

- [54] **SLUMP METERS FOR MOBILE CONCRETE MIXERS**
- [75] Inventor: **Frederick Stanley Johnson**, Calgary, Alberta, Canada
- [73] Assignees: **Consolidated Concrete Limited; Herbert T. Welch**, Calgary, Alberta, Canada; part interest to each
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- [52] U.S. Cl. .... **259/177, 73/59, 73/136 R**
- [51] Int. Cl. .... **B28c 5/18**
- [58] Field of Search .... **259/175, 176, 177, 259/154, 149, 164, 165, 168, 3, 14, 30, 81, 89; 73/136 R, 59**

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*Primary Examiner*—Robert W. Jenkins  
*Attorney*—Stanley G. Ade

[57] **ABSTRACT**

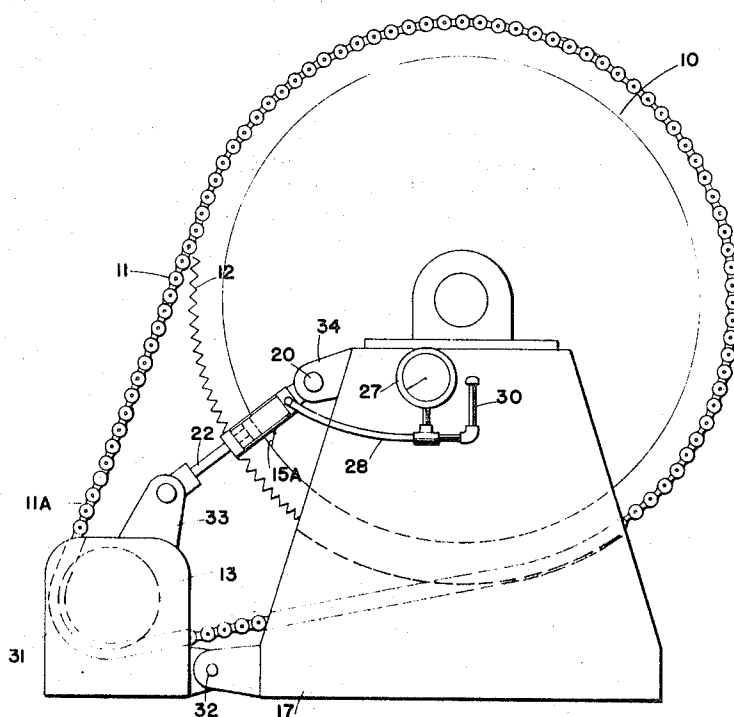
A closed hydraulic piston and cylinder assembly is connected to a pressure gauge and is acted upon by the drive chain so that a variation of the load in the drum, which is a function of the slump condition of the concrete, is read out directly on a pressure gauge which may be calibrated directly in inches of slump. The device may either have a sprocket engaging the drive chain or may substitute for the conventional chain tightener and react directly between the drive casing and the base.

[56] **References Cited**

**UNITED STATES PATENTS**

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**8 Claims, 9 Drawing Figures**



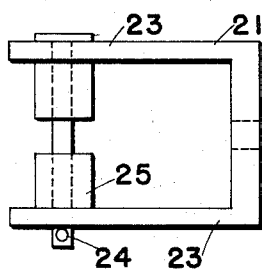
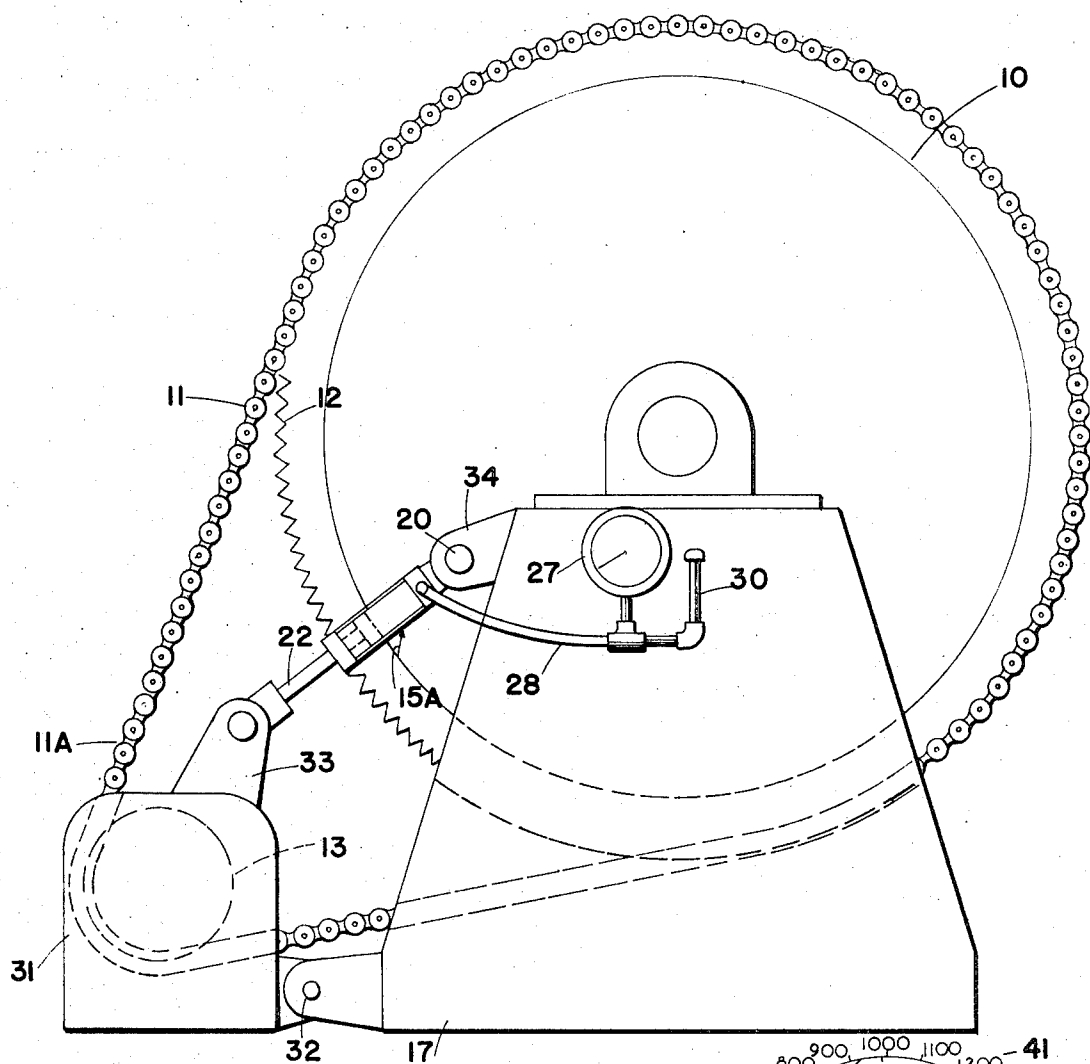


FIG. 3

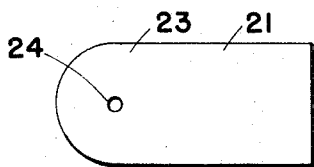


FIG. 4

FIG. 1

FIG. 9

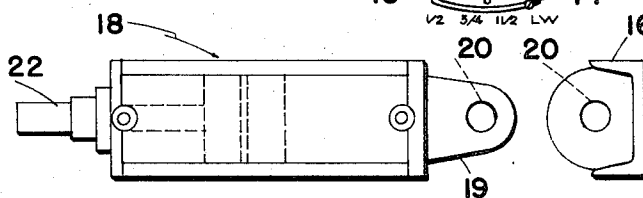
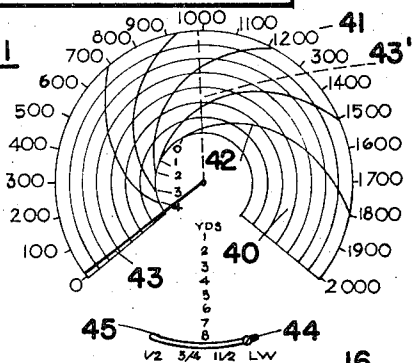


FIG. 5

FIG. 6

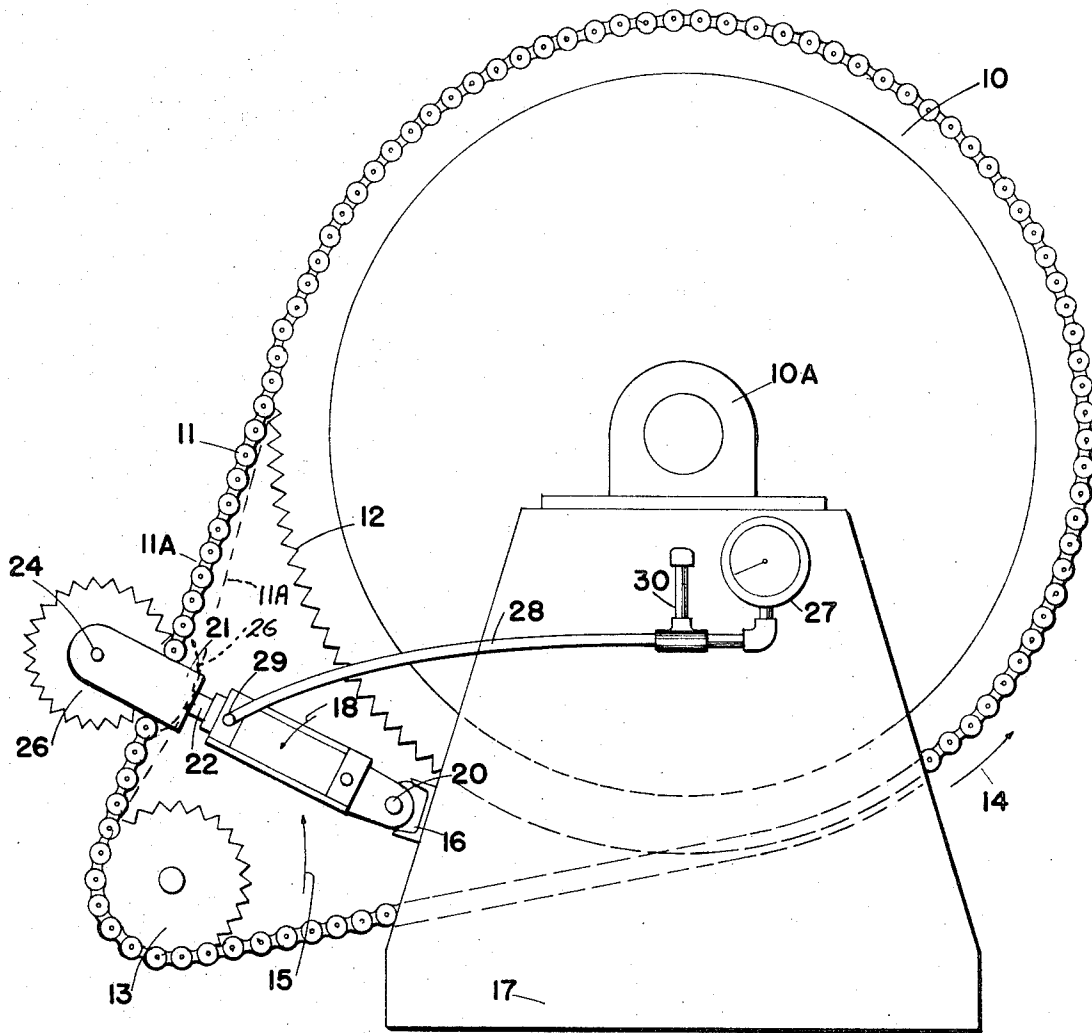


FIG. 2

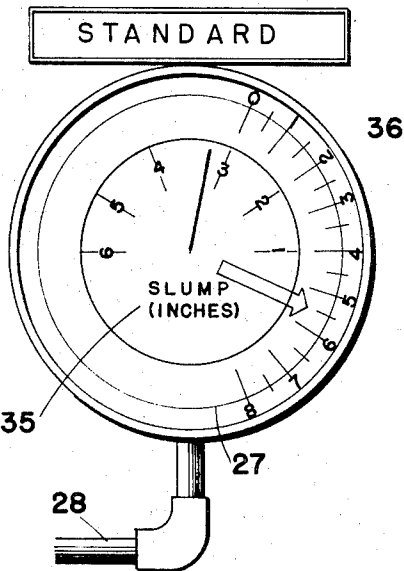


FIG. 7

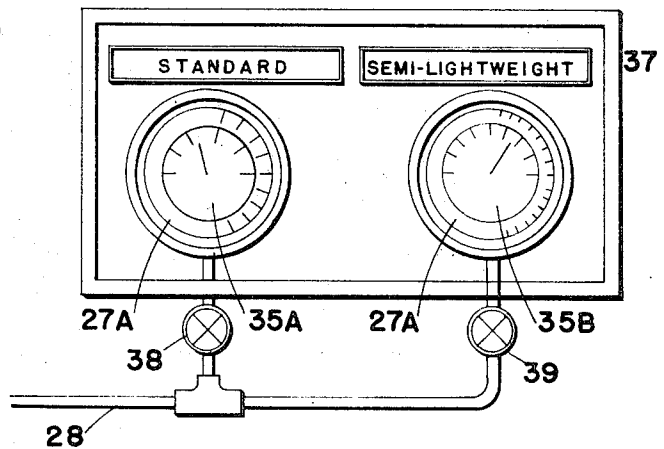


FIG. 8

## SLUMP METERS FOR MOBILE CONCRETE MIXERS

### BACKGROUND OF THE INVENTION

This invention relates to new and useful improvements in slump meters, particularly meters designed for measuring the slump of concrete and utilized specifically in conjunction with mobile concrete mixers.

At the present time, the slump of concrete is measured by sampling the batch and checking the slump of the few shovels full in the sample by means of a conventional slump cone.

Unfortunately, the cone is not very accurate and the sampling process leaves much to be desired inasmuch as it is not necessarily fully representative of the batch and is basically a laboratory test.

It has been felt desirable for some time to have a slump meter which enables the slump of the entire batch to be monitored continuously from the time it is placed in the mobile mixer until it is delivered to the customer.

### SUMMARY OF THE INVENTION

The present invention provides such a slump meter which is attached to the truck carrying the mobile mixer and which enables the driver to ascertain the slump conditions accurately and at all times and to adjust same if necessary in order to bring them up to customer specifications.

The slump is measured directly from the final drive chain thus obviating any dampening effects due to gear box reduction or motor condition.

The principal object and essence of the invention is therefore to provide a device of the character herewithin described which enables the driver of a mobile mixer truck to ascertain the slump conditions of the load within the mixer at all times.

A yet further object of the invention is to provide a device of the character herewithin described in which, once the slump of the concrete is known, it is possible then to determine the volume of concrete still remaining in the mixer.

A yet further object of the invention is to provide a device of the character herewithin described which can be used with mobile mixers of various construction and manufacture.

A yet further object of the invention is to provide a device of the character herewithin described which is simple in construction, economical in manufacture, and otherwise well suited to the purpose for which it is designed.

With the foregoing objects in view, and such other or further purposes, advantages or novel features as may become apparent from consideration of this disclosure and specification, the present invention consists of the inventive concept which is comprised, embodied, embraced, or included in the means, method, process, product, construction, composition, arrangement of parts or new use of any of the foregoing, herein exemplified in one or more specific embodiments of such concept, reference being had to the accompanying drawings in which:

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic end view of a mixer drum and drive with the device incorporated therein.

FIG. 2 is a view similar to FIG. 1 but showing a different embodiment.

FIG. 3 is a front elevation of the sprocket bracket per se.

FIG. 4 is a view at right angles to FIG. 3.

FIG. 5 is a front elevation of the hydraulic cylinder and piston assembly sectioned in part.

FIG. 6 is a front elevation of the mounting bracket for the cylinder.

FIG. 7 shows one type of dial face.

FIG. 8 shows a pair of dial faces useable with standard concrete or semi-light weight concrete.

FIG. 9 shows an enlarged view of an alternative graph type dial face.

In the drawings like characters of reference indicate corresponding parts in the different figures.

### PRELIMINARY DESCRIPTION

The slump or viscosity of ready-mix concrete is an important consideration inasmuch as the majority of premixed concrete is ordered by specifying not only the type of concrete but the slump or viscosity thereof.

It has been found that there is a direct relationship between the slump of concrete in the mixer and the amount of power required to turn the mixer and the present device, when appropriately connected to the drive mechanism of a truck mixer, reflects the power required through pressure on an hydraulic cylinder which in turn is equipped with a pressure gauge. The dial face of the pressure gauge may be calibrated so as to read the slump of concrete in increments of one half inch and for varying quantities of concrete within the mixer.

### DETAILED DESCRIPTION

Proceeding first to describe the invention shown in FIG. 2, reference character 10 illustrates schematically an end view of the mixer drum having a drive chain 11 extending around a gear ring 12 which in turn is secured to the periphery of the drum. The drum is mounted for rotation between bearings 10A (one of which is shown) supported upon bracket frame 17.

The sprocket chain 11 also passes around a drive sprocket 13 which is adapted to be driven by the source of power on the truck (not illustrated) in the direction of arrow 14.

The load on the drum is therefore present in the run of chain 11A extending between the sprocket 13 and the ring gear 12 and it is at this point that the load is read by the device collectively designated 15.

This device consists of a base bracket 16 secured to the frame or base 17 of the drum 10 and having a piston and cylinder assembly collectively designated 18 pivotally secured by one end 19 thereof within this bracket 16 by means of pin 20.

A carrier 21 is secured to the distal end of the piston rod 22 and this carrier includes a pair of spaced and parallel side plates 23 carrying a bearing pin 24 and spacers 25 between which a chain sprocket 26 is journaled for free rotation.

The side plates 23 of the bracket span each side of the chain 11 and the sprocket wheel or gear 26 engages this chain on the outer side thereof as clearly shown in FIG. 2.

An oil filled pressure gauge 27 is mounted in a convenient location together with a hose 28 extending

therefrom to one end of the piston and cylinder assembly as indicated by reference character 29. A fill pipe assembly 30 is positioned along the length of the hydraulic hose 28 to enable hydraulic fluid to be injected into the device under pressure. The device also acts as a chain tightening device and sufficient oil under pressure is placed within the fill pipe to deflect the chain portion 11A as clearly shown, it being understood that the drum is empty at this time and under free load.

The dial is then set to zero for the particular truck upon which the device is installed and this automatically sets the calibration of the dial for all conditions of load and slump. Furthermore, the device automatically monitors chain and sprocket wear by checking the dial when the drum is empty.

In operation, as the load increases within the drum due to the amount of concrete and the slump thereof, the portion 11A of the chain tries to align itself tangentially with the ring gear 12 and the sprocket 13. This places a direct load upon the hydraulic fluid within the piston and cylinder assembly which is recorded directly by the dial 27. It is desirable to preload the system with approximately 25 p.s.i. with the drum empty and then set the dial to zero. It should also be noted that the angle between the sprocket 26 and the chain is substantially constant thus ensuring consistent and accurate readings under varying conditions.

FIG. 1 shows an alternative embodiment in which the device is secured to a gear box type drive mechanism. Where indicated, corresponding reference characters have been given. The drive sprocket 13 is driven by a gear box 31 which is pivoted to the base 17 by means of pivot assembly 32.

A fixed bracket 33 extends upwardly from the gear box and normally carries a chain tightener. This is removed and the device 15A hereinbefore described is connected between this arm 33 and a fixed lug 34 upon the base 17.

The device consists of the piston and cylinder assembly 18 hereinbefore described, the only difference being that the flexible or hydraulic hose 28 is connected to the opposite end of the cylinder because it is acting in the opposite direction to that of the previous embodiment.

The operation is similar inasmuch as the load on the portion of the chain 11A is directly proportional to the slump and volume of concrete within the drum and this is recorded upon the pressure gauge or dial assembly 27. Once again the system is preferably loaded to 25 p.s.i. with the drum empty.

Although the type of dial face used can take many forms, FIG. 7 shows one preferred embodiment in which 35 illustrates the dial face within the pressure gauge 27. The dial is calibrated to measure the slump in inches and the outer ring 36 of the dial may also be calibrated as illustrated and manually rotatable to set the dial for use with varying amounts of concrete within the drum.

FIG. 8 shows an arrangement with two pressure gauges 27A and 27B carried in a common casing 37. These gauges have dials 35A and 35B respectively and valves 38 or 39 may be actuated to place either gauge in circuit. Gauge 27A can be calibrated for normal concrete and gauge 27B for semi-lightweight concrete having different load characteristics.

The dial calibration is permanently set after installation and calibrated for the individual truck and may, alternatively, be in graph form to read either pounds of force, inches of slump or the like. Under normal conditions the only adjustments which might be required from time to time is due to the wear on the blades within the drum which, of course, will effect the load characteristics thereof and wear in the chain and sprocket assemblies.

It is believed that measuring the slump at this point is advantageous inasmuch as it rules out any dampening effect of gear box reduction units or motor conditions or the like which would tend to make the final read-out inaccurate. It should also be noted that the hydraulic systems are completely closed systems thus reducing servicing.

FIG. 9 shows an alternative dial construction in which the dial face is designated 35C. A plurality of concentric circles 40 inscribed thereon, each one corresponding to the number of yards of concrete within the drum 10. It will be understood that the load on the chain 11 varies proportionately to the amount of concrete within the drum and this arrangement enables accurate slump measurements to be ascertained whatever the quantity of concrete.

The markings 41 around the perimeter indicates pounds per square inch pressure and graph lines 42 are plotted for various degrees of slump such as 0 inch, 1 inch, 2 inches, etc.

These graph lines are plotted for each machine so that the degree of slump can be read off for any amount of concrete by the intersection of the dial needle 43, with the relevant graph line for the quantity of concrete remaining in the drum. For example the dotted line 43' indicates 1 inch of slump for four cu.yds. of concrete, just over 2 inches slump for six cu.yds. of concrete and nearly 3 inches of slump for eight cu.yds. of concrete.

If closer measurements are required then the dial face can be adjusted radially due to the clamp screw 44 through the arcuate slot 45 in the dial face. This enables the dial face to be set to read slump in  $\frac{1}{2}$  inch,  $\frac{3}{4}$  inch and  $1\frac{1}{2}$  inches increments as well as having a setting for light weight aggregate L.W.

It will of course be appreciated that the cylinder diameter or mechanical linkage can be altered to accommodate various models or sizes of trucks and concrete mixes.

Various modifications may be constructed or performed within the scope of the inventive concept disclosed. Therefore what has been set forth is intended to illustrate such concept and is not for the purpose of limiting protection to any herein particularly described embodiment thereof.

What I claim as my invention is:

1. In a mobile ready mix type concrete mixer which includes a concrete holding drum journaled for rotation upon a base and having a ring sprocket gear surrounding the drum and a sprocket chain extending around said ring gear and a drive assembly sprocket; a slump meter assembly, said assembly including a pressure gauge, a piston and cylinder assembly pivotally secured by one end thereof to said base, an hydraulic hose extending between one end of the cylinder of said piston and cylinder assembly and said gauge, and means operatively connecting the piston rod of said piston and cylinder assembly to said drive chain to sense the tension on said chain.

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2. The device according to claim 1 in which said means includes a carrier secured to said piston rod, a chain sprocket journaled for rotation on said carrier and engaging said chain between said ring gear and said drive sprocket on the loaded run of said chain.

3. The device according to claim 2 in which said carrier includes a pair of spaced and parallel side plates one upon each side of said chain whereby said sprocket engages said chain upon the outer side thereof.

4. The device according to claim 3 which includes a fill pipe assembly connected to said hydraulic hose for filling said piston and cylinder assembly, said hose and said pressure gauge and preloading same by a predetermined amount of hydraulic fluid under pressure, said pressure gauge including a dial and an adjustable outer ring surrounding said dial.

5. The device according to claim 2 which includes a fill pipe assembly connected to said hydraulic hose for filling said piston and cylinder assembly, said hose and said pressure gauge and preloading same by a predetermined amount of hydraulic fluid under pressure, said pressure gauge including a dial and an adjustable outer ring surrounding said dial.

6. The device according to Claim 1 in which said drive sprocket assembly includes a gear box pivotally

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secured by one side thereof to said base, said sprocket assembly including a drive shaft and a drive sprocket secured thereto; said means operatively connecting said piston rod to said drive chain includes means pivotally connecting said piston rod of said piston and cylinder assembly to said gear box above the point of pivotal attachment of said box to said base, said piston and cylinder assembly acting as a chain tensioning device.

7. The device according to claim 6 which includes a fill pipe assembly connected to said hydraulic hose for filling said piston and cylinder assembly, said hose and said pressure gauge and preloading same by a predetermined amount of hydraulic fluid under pressure, said pressure gauge including a dial and an adjustable outer ring surrounding said dial.

8. The device according to claim 1 which includes a fill pipe assembly connected to said hydraulic hose for filling said piston and cylinder assembly, said hose and said pressure gauge and preloading same by a predetermined amount of hydraulic fluid under pressure, said pressure gauge including a dial and an adjustable outer ring surrounding said dial.

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