may be readily adjusted to accommodate various diameters of pipe without having to relocate the pivot bolts 45 or disconnect the springs 53.

A scraper housing 56, secured to and depending from the upper cross members 4, encloses the ring gear 41 and attached scraper mounting rings 43, and is provided with openings 57 in opposite sides to accommodate the projecting scraper supporting shafts 48. Inside of the housing 56 and mounted on the inner walls thereof, there are eccentrically adjustable roller bearings 58 for engaging and supporting the peripheries of the scraper mounting rings 43.

Referring now to Figures 1, 3, and 4, the pipe cleaning machine is provided with a cleaning and brushing assembly wherein the flails or cleaners 59 and brushes 60 revolve at relatively high speeds, whereas the assembly turns about the pipe 10 slowly, thus preventing excessive vibration of the entire machine. The shaft 36, between the universal joint 38 and the driven double sprocket 35 is provided with another sprocket 61 which drives a large ring gear 62 by means of an endless chain 63. The cleaning and brushing assembly is supported in circular tubular members 64 which are spaced from each other and secured to the upper and lower portions of the side frames 1. The lower portions of the circular members 64 are truncated where they are secured to cross members 65 positioned between the lower horizontal lengths of the side frames 1. Other horizontal cross members 66, particularly shown in Figure 3, are secured between the circular members 64 and support eccentrically adjustable rollers 67, and, as particularly shown in Figure 4, the referred to rollers are mounted on axles 68 which extend from one horizontal support 66 to the corresponding support 66 in the adjacent tubular member 64. Each roller 67 has a pair of flanges 69 spaced from each end thereof for rotatably engaging and supporting the peripheries of spaced mounting rings 70. The referred to ring gear 62 is positioned between the mounting rings 70, but is not fixedly secured thereto. Rollers 71 are mounted on axles 72 and extend between the mounting rings 70 for engaging internal flanges 73 formed in the inside peripheries of the ring gear 62. The axles 72 include eccentrically adjustable bearings 74, as particularly shown in Figure 3. Internally of the ring gear 62 there is a chain gear 75 which is secured to an internal rib 76 by means of bolts 77. The purpose of the last referred to gear 75 is to drive sprockets 78

which are mounted on shafts 79 extending through the pairs of mounting rings 70 and outwardly therefrom.

On the end of each shaft 79, toward the described scraper arrangement, there is a pair of flailing heads, each comprised of spaced pairs of disk plates 80 and having multiple flails 59 previously referred to, pivotally mounted on pins 81 which are secured to and positioned between the pairs of disk plates.

The flails 59 are rectangular in shape and are of hard material, such as tempered steel. Holes 82 are formed through the flails 59 near each end whereby the same may be reversed on the pins 81 when one end becomes worn. As shown in Figure 6, the flails 59 are provided with stops 83 which extend through and between the pairs of disk plates 80 so as to limit the pivotal movement of the flails and cause them to strike the pipe 10 for cleaning the same. The limited movement of one of the flails 59 is shown by means of dotted lines in a broken portion of Figure 6. As shown in Figure 1, each shaft 79 carries a pair of flailing heads which are retained thereon by means of nuts 84.

The ends of the shafts 79, opposite the flailing heads described, are provided with circular brush units 85 which are held between disk retainers 86 and secured on the said shaft by means of nuts 87. The described sprockets 78, mounted on each of the described shafts 79, mesh with the internal chain gear 75 for rotating the flails 59 and brushes 60 at a relatively high speed.

The flails 59 and brushes 60 are rotated about the pipe 10 at a relatively low speed by means of a ring gear 88 secured to the inner face of one of the mounting rings 70. A sprocket 89 mounted on the drive shaft 36 drives a sprocket 90 on a speed reducer 91 by means of an endless chain 92. By means of another sprocket 93 on the speed reducer 91 and an endless chain 94, the ring gear 88 slowly turns the entire flail and brush assembly and causes a planetary action of the same around the pipe 10. The speed reducer 91 is supported on the upper part of the frame 1 by means of a bracket 95.

In operation, the pipe 10 to be cleaned is first engaged between the upper and lower crawler wheels 9 and 11 near the scrapers 39. When the machine is stationary, the driven crawler wheels 9 feed the pipe inwardly where it is scraped by means of the described scrapers 39. As the action of the last referred to crawler wheels 9 continue, the pipe 10 is acted upon by the flails 59 in the manner described, and thus cleans and smoothes the same. As the pipe 10 continues through the machine it is brushed by the brushes 60. The driven crawler wheels 9 near the brushes 60 and the supporting crawler wheels 11 therebeneath engage the pipe 10 and continue the longitudinal movement of the same through the assembly. After cleaning, the pipe is inspected and repaired if necessary. By reason of the resilient action of the described scrapers 39, flails 59, and the brushes 60, projections on the pipe 10, such as collars and patches, may be accommodated since the referred to parts will open sufficiently to allow the projections to pass.

The described form of the invention is not restrictive, but may be made in many ways within the scope of the appended claims.

What is claimed is:

1. In a pipe cleaning machine including a frame, a pair of spaced mounting rings rotatably supported by said frame, shafts extending through and rotatably mounted in said rings, sprockets on said shafts between said rings, an internal ring gear meshing with said sprockets, cleaning heads mounted on said shafts, a ring gear mounted on at least one of said mounting rings, driven shafts supported by said frame outwardly of said mounting rings, driving means connecting one of said driven shafts with said internal ring gear, and driving means connecting the remaining driven shaft with said ring gear mounted on said mounting ring.

2. In a pipe cleaning machine including a frame, rollers supported by said frame, a pair of spaced mounting rings rotatably engaged by said rollers, shafts extending through and rotatably mounted in the said rings, sprockets on said shafts between said rings, an internal ring gear meshing with said sprockets, disks secured on said shafts, flails pivotally carried by said disks, a ring gear mounted on at least one of said mounting rings, driven shafts supported by said frame and positioned outwardly of said mounting rings, driving means connecting one of said driven shafts with said internal ring gear, and driving means connecting the remaining driven shaft with said ring gear mounted on said mounting ring.

3. In a pipe cleaning machine, a frame, pipe supports positioned for moving the pipe to be cleaned relative to said machine, said pipe supports including pairs of freely rotatable crawler wheels for supporting the said pipe and driven pairs of crawler wheels for engaging said pipe, a cleaning assembly including a pair of spaced mounting rings rotatably supported by said frame, shafts extending through and rotatably mounted in said rings, sprockets on said shafts between said rings, a rotatable internal ring gear arranged for meshing with said sprockets, cleaning heads mounted on said shafts, a ring gear secured to one of said mounting rings, driven shafts supported by said frame outwardly of said mounting rings, driving means connecting one of the last said driven shafts with said internal ring gear, and driving means connecting the remaining driven shaft with said ring gear secured to said mounting ring.

JOSEPH E. HAUSER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
67,112	Heffron	July 23, 1867
856,614	Wright	June 11, 1907
1,144,759	Eek	June 29, 1915
1,176,452	Hubbell	Mar. 21, 1916
1,215,482	Chamberlain	Feb. 13, 1917
1,370,769	Sperling	Mar. 8, 1921
1,406,047	Mikshel	Feb. 7, 1922
1,718,179	Olson	June 18, 1929
1,901,247	Kinzbach	Mar. 14, 1933
1,941,002	Harrison	Dec. 26, 1933
2,064,577	Thayer	Dec. 15, 1936
2,279,922	Kraner	Apr. 14, 1942
2,299,523	Carpmail	Oct. 20, 1942
2,302,196	Downs et al.	Nov. 17, 1942
2,307,449	Carpmail	Jan. 5, 1943
2,353,125	Carpmail	July 11, 1944
2,359,568	Logan	Oct. 3, 1944
2,427,129	Fields	Sept. 9, 1947
2,436,099	Cummings et al.	Feb. 17, 1948
2,471,580	Perrault et al.	May 31, 1949