

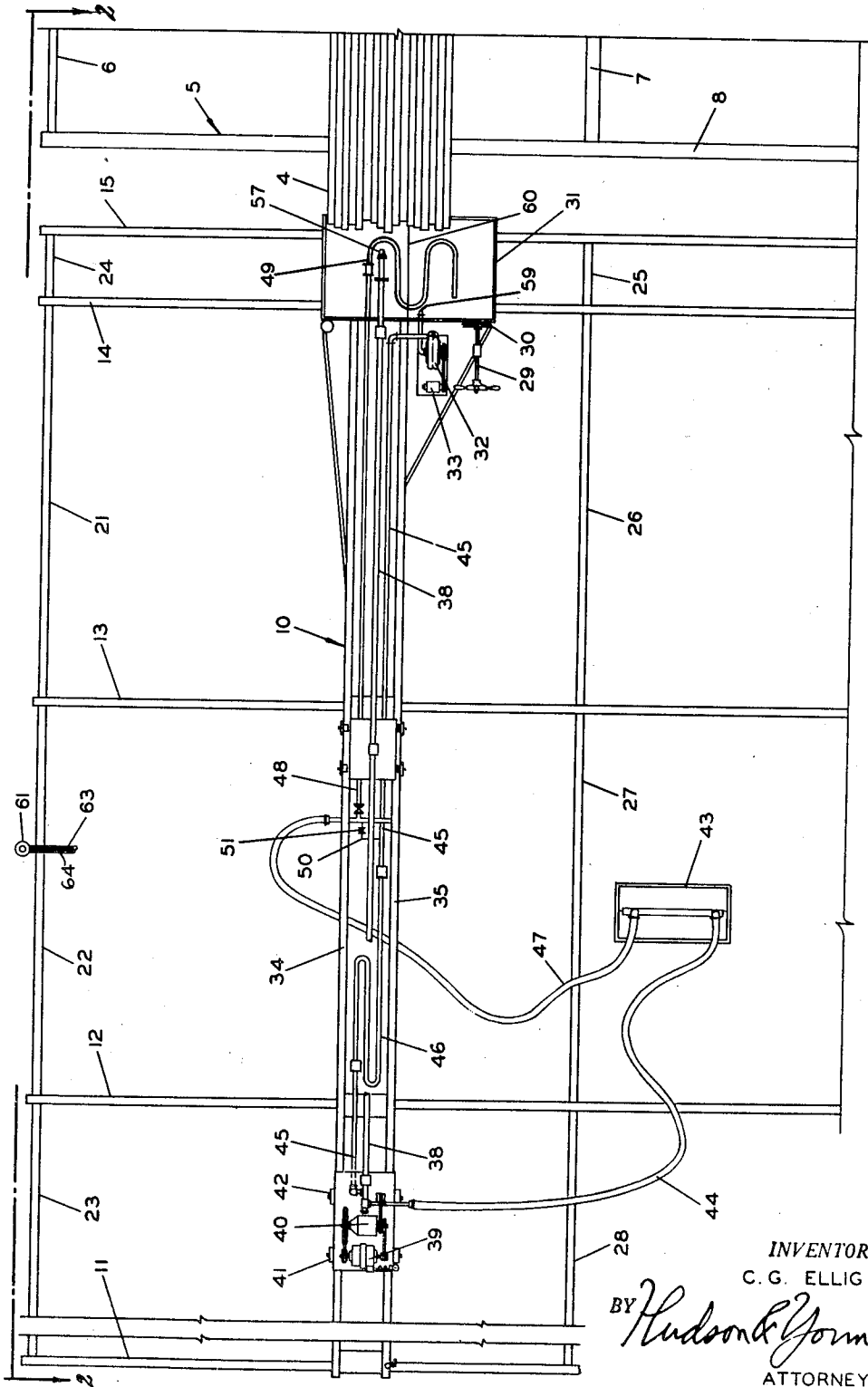
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C. G. ELLIG
GUIDED CARRIAGE MEANS FOR FLUSHING
THE INTERIOR OF LENGTHS OF PIPE

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3 Sheets-Sheet 1



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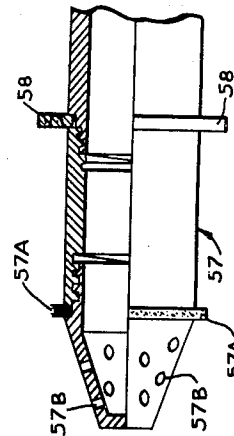
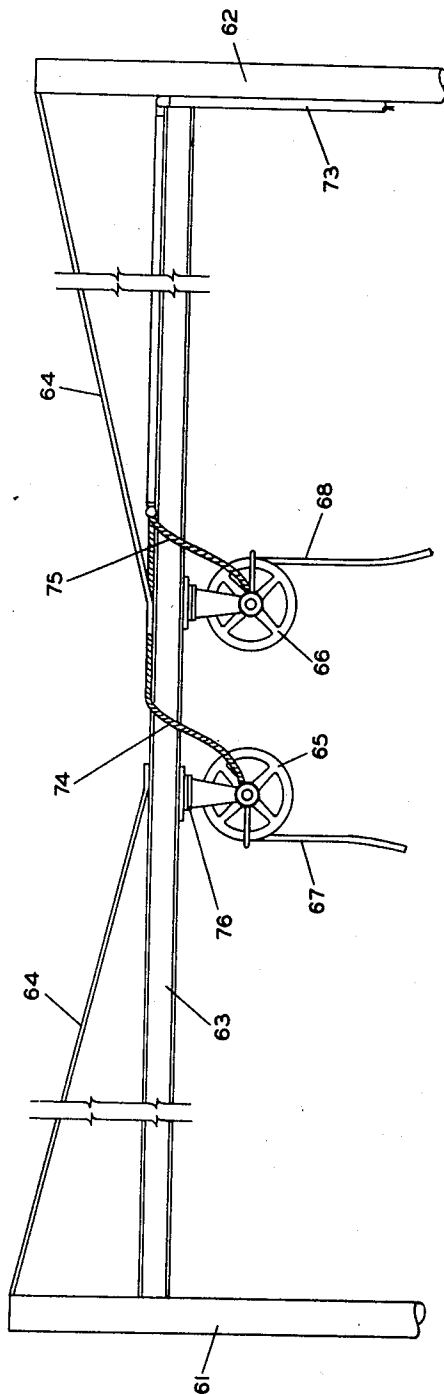


FIG. 3.

FIG. 4.

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GUIDED CARRIAGE MEANS FOR FLUSHING
THE INTERIOR OF LENGTHS OF PIPECarl G. Ellig, Phillips, Tex., assignor to Phillips
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2 Claims. (Cl. 134-168)

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This invention relates to devices for cleaning the insides of tubes. In a more specific aspect it relates to a device for cleaning oil well tubing in order to remove accumulation of paraffin and other deposits by means of brushing and washing with a chemical solution.

In other specific aspects it relates to cleaning serially a long row of pipes. It obviously relates to cleaning pipe while it is piled in a pipe rack without moving the pipe.

In numerous arts it is necessary to clean the inside of a large number of pipes. In the oil industry, in flowing and pumping wells, paraffin and salts such as gypsum tend to accumulate inside the tubing. Such accumulations reduce the effective size of the tubing and increase the expense of moving fluids therethrough. Because of this, it is necessary every now and then to pull the tube out of the well and clean it. When the tubing is pulled out of the well it is convenient to pile the tubing on a tubing rack or platform.

The present invention relates to a device for cleaning the tube while piled on such a platform without moving the tubing.

One object of the invention is to provide a moving platform with a reciprocating fountain brush whereby a large number of pipes may be cleaned serially without moving the pipes.

Another object is to provide means for supplying liquid to such a fountain brush.

Another object is to heat the liquid so supplied to increase its solvent action.

Another object is to provide a pipe cleaning device which is rugged and has a simple fool proof action, which may be constructed out of standard parts which are easily replaced and which is simple and easy to operate.

Another object is to provide a tube cleaning device.

Numerous other objects and advantages will be apparent to those skilled in the art upon reading the accompanying specifications, drawings and claims.

In the drawings:

Figure 1 is a plan view of a tube cleaning device embodying the present invention with parts broken away.

Figure 2 is an elevational view with parts broken away and with parts in cross section of the structure shown in Figure 1. Figure 2 is taken along the line 2-2 in Figure 1 looking in the direction indicated by the arrows. It will be noted that Figure 2 is not a cross sectional view of Figure 1 because no portion of the machine is

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cut by line 2-2, however the ground is shown in cross section and a portion of tank 31 has been broken away to show internal details of construction. It will be noted that hoses 44 and 47, pole 61, beam 63 and brace 64 shown in Figure 1 have been removed and are not shown in Figure 2 in order to avoid cluttering up the view.

Figure 3 is an elevational view, with parts broken away of the electric power transmission system employed with the device as shown in Figures 1 and 2.

Figure 4 is an elevational quarter-sawed enlarged view of the fountain brush 57 shown in Figures 1 and 2.

The devices heretofore employed for cleaning oil well tubing and the like are slow and cumbersome, requiring an excessive expenditure of time and man power. The best of the so called "portable" cleaners available require 3 men for their operation, and they are not satisfactory from the standpoint of time and also thoroughness of cleaning. The present invention provides an apparatus with which one man, working all alone, can clean tubing faster and more thoroughly than is possible with the old 3 man portable cleaners.

Figure 1 shows a plan view of apparatus embodying the present invention as applied to the cleaning of a row of pipes 4, stacked on any suitable pipe rack generally designated as 5. Pipe rack 5 may be built up in any manner desired, but is shown as consisting of old second hand pieces of pipe welded together, there being longitudinal members 6 and 7 and transfer members such as 8 supported on vertical members 9 (as shown in Figure 2).

The apparatus of Figure 1 comprises a cleaning unit generally designated as 10. The cleaning unit 10 is mounted for movement along a plurality of tracks 11, 12, 13, 14 and 15, which tracks extend transverse to the axis of tubes 4. Cleaning unit 10 is shown in Figure 2 as mounted for movement on tracks 11, 12, 13, 14 and 15 on rollers 16, 17, 18, 19 and 20 respectively.

Obviously tracks 11 to 15 could be eliminated where the ground is smooth enough and rollers 16 to 20 could be rubber tired wheels. However, it is much easier to properly aline rails 11 to 15 than to try to smooth out the ground sufficiently for trackless operation, so tracks are generally preferred.

While 11 to 15 may be independently set in the ground it is preferred to cheapen the construction cost by welding rails 11 to 15 in proper relation

by means of spacing members 21, 22, 23, 24, 25, 26, 27, and 28. These spacing members may be of any old scrap available and may be welded to the rails or tracks.

It may be seen that unit 10 may be moved 5 down tracks 11 to 15 to clean each one of pipes 4 in turn, and in order to make this movement, a hand wheel 29 is provided which drives wheel 19 by means of chain transmission 30.

Cleaning unit 10 comprises a liquid or chemical bath 31, a chemical pump 32 driven by electric motor 33, and a pair of tracks 34 and 35 all of which are in fixed position relative to each other, but which move as unit 10 along the tracks 11 to 15.

Mounted on wheels on tracks 34 and 35 are two carriages 36 and 37 which support a steam cleaning pipe 38 and other equipment which will now be described.

On carriage 37 is a reversible electric motor 39 20 which drives through a gear reduction 40, wheels 41 and 42 moving carriage 37 back and forth along tracks 34 and 35 causing pipe 38 to travel in and out pies 4 which are being cleaned. Steam is supplied to pipe 38 from a sunken connection box 43 through steam-hose 44.

The liquid in 31, which is preferably a heated chemical cleaning solution, is pumped by pump 32 through pipe 45 into pipe 38. Pipe 45 is provided with an intermediate flexible hose section 46 (shown in the left hand portion of unit 10 in Figure 1) to allow for movement of carriage 37.

Steam-hose 47 communicates with and supplies steam to steam pipe 48 from which it passes into heating coil 48 in vat 31 to warm the liquid therein. While the end of pipe 49 may pass out of vat 31 so that the steam will not mix with the liquid, in most instances it is preferred to have the steam coming out the end of pipe 49 and bubble up through the liquid in vat 31 as shown.

A portion of the steam in hose 47 may be fed into pipe 45 through pipe 50 controlled by valve 51 if desired. Whether this is necessary depends largely on the character of liquid used in tank 31, and if desired a number of by-passes such as 58 40 may be spaced along between pipes 45 and 48 each with a valve similar to 51 in order to add steam at a plurality of points to pipe 45 to keep the liquid therein in constant agitation at relatively high temperature. However, in many instances pipe 50 is not necessary and valve 51 may remain closed.

Figure 2 shows additional details of the cleaning unit 10. Pipe 38 is guided by stands 52, 53, and 54 which may be adjusted as to height by wheels 55 which operate set screw clamp center support portion 56. Pipe 38 is slidably mounted in the support portion on head 56 of each of stands 52 and 53, and is clamped to head 56 of stand 54. Pipe 38 is preferably provided with a fountain brush 57 in order to get the maximum cleaning effect from the cleaning liquid in tank 31. Any of the standard type fountain brushes may be employed, there are generally bristles 57A of wire or other stiff material on brush 57 which scrape material off the inner surfaces of pipes 4 and there are generally a number of outwardly directed jets 57B on head 57 directing the liquid to impinge forcibly on the inside of pipe 4 to remove the matter encrusted thereon. Head 57 is not absolutely essential but is very much preferred as increasing the efficiency of the device. To further increase the efficiency of the device, although the additional increase is not as large, it

is preferable to provide a swab or scratcher 58, or a number of the same, on pipe 38 behind fountain head 57. The function of swab 58 is to form a collar to prevent too rapid return of liquid from pipe 4 into vat 31 and to cause more of the liquid to move back into pipe 4 ahead of fountain brush 57 whereby some pre-treatment is afforded. Wires 57A may be radial and may be soldered or otherwise secured together at their base into a ring. Swab 58 is preferably fabric, such as second-hand canvas-base belting. The external structure shown originally in Figures 1 and 2 is preferred, and the internal construction shown in Figure 4 by amendment is merely one of many 15 possible ways of assembly and is not claimed.

Pipes 4 are supported on rack 5 in a tilted position (which tilting is too slight to show in Figure 2). The tilting being sufficient to allow liquid to drain back out of pipe 4 into tank 31 upon the withdrawal of head 57. Preferably swab 58 is smaller than the interior of pipe 4 so that some liquid drains and passes swab 58 at all times.

When head 58 is withdrawn from one of pipes 4 the liquid therein drains back into tank 31 25 carrying pieces of scale and paraffin and in order to prevent these pieces from being picked up by intake 59 of pump 32 a vertical screen 60 is provided traversing the entire interior of tank 31. Because of difficulty of illustration, screen 60 has been shown on Figure 2 as a broken-away portion of a larger screen. If desired, a further filter or a screen intake may be provided on the end of intake 59 in tank 31 to prevent pump 32 from picking up solids which may pass through screen 60 35 or may drain out of pipes 4 on the wrong side of screen 60.

Most of such material drains out of pipe 4 as head 57 is withdrawn. Some liquid may pass through the other end of pipe 4 and be lost on the ground. If desired a trough may be provided at the far end of pipes 4 to collect liquid passing therethrough, which trough may be bailed out from time to time and the liquid replaced in tank 31. However, it has been found that the amount 45 of such lost liquid is, in most instances, small enough to be negligible and such a trough is not generally necessary. A certain amount of liquid is lost in the form of steam and a certain amount of liquid is collected by condensation of steam emerging from pipe 39 into vat 31. So the amount of liquid in 31 is relatively constant and need not be made-up by addition of liquid except perhaps at long intervals of time.

While of course, motors 33 and 39 could be self-controlled internal combustion engines with independent supplies of fuel, it is preferred to use electric power which power could of course be supplied by batteries (not shown). Whenever commercial electric power is available it is preferred to use the same and it is preferred to employ the power transmission system shown.

In Figure 3 supporting poles 61 and 62 are placed at opposite ends of tracks 11 to 15 and between poles 61 and 62 a cross member 63 is provided which may be reinforced by guide wires or rods 64. Mounted adjacent the center portion of member 63 it is preferred to have cable reels 65 and 66. These cable reels are of a well known type employing a spring mechanism which always 70 keeps the cables 67 and 68 wound upon the reels 65 and 66 as much as possible. As shown in Figure 2, this keeps cables 67 and 68 taut, keeping them off the ground and out of the way. Cable 67 leads to a cable attachment post 69 and supplies power to motor 33. Cable 68 leads to a simi-

lar supporting post 70 and supplies power to motor 39. On either or both of posts 69 and 70 suitable switches of other forms of a motor control 71 may be mounted at a position convenient to the operator. From control 71 a cable 72 may lead to motor 39; as a continuation of electric cable 68.

In Figure 3 the power comes in conduit 73 and branches out through conduits 74 and 75 to connect with cables 67 and 68 respectively on reels 65 and 66 by suitable brushes or other equipment (not shown).

Both of reels 65 and 66 may be provided with a swivel 76 to allow reels 65 and 66 to properly position themselves.

Carriage 36 is preferably connected to carriage 37 by a lost motion connection such as chain 77, the operation of which will be described later. For relatively short lengths of pipes 38 carriage 36 and related parts are unnecessary, but when pipe 38 is long it is preferred to have one or more carriages such as 36 to keep pipe 38 from buckling.

It will be noted in Figure 2 that motor reversing switch 71 which controls the direction of rotation of motor 39 and thereby the direction of travel of carriage 37, is provided with a reversing switch actuator 78. Frame 10 has an upright element 79 rigidly secured thereto comprising a member 80 adapted and disposed to cooperate with reversing switch actuator 78 as will be described under the operation of the invention.

Operation

From the foregoing discussion it is evident that only one operator is required. His duties are very light, since he has only to put unit 10 into proper position each time a new pipe 4 is to be cleaned by turning wheel 29 and to reverse switch 71 by resetting actuator 78 when the fountain brush 57 has reached the other end of the pipe 4 being cleaned. The uniform speed of pipe 38, which may be in the neighborhood of about 30 feet per minute and the substantial rate at which steam and chemical solutions are supplied, which may be at a rate in the neighborhood of about one gallon of solution per minute and as much steam as seems necessary depending on the condition of the pipe 4 and the outdoor temperature on that day, obviously result in greater efficiency than has been attained by portable cleaners of the prior art.

While of course the invention may be applied to a wide range of sizes and while the positions and arrangement of parts may vary widely, in order to give a specific example for purposes of illustration a successful embodiment of this invention employs a vat 31 which is 32 inches high, 36 inches wide and 6 feet long, tracks 11, 12, 13, 14 and 15 being made from 3 inch by 5 inch I beams and member 21 and like parts being 2 inch welded line pipe. Naturally any available material, new or secondhand, may be employed in constructing the device.

While many types of chemical mixtures or just water may be employed in tank 31, it is preferred to use about 5 pounds of any usual commercial pipe cleaning chemical to about 55 gallons of water. While a wide range of steam pressure values give useful results it is preferred to employ approximately 90 pounds steam pressure.

In operation, the vat 31 is filled with the chemical solution and unit 10 is positioned so that head 57 will enter the first pipe 4. Carriage or carriages 36 are spaced between carriage 37 and tank 31, holding up pipe 38. Electric power is supplied through switch 71 energizing motor

39, steam is supplied through pipes 44 and 47 and motor 33 is started up actuating pump 32.

Carriage 37 travels to the left as seen in Figure 2 and carriage or carriages 53 travel or stay still depending upon friction conditions between pipe 38 and guide 56 as compared to the friction between carriage 53 and tracks 34. In either case pipe 38 is sufficiently supported and in time chain 77 sags and carriage 37 closes up the space between it and carriage 36.

Fountain brush 57 has a scraping and jetting action on the deposits inside pipe 4 and chemical solutions from 31 pumped by pump 32 and heated by coil 49 and in some cases additional steam from pipe 50, has a solvent action on the material inside pipe 4. Some of the solution runs back past swab 58 into tank 31 because pipes 4 are resting on rack 5 at an angle allowing them to drain back into tank 31.

When the operator judges brush 57 has reached the outer end of pipe 4 (which he can easily do by knowing the average length of pipe 4 and painting footmarks on pipe 38) he will find switch 71 is near at hand so that he can operate reversing arm 78. Carriage 37 then proceeds to the right picking up chain 77 and picking up carriage 36, or carriages 36 as the case may be, as the lost motion in chain 77 is removed. This provides for support of pipe 38 so that no undue long portion thereof is ever unsupported.

When carriage 37 has withdrawn the head 57 from pipe 4 the liquid in pipe 4 runs into tank 31 carrying solid material therein. Screen 60 may be employed to prevent this solid material from being recirculated as such prevention is desirable. A member 80 of element 79 reverses switch 71 by contact arm 78 while operator turns handwheel 29 the amount necessary to guide head 57 into the next pipe 4 and the operation is repeated.

Obviously formal changes may be made in the specific embodiments of the invention described without departing from the spirit and substance of the present invention, the scope of which is commensurate with the appended claims.

Having described my invention, I claim:

1. A pipe cleaning device comprising in combination a pipe rack constructed and disposed to support a plurality of parallel pipes in a substantially horizontal plane but with the longitudinal axes of said pipes sloping downward enough to permit gravity draining of liquid out of the same ends of said pipes, a first carriage constructed and disposed to move transversely of the longitudinal axes of said pipes adjacent said ends of said pipes, a tank mounted on said first carriage constructed and disposed to receive liquid draining by gravity from said ends of said pipes, a second carriage mounted on said first carriage and constructed and disposed to move on said first carriage along the longitudinal axis of any one of said pipes depending on the position of said first carriage, a pipe cleaning tool comprising a tube mounted on said second carriage and constructed and disposed to move with said second carriage and for one end to enter and be withdrawn from any one of said pipes depending on the position of said first carriage, a head having outwardly directed jet forming holes communicating with said tube mounted on said end of said tube, a collar of diameter suitable to enter said pipes mounted on said tube adjacent said head, means mounted on said first carriage adjacent said ends of said pipe disposed to position and guide said tube in its movements, means

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to pump liquid from said tank into said tube, means to drive said first carriage in said movements and means to drive said second carriage in said movements.

2. A pipe cleaning device comprising in combination a pipe rack constructed and disposed to support a plurality of parallel pipes in a substantially horizontal plane but with the longitudinal axes of said pipes sloping downward enough to permit gravity draining of liquid out of the same ends of said pipes, a first carriage constructed and disposed to move transversely of the longitudinal axes of said pipes adjacent said ends of said pipes, a tank mounted on said first carriage constructed and disposed to receive liquid draining by gravity from said ends of said pipes, a second carriage mounted on said first carriage and constructed and disposed to move on said first carriage along the longitudinal axis of any one of said pipes depending on the position of said first carriage, a pipe cleaning tool comprising a tube mounted on said second carriage and constructed and disposed to move with said second carriage and for one end to enter and be withdrawn from any one of said pipes depending on the position of said first carriage, a head having outwardly directed jet forming holes communicating with said tube mounted on said end of said tube, means mounted on said

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first carriage adjacent said ends of said pipe disposed to position and guide said tube in its movements, means to pump liquid from said tank into said tube, means to drive said first carriage in said movements and means to drive said second carriage in said movements.

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