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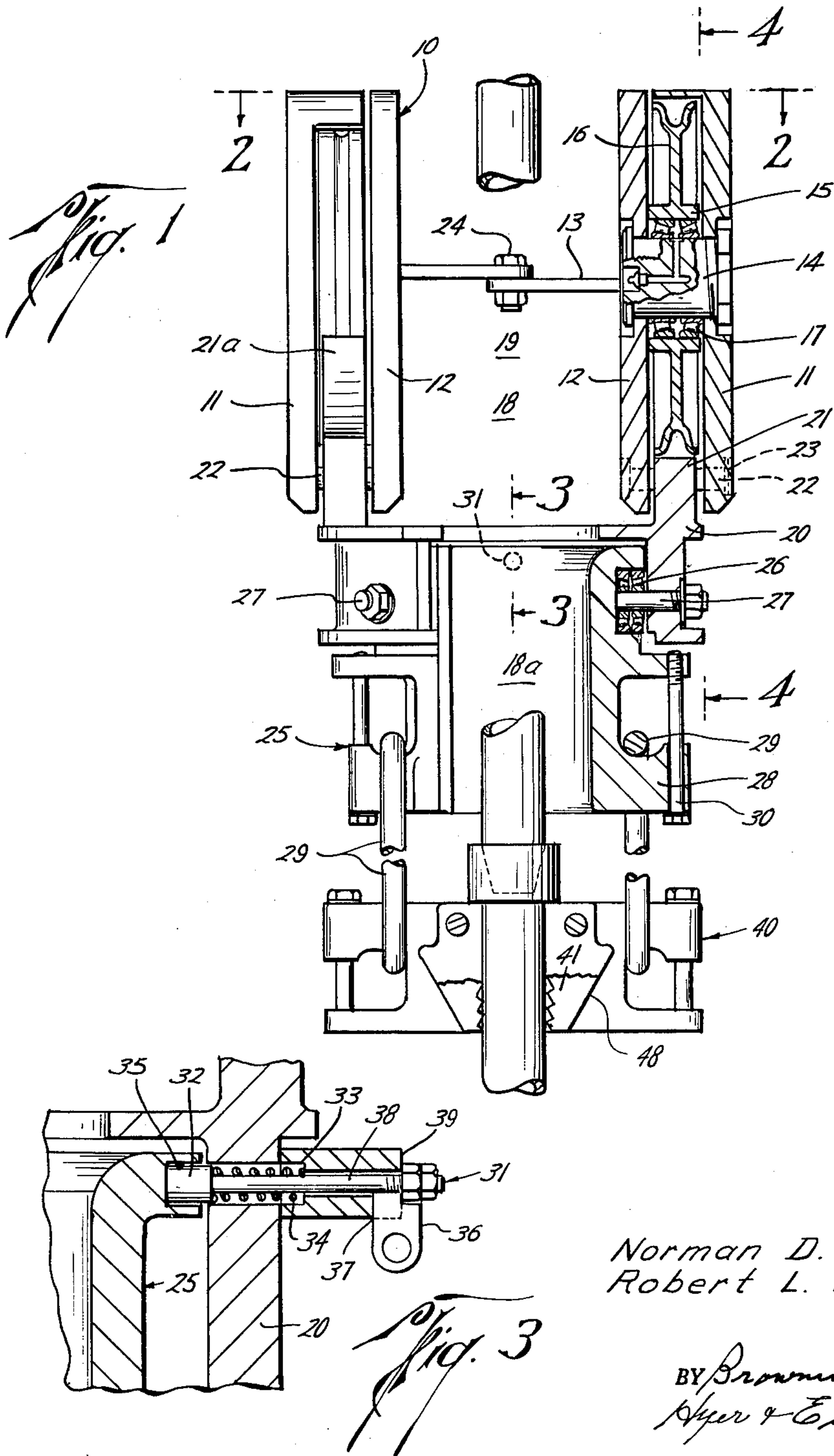
N. D. DYER ETAL

3,101,928

TRAVELING BLOCK ASSEMBLY

Filed July 24, 1961

3 Sheets-Sheet 1



Norman D. Dyer
Robert L. Franks
INVENTORS

BY *Browning, Simms,
Dyer & Eisenhardt*
ATTORNEYS

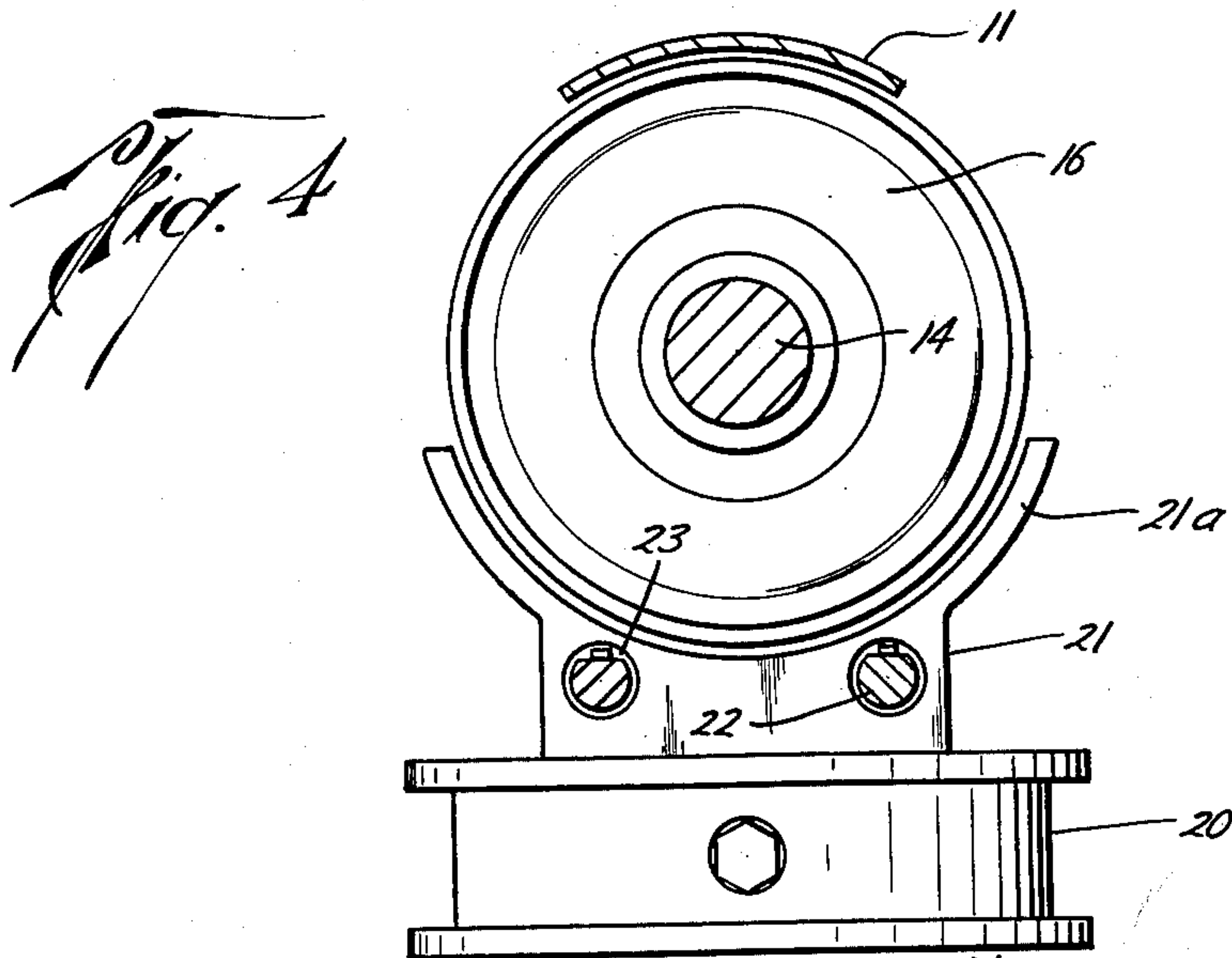
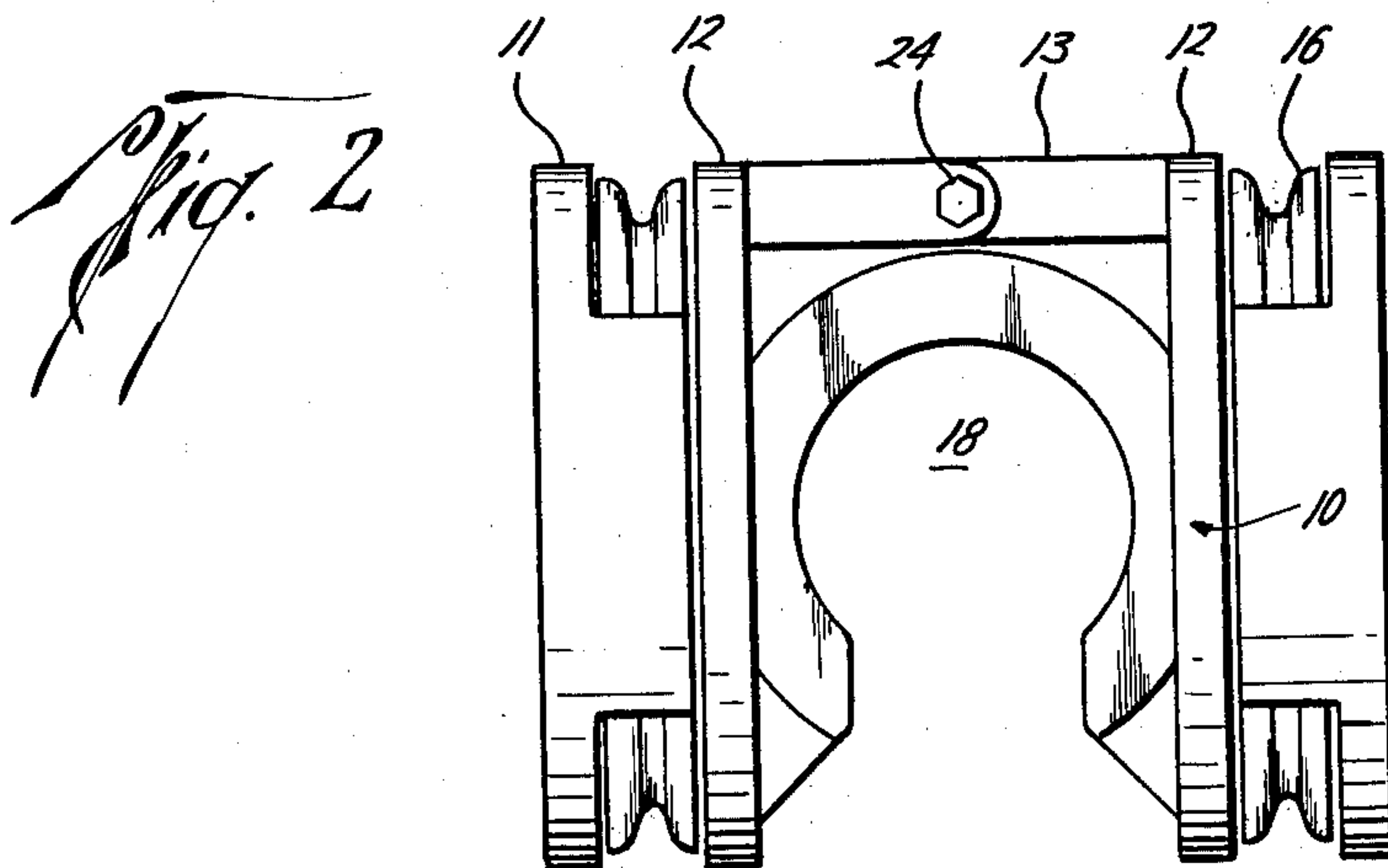
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Norman D. Dyer
Robert L. Franks
INVENTORS

BY *Browning, Simms*
Dyer & Eickmeyer
ATTORNEYS

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3 Sheets-Sheet 3

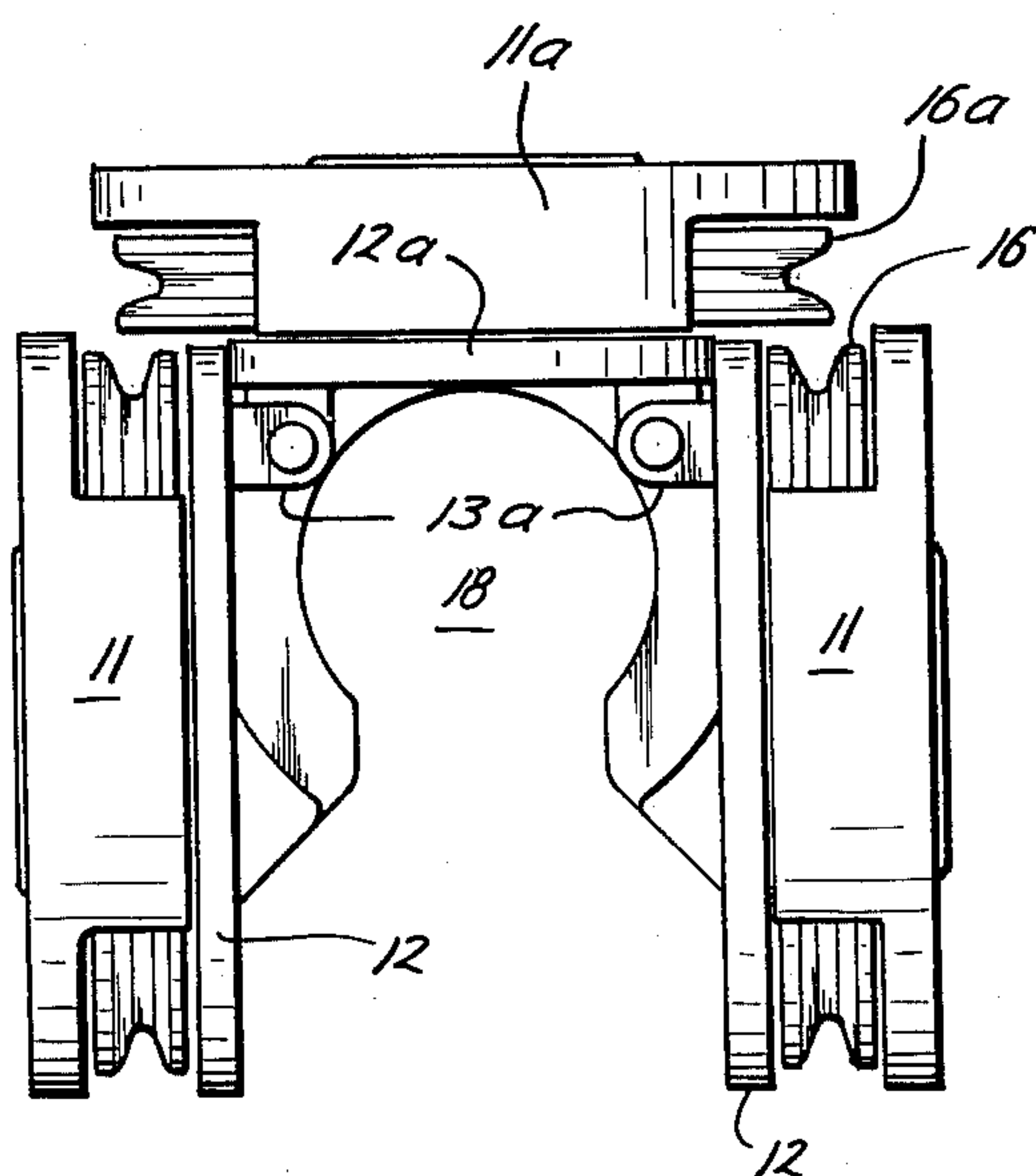
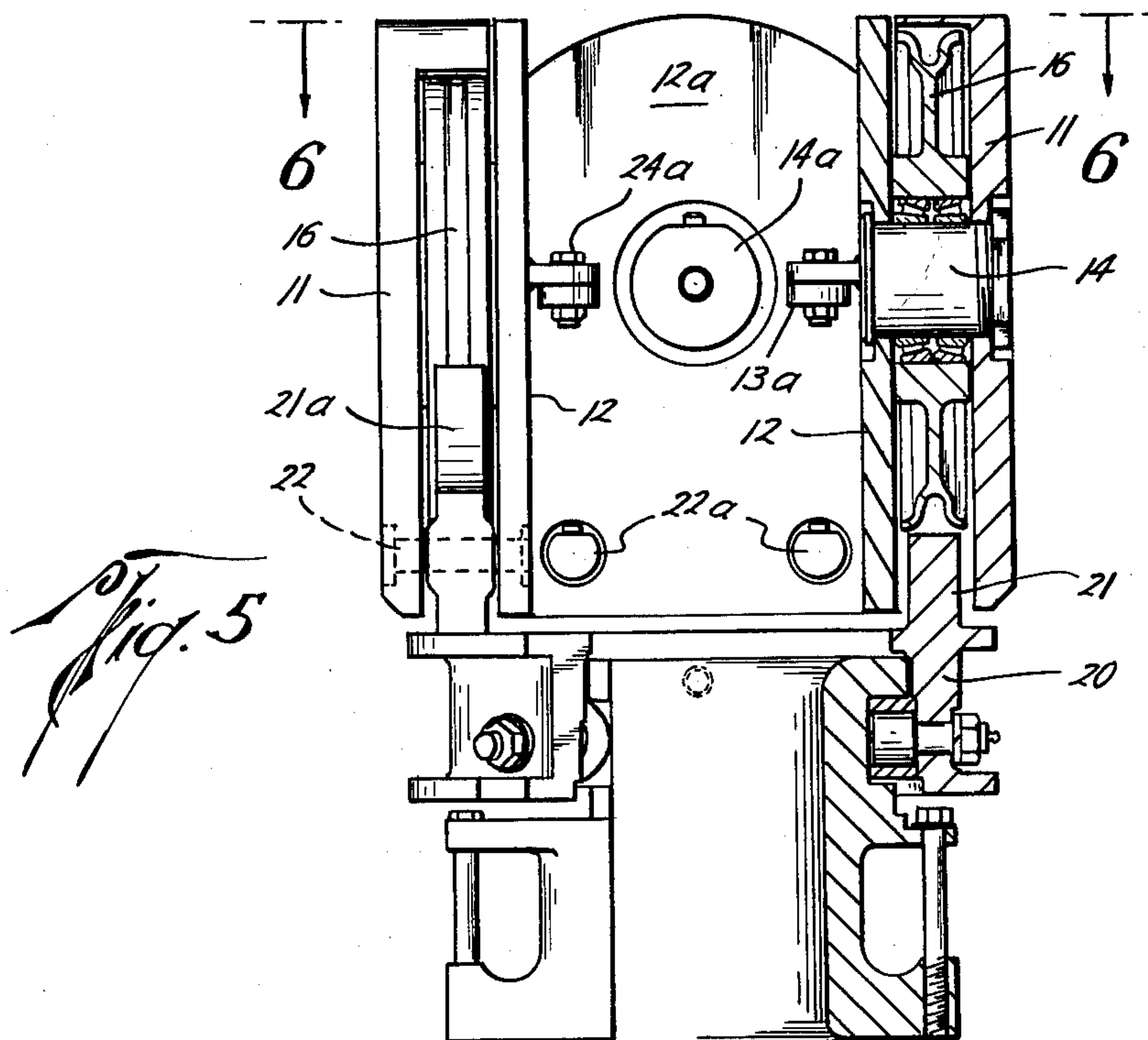


Fig. 6

Norman D. Dyer
Robert L. Franks
INVENTORS

BY *Browning, Simms
Dyer & Eichenkrantz*
ATTORNEYS

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TRAVELING BLOCK ASSEMBLY

Norman D. Dyer and Robert L. Franks, Beaumont, Tex., assignors to Dresser Industries Inc., a corporation of Delaware

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10 Claims. (Cl. 254-194)

This invention relates to improved apparatus for running pipe, such as drill string and flow tubing, into and out of wells being drilled, completed or worked over.

In connection with running drill string or production tubing into a well, and pulling such pipe from a well, pipe sections are handled in a derrick and usually must be moved quickly between one side of the derrick where they are stacked and the center of the well bore; and this movement should be in unison with movement of the traveling block in order not to interfere with operations of the latter. Such work requires perfect timing on the part of the crew and a great deal of exertion and is also quite hazardous.

U.S. Patent 2,734,718 has described an improved traveling block having a vertical opening therethrough which is also open at the side of the block. Use of blocks of this type overcomes a great many of the disadvantages encountered in running pipe into and out of a well with the use of closed blocks. The work has been simplified by the use of such blocks having vertical openings therethrough which are also open at the side so that relative sideways movement between the traveling block and pipe may cause the pipe to be received into or removed from the block, and the hazards involved in the manipulation of traveling block and pipe sections also have been reduced. In addition, a number of time-saving procedures have been made possible by the use of traveling blocks having a side opening therein.

For example, in one particular system of operations using a side opening traveling block, the block reciprocates up and down almost continuously with substantially no time lost at the top and bottom of the movement to carry out such operations as spinning out joints in the pipe and moving sections of the pipe to or from a side of the derrick. In this system, the operation of coming out of the hole begins by positioning an elevator attached to the traveling block to hoist the string of pipe.

The elevator used in this particular type of operation preferably is of the so-called "automatic" type comprising a bowl tapered inward at the bottom having a pipe-receiving opening therethrough, and a series of dogs sliding on the side of the bowl into and out of position to grip the pipe. An elevator of this type may be left on the pipe continuously as the traveling block is raised and lowered. In descending the dogs in the automatic elevator are retracted to pass over boxes of tool joints in the pipe. As the elevator slides down the pipe to a point where it is desired to engage the pipe, the dogs fall into position against the outer pipe surface or are moved into pipe-engaging position by manipulation of a handle so that an upward pull on the elevator causes the dogs to grip the pipe more tightly.

In this system of operation, the traveling block then moves upward lifting the pipe until it lifts a desired joint in the pipe far enough above the derrick floor so that the elevator can grip a lower section of the pipe below the joint connecting the upper and lower pipe sections. Slips are set at the derrick floor to hold the pipe in this position, and the traveling block immediately begins to move downward. The pipe above the joint thus extends upward through the traveling block as the block descends. While the traveling block is descending, the derrick man places a "stab" in the upper end of the pipe, tongs are attached at a point above the joint near the derrick floor, and the

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upper joint of the pipe is spun out while the block is descending. When the joint is spun out, a line connected to the stab lifts the stand of pipe and carries it out through the side of the traveling block to a side of the derrick where it is stacked.

In the meantime, the elevator has gripped the lower stand of pipe at a point below the joint, the slips have been released, and the traveling block has begun its upward travel carrying the next stand of pipe with it.

In going into the hole, this sequence of operations is reversed in that a string of pipe is lowered into the hole by the traveling block while the stab and transfer equipment connected thereto is being positioned to lift a stand of pipe from the rack. When the traveling block reaches the derrick floor, slips are set and a stand of pipe is transferred from the racks into position for joint makeup. This movement requires that the pipe enter the side of the traveling block in order to center it over the pipe in the well. With slips still set, the traveling block moves upward and the joint is made up with the tongs. When the traveling block reaches the upper end of the stand of pipe, the slips are released and the traveling block lowers the pipe into the hole while the stab and cooperating transfer equipment is raising the next joint ready to move it in position over the center of the hole.

It will thus be seen that not only convenience and the hazards involved may be decreased by use of side opening traveling blocks, but that a trip into and out of the hole may also be performed in much less time than is required with closed block equipment.

Although traveling blocks having side openings have these great advantages, they also have certain disadvantages which have prevented their use in many situations where they would otherwise have been used. For example, a side opening traveling block has not been able to support pipe in any manner that would permit relative rotation between the block and pipe. It is often extremely important that the pipe be permitted to turn as it is being raised and lowered without turning the traveling block. When pipe is being lowered into a hole, a "corkscrew" hole or other abnormality in the walls of the bore frequently will cause the tubing, when it is held against rotation at the surface, to "wind up"; that is, to be strained resiliently in a twisting manner. Tubing in this condition, when it reaches a lower point where the torque is released, will cause the lower end thereof to rotate; and nearly all tubing lowered into a well has a packer on the lower end which will be set by rotation of the tubing relative to the packer. This winding up and sudden release will, of course, set any packer attached to the lower end of the tubing. It is then necessary to stop operations and release the packer.

This stoppage of work to release a packer frequently causes loss of more time than is gained by the use of a continually moving traveling block since the tubing must be suspended from a block of different type to permit it to be rotated to release the packer.

Rotating fishing tools, and similar rotating operations, frequently must be carried out by rotating a string of tubing while tension is maintained on it; and operations of this type have not been able to make use of side opening traveling blocks.

It is accordingly a principal object of this invention to provide a side opening traveling block assembly having the known advantages of side opening traveling blocks but which also permits pipe to turn as it is being raised or lowered into a well without rotating the traveling block.

Another object is to provide a side opening traveling block assembly which eliminates winding of the string of pipe in passing a corkscrew hole and thus eliminates sudden release of torque resulting in setting a packer carried by the lower part of the pipe.

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Another object is to provide an improved side opening traveling block assembly which permits rotation of pipe for setting packers, rotating fishing tools and other rotary operations while tension is maintained on the pipe.

Another object is to provide an improved side opening traveling block assembly of the above type which is demountable so that a single sheave or section of sheaves may be used for light work such as running rod into and out of wells and which is quickly disassembled for such use and is quickly and easily reassembled for running pipe.

Another object is to provide an improved side opening traveling block assembly having a built-in side opening rotatable adapter enabling free rotation of a pipe supported from the adapter.

Another object is to provide a device of this type in which the adapter is easily rotated by manual operation to bring a side opening therein into coincidence with the side opening in the traveling block.

Other objects, advantages and features of novelty will become apparent to those skilled in the art upon consideration of the following description, the claims, and the attached drawings.

In the attached drawings, wherein like reference numerals are used throughout to designate like parts:

FIG. 1 is an elevation, partly in section, of a preferred traveling block assembly embodying principles of the present invention;

FIG. 2 is a plan of the device of FIG. 1 on the line 2—2;

FIG. 3 is a detail of a locking device;

FIG. 4 is a vertical section through the device of FIG. 1 on the line 4—4;

FIG. 5 is an elevation of a modification of the device of FIG. 1, partly in section, and illustrating a sheave disposed transversely to a pair of sheaves arranged as in FIG. 1; and

FIG. 6 is a plan of the device of FIG. 5 on the line 6—6.

In the drawings, the reference numeral 10 designates generally a housing for a traveling block. Housing 10 is made up of opposed pairs of outer and inner sheave guards 11 and 12, respectively, connected by a demountable tie bar 13. Each of the pairs of sheave guards and supports 11 and 12 has a central shaft 14 arranged therein on which a hub 15 of a sheave 16 is journaled through suitable antifriction bearings 17. While only a single sheave 16 is illustrated in each of the opposite sections of housing 10, it is to be understood that as many sheaves as are required may be mounted on shaft 14. Two or three sheaves, however, will usually be sufficient for light work such as running production tubing and work-over of wells.

A block constructed as just described from two pairs of sheave guards 11 and 12 connected by a tie bar 13 adjacent to the outer periphery of guards 11 and 12 at one side thereof leaves a vertical central passageway through the block which is unobstructed and open through a side of the block so that a pipe 19 may be received into a central position in the block by relative sideways movement of the pipe and block.

An annular ring 20 having an upstanding shoulder 21 is disposed at the bottom of the block with shoulder 21 between sheave guards 11 and 12. Ring 20 is attached to the sheave guards by removable pins 22 disposed in suitable openings in guards 11 and 12 and shoulder 21, and preferably held in place by suitable lock ring attachments 23. Ring 21 also has a vertical unobstructed passageway therethrough which is open at a side of the ring at 18a, the opening 18a registering with the opening 18 in the side of housing 10.

It will be seen that removal of one pin 22 and removal of bolt 24 holding the tie bar assembly together separates one sheave, or set of sheaves if more than one is present between the sheave guards of a single section, from the

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remainder of the assembly. The single separated sheave then may serve as a traveling block for light work such as running rod while the remainder of the assembly is swung aside out of the way by means of a cat line or other transfer equipment. When it is desired to run pipe into or out of the hole, the entire assembly is quickly placed in condition to do so by reinserting pin 22 into the openings in the sheave guards and shoulder 21 replacing bolt 24 in the tie bar assembly, and the device is then ready for running pipe.

An adapter designated generally as 25 is supported from ring 20 on friction reducing bearings 26, which are preferably double tapered roller bearings, journaled on shafts 27 extending through suitable openings in ring 20. These bearings are preferably five in number and are arranged equidistant from each other so that weight carried upon the longitudinal axis of block 10, ring 20, and adapter 25 is evenly distributed upon the bearings.

Adapter 25 has laterally extending arms 28 adapted to receive links 29. Bolts 30 are passed through arms 28 outside links 29 and prevent accidental disengagement of the links. A locking device, indicated generally as 31, is included so that, when work is to be done which requires orientation of the line of pipe, the adapter can be locked in the ring in a manner to prevent its turning on bearings 26.

A preferred locking device is shown in detail in FIG. 3 and comprises a locking plunger 32 disposed to reciprocate in an opening 33 in ring 20 and to be moved by pressure of spring 34 to engage a socket 35 in adapter 25. A releasing rod 38 is attached to plunger 32 so that the plunger may be withdrawn from socket 35 by manipulation of handle 36 which fits into a slot 37 in extension 39 of ring 20 when the plunger is in locking position but is manually withdrawn from slot 37 and rotated to maintain the plunger in released position when it is desired that the adapter rotate freely on bearings 26.

A conventional elevator 40 is carried by links 29 and may be of any type desired since the details of construction of the elevator are not a part of this particular invention. Elevator 40 is illustrated as of automatic type having dogs 41 movable upon an inclined face 48 of a central bowl in the elevator to and from a pipe-gripping position.

FIGS. 5 and 6 illustrate a modification of the device described above in which a sheave is disposed transversely of the block behind the central opening therethrough. The construction is very similar to the device of FIG. 1 in that the housing comprises two sections, each made up of an outer and inner sheave guard 11 and 12, respectively, disposed substantially parallel to each other on opposite sides of the vertical opening 18 through the block. One or more sheaves 16 are journaled on antifriction bearings on shaft 14 in each of the lateral sections of the block while a transverse sheave 16a is similarly journaled on an axle 14a in a transverse section of the housing made up of sheave guards 11a and 12a, respectively.

Two separate tie bar assemblies 13a are used in this modification and are each attached respectively to one of the sheave guards 12 and the inner guard 12a of the transverse housing section. As in the device of FIG. 1, the tie bar assemblies are demountable by removal of bolts 24a. The ring 20 is as described under FIG. 1, having an upstanding shoulder 21 and an extension 21a of shoulder 21 serving as a lateral sheave guard. The ring, however, has additional openings therethrough to accommodate additional pins 22a which are removable and identical in construction with the pins 22 described above. An adapter 25, which is the same in all respects as adapter 25 described above, is attached to the ring.

Thus, it will be seen that this modification is substantially the same as that of FIG. 1 with the exception of addition of a third sheave giving increased lifting power to the traveling block.

It is believed that operation of the device is obvious

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from the above description. Pipe being run into or out of a hole may be received into the opening 18 through the side of the block assembly or removed at will through the same opening. While tension is maintained on the block and on the pipe supported thereby, the pipe is free to rotate so that it does not wind up on encountering corkscrew conditions in the hole, or may be rotated for any purpose desired such as to set a packer, rotate fishing tools, etc. while the pipe is extending through the block. The swiveling effect of adapter 25 turning on bearings 26 supported by rings 20 permits rotation at will and lets the pipe rotate freely when corkscrew conditions are encountered.

If at any time it is desired to maintain pipe in an orientated position, as may be required for example in certain logging operations, this may be accomplished easily by rotating handle 36 of the locking device to permit spring 32 to force the locking plunger 35 to the socket in the adapter thus holding the adapter stationary.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the apparatus.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

The invention having been described, what is claimed is:

1. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway therethrough open at a side of the housing, adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, and at least one sheave disposed in the housing on each of two opposite sides of the opening; a ring carried by a lower end of the housing in fixed relationship therewith, having a lateral opening therein registering with the open side of the housing; and an annular adapter, rotatably supported by the ring, having a vertical opening through a side thereof registerable with the lateral opening in the ring and with the open side of the housing.

2. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway therethrough open at a side of the housing, adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, and at least one sheave disposed in the housing on each of two opposite sides of the opening; a ring carried by a lower end of the housing in fixed relationship therewith, having a lateral opening therein registering with the open side of the housing; an annular adapter, rotatably supported by the ring, having a vertical opening through a side thereof registerable with the lateral opening in the ring and with the open side of the housing; a pipe elevator; and means for non-rotatably attaching the elevator to the adapter.

3. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway therethrough open at the side of the housing, adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, said housing including two sections disposed on opposite sides of said vertical passageway and a releasable tie bar connecting the two sections of the housing, and at least one sheave disposed in each of said sections of the housing; a ring carried by a lower end of the housing in fixed relationship there-

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with, having a lateral opening therein registering with the open side of the housing; and an annular adapter rotatably supported by the ring having a vertical opening through a side thereof registerable with the lateral opening in the ring and with the open side of the housing.

4. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway therethrough open at a side of the housing, adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, said housing including two sections disposed on opposite sides of said vertical passageway and a tie bar releasably connecting the two sections of housing, and at least one sheave disposed in each section of the housing a ring carried by a lower end of the housing in fixed relationship therewith having a lateral opening therein registering with the open side of the housing; an annular adapter, rotatably supported by the ring, having a vertical opening through a side thereof registerable with the lateral opening in the ring and with the open side of the housing; a pipe elevator; and means, including a pair of elongate links, for non-rotatably attaching the elevator to the adapter.

5. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway therethrough open at a side of the housing adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, said housing including two sections disposed on opposite sides of the vertical passageway, and a tie bar releasably connecting the two sections of the housing, and at least one sheave disposed in each section of the housing; a ring detachably carried by a lower end of the housing in fixed relationship therewith, having a lateral opening therein registering with the open side of the housing; and an annular adapter rotatably supported on anti-friction bearings carried by the ring, having a vertical opening through a side thereof registerable with the lateral opening of the ring and with the open side of the housing.

6. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway therethrough open at a side of the housing, adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, said housing including two sections disposed on opposite sides of the vertical passageway and a tie bar releasably connecting the two housing sections, and at least one sheave disposed in each section of the housing; a ring releasably carried by a lower end of the housing in fixed relationship therewith, having a lateral opening therein registering with the open side of the housing; an annular adapter rotatably supported by the ring, having a vertical opening through a side thereof registerable with the lateral opening in the ring and with the open side of the housing; a pipe elevator; and means for nonrotatably attaching the elevator to the adapter.

7. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway therethrough open at a side of the housing, adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, said housing including two discrete sections disposed on opposite sides of the vertical passageway and a tie bar releasably connecting the two housing sections, and at least one sheave disposed in each of the housing section; a ring detachably carried by a lower end of the housing in fixed relationship therewith, having a lateral opening therein registering with the open side of the housing; an annular adapter, rotatably supported by the ring, having a vertical opening through a side thereof registerable with the lateral opening in the ring and with the open side of the housing; means for releasably locking the adapter against rota-

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tion relative to the ring; a pipe elevator; and means, including a pair of elongate links, for nonrotatably attaching the elevator to the adapter.

8. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway there-through open at a side of the housing, adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, and at least one sheave disposed in the housing on each of two opposite sides of the vertical passageway; a ring carried by a lower end of the housing in fixed relationship therewith having a lateral opening therein registering with the open side of the housing; an annular adapter, rotatably supported by the ring, having a vertical opening through a side thereof registerable with the lateral opening in the ring and with the open side of the housing; and means for releasably locking the adapter against rotation relative to the ring.

9. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway there-through open at a side of the housing, adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, said housing including two sections disposed at each of two opposite sides of the vertical passageway, a third section disposed substantially perpendicular to said two sections and substantially tangential thereto, and two tie bars, each releasably connecting one of said two sections to the third section, and a sheave disposed in each of the housing sections; a ring detachably carried by the lower end of the housing in fixed relationship therewith, having a lateral opening therein registering with the open side of the housing; an annular adapter rotatably supported on anti-friction bearings carried by the ring, having a vertical opening through a side

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thereof registerable with the lateral openings in the ring and with the open side of the housing; and means for releasably locking the adapter against rotation relative to the ring.

10. An improved traveling block assembly comprising in combination a traveling block, including a housing having a central unobstructed vertical passageway there-through open at a side of the housing, adapted to receive a substantially vertical pipe by relative sideways movement of the pipe and housing, said housing including two sections disposed on each of two opposite sides of the vertical passageway, a third section substantially perpendicular to said two sections and substantially tangential thereto, and two tie bars, each releasably connecting one of said two sections to said third section, and a sheave disposed in each of the housing sections; a ring detachably carried by a lower end of the housing in fixed relationship therewith, having a lateral opening therein registering with the open side of the housing; an annular adapter, rotatably supported on anti-friction bearings carried by the ring, having a vertical opening through a side thereof registerable with the lateral opening in the ring and with the open side of the housing; means for releasably locking the adapter against rotation relative to the ring; a pipe elevator; and means for nonrotatably attaching the elevator to the adapter.

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