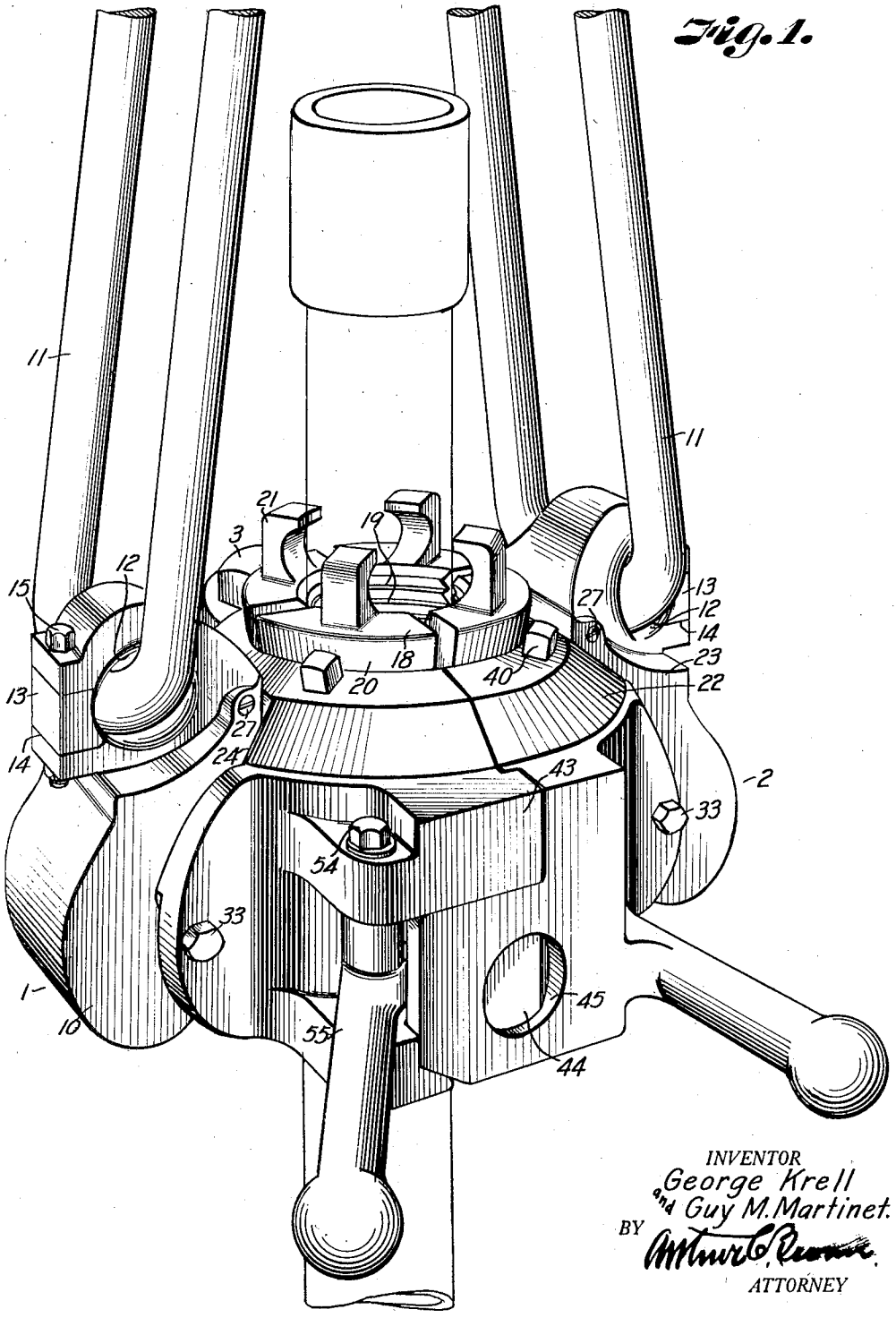
July 16, 1929. G. KRELL ET AL 1,721,024

ELEVATOR OR SPIDER

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Fig. 1.



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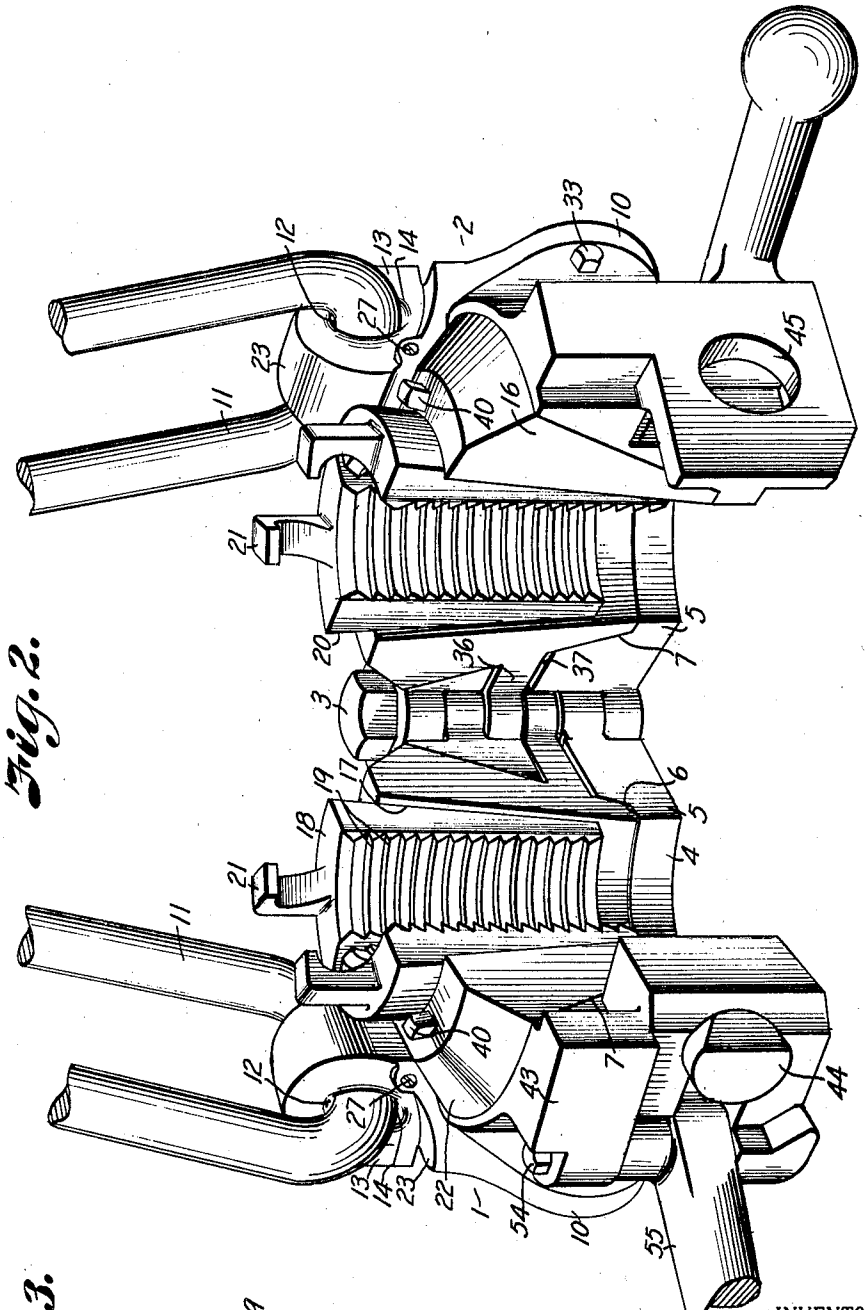


Fig. 2.

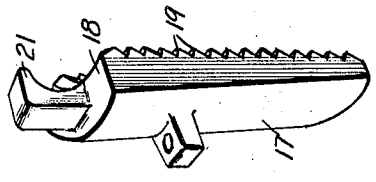


Fig. 3.

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Fig. 4.

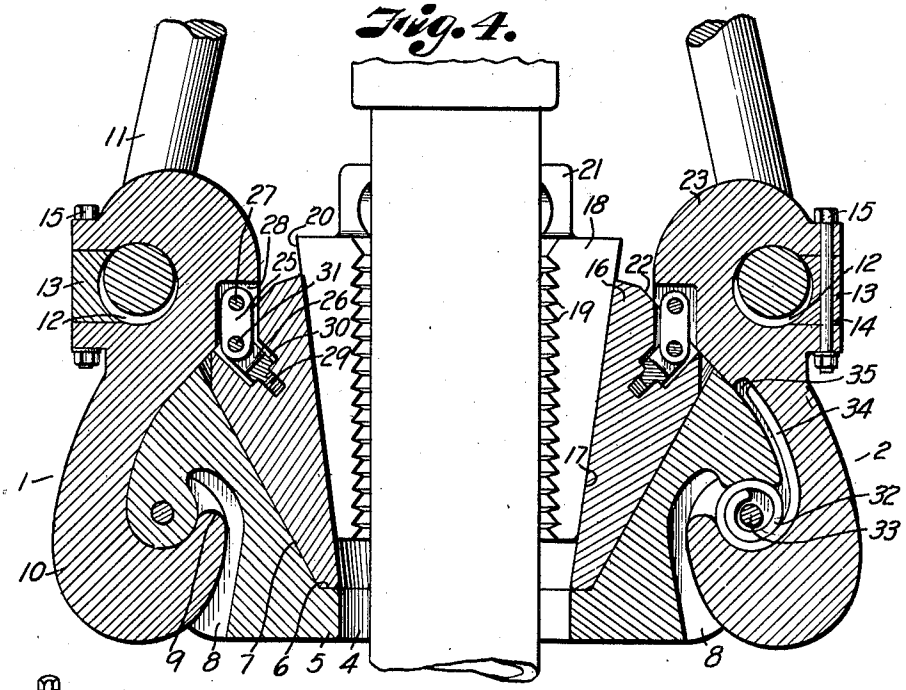


Fig. 5.

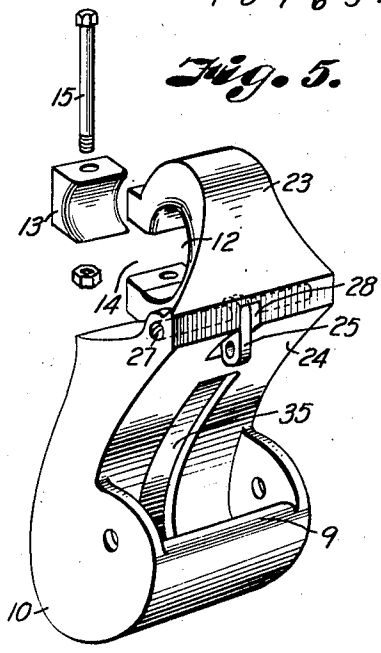
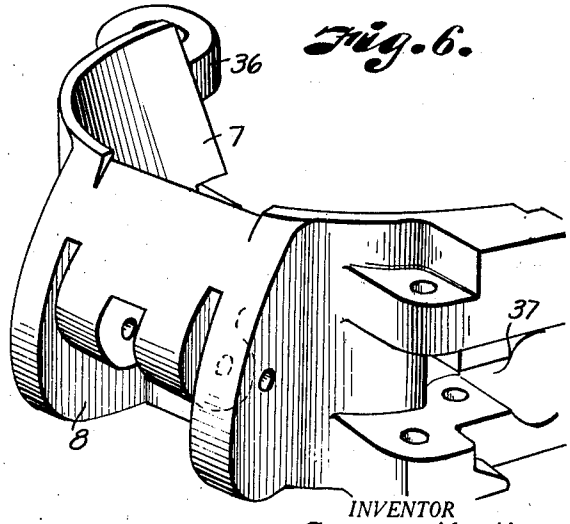


Fig. 6.



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Fig. 7.

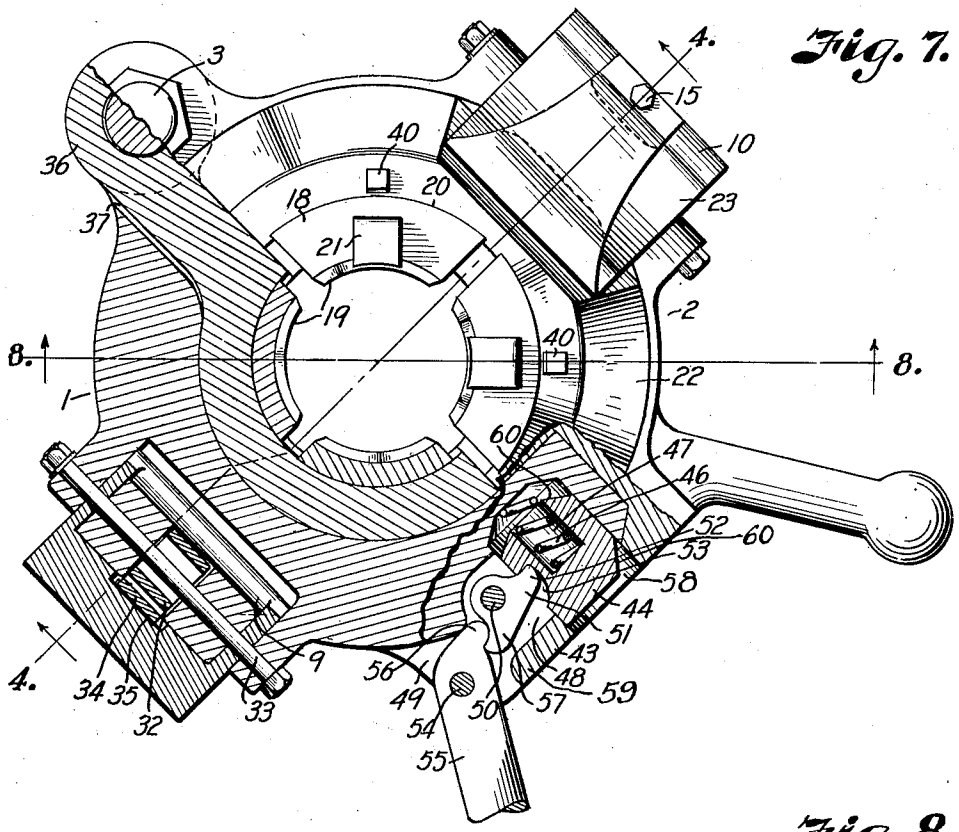
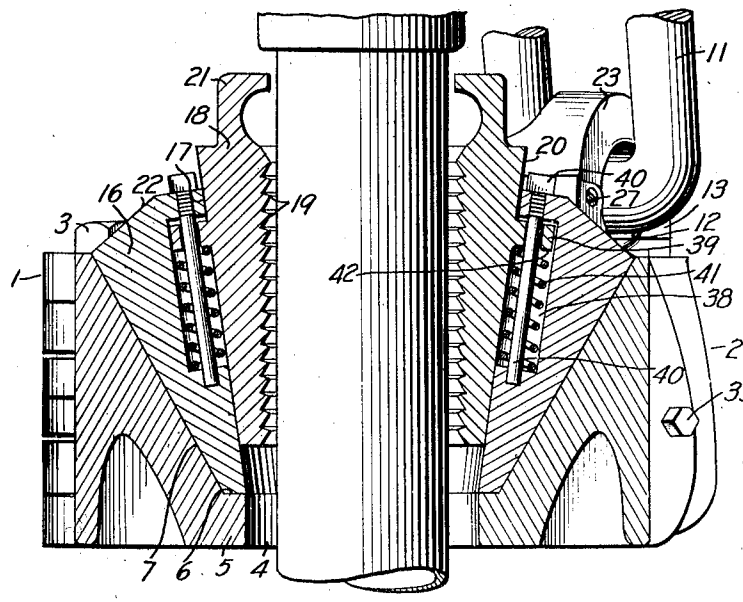


Fig. 8.



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Patented July 16, 1929. 1,721,024

UNITED STATES PATENT OFFICE.

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ELEVATOR OR SPIDER.

Application filed January 14, 1927. Serial No. 161,133.

Our invention relates to pipe clamps and more particularly to a device of that character for use as a tubing or casing elevator or spider, the principal object of the invention being to provide a slip structure of this character wherein the slips are slidingly supported at an angle less than that of repose, to effect their proper gripping relation with the tubing or casing and which co-operate with complementary basket or carrying means having tapered support at an angle greater than that of repose to facilitate spread of the slips when relieved of their burden; such complementary means being under control of a lever element to resist expansion while the slips are being set and to promote expansion when the slips are relieved to obviate "freezing" of the slips in the carrying means.

In accomplishing the object above generally stated we have provided improved details of structure hereinafter described and illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a clamp embodying our invention and illustrating its application to well tubing.

Fig. 2 is an enlarged detail perspective view of the clamp, illustrating its hinge construction for ready application to its object.

Fig. 3 is a detail perspective view of one of the slips.

Fig. 4 is a central vertical section on the line 4—4 of Fig. 7, particularly illustrating the differential angle contacts of the slip and basket members in the frame.

Fig. 5 is a detail perspective view of one of the frame hangers.

Fig. 6 is a detail perspective view of one of the semi-circular frame members.

Fig. 7 is a plan view of the clamp, partly in section, to illustrate the hinge, the hanger and the lock members.

Fig. 8 is a vertical section on the line 8—8, Fig. 7.

Referring more in detail to the drawings:

1—2 designates the respective halves of a circular frame having hinged connection through a pin or the like 3, whereby the frame is adapted to open and close for application to a pipe or casing; the body members, when closed, having a cylindrical bottom opening 4 formed in a flange 5 and providing a shoulder 6 upon which the lower ends of basket members are adapted to bear, as presently described; the opening 4 being of greater diameter than the largest size of pipe or casing with which the device is to be used.

Above the flange 5 the inner walls of the frame members are tapered to form a conical seat having an angle greater than that of repose, preferably about 60°, as indicated at 7.

The frame members 1—2 are provided at opposite sides with undercut recesses 8 for receiving the lips 9 of hanger members 10, whereby the frame may be supported from ordinary bails 11. The bails are preferably seated in sockets 12, which may be closed by blocks 13 pinned in the mouths 14 of the sockets, as indicated at 15, although any suitable construction of hanger bail and connection may be employed.

Located within the tapered portion of the frame is a basket consisting of wedge-like blocks 16, the outer faces of which correspond in angle to the inner faces of the frame members to seat closely thereagainst and in sliding contact therewith. The inner faces of the basket members are also tapered but at an angle less than that of repose, preferably about 7 degrees, as indicated at 17, in order that the slips which seat within the basket, as presently described, will have a friction locking relation with the basket members and with the tubing or casing which they are adapted to grip.

18 designates the slips which may be of any ordinary construction in that they comprise corrugated or toothed inner faces 19, adapted for gripping the pipe or casing and having tapered outer faces 20 adapted for cooperation with the tapered seat, except that the slips employed in our improved clamp are provided with upstanding ears 21, adapted for engagement with the coupling collar of a tubing or casing joint.

With a clamp comprising elements constructed as described, with the basket members seated in the frame and the slips in the basket members, when weight of a string of tubing or casing is applied to the slips, the angle of contact we have provided between the basket members and frame will permit the basket members to clamp on the frame members and expand the basket if no means is provided to offset this tendency. Such means we have provided in a connection between the bail hangers and basket members, preferably contemplating an overhanging of the basket members by the upper ends of the hangers, as clearly indicated in Fig. 4 of the

drawings. With this arrangement each of the basket members has a downwardly and outwardly beveled rim 22 and each of the hanger members a head 23 extended over said rim and provided with a face 24 having a bevel corresponding to that on the basket member rim so that when the weight of the frame and its supported parts is placed on the hanger members, the upper ends of the hangers are drawn inwardly because of the converging relation of the bails, and the beveled faces of the hanger heads forced against the beveled rims of the basket members to wedge the basket members downwardly to their seats.

From experience it has been learned that with a combination of slips in a tapered frame wherein the angle of contact is sufficient to effect a working gripping force, friction between the slips and the tubing or casing becomes so great that it is often impossible, or at least quite difficult, to separate the slips from the tubing or casing, the common practice requiring a hammering or like action to effect the separation.

With our arrangement, however, it is only necessary to relieve the pressure of the hanger members on the basket members in order to effect this separation, as the 60 degree angle of contact between the basket members and frame permits the basket members to climb the wall of the frame under influence of the weight of the tubing when unrestrained and thereby free the slips. In order, however, to effect a positive spreading of the basket for relief of the slips, we connect each of the hanger members with a basket member preferably through a toggle linkage 25—26, the link 25 being pivoted at 27 in an inwardly opening socket 28 in the hanger head and the link 26 having a screw shank 29 threaded into a socket 30 in the upper end of the basket member and being pivotally connected at 31 with the inner end of the link 27, so that when the hanger member is spread, it pulls on the basket member to open the basket and free the slips so that they are easily removable from the tubing or casing.

It is customary in the use of a clamp of this kind as a tubing elevator, to slightly lower the tubing after elevation of the string to expose the upper joints so that a lower joint of the tubing may be gripped by a spider on the derrick platform. When this occurs, weight of the long string of casing is removed from the clamp and the hangers may be spread by the exertion of a relatively slight force.

We, therefore, provide each hanger member with spreading means, preferably consisting of a spring 32 coiled about a hinge pin 33, presently mentioned, bearing at one end against the frame member and having an arm 34 extending into a seat 35 in the shank of the hanger and yieldingly urging the hanger away from the frame. With this arrangement, when the tubing is let down to support on the spider, the spring will spread the hanger members and remove their heads from contact with the rims of the basket members, to permit the basket members to climb and release the slips.

Should the basket members stick, they are positively loosened by a pull of the toggle links as the hanger heads move outwardly. This linkage is further effective to induce a greater spreading of the basket members than would be possible merely from the climbing action under the weight of the suspended parts, as the latter would free the parts but for a fraction of an inch, whereas it is desirable to provide a greater spread in order to afford freedom of movement of the slips relative to the tubing.

This linkage further provides a positive connection between the basket members and hangers to avoid dropping of the basket members and their dissociation from the device.

We prefer to permanently anchor the basket members in the frame by arms 36 (Figs. 2 and 7), extended through slots 37 in the frame members and hingedly mounted on the pin 3, which connects the frame members, the arms having play in their slots and on the hinge pins to permit the vertical movement of the basket members, as heretofore described.

It is desirable that the slips form a permanent part of the clamp and also that they be normally open, i. e., spread to receive a tubing or casing. To effect this mounting and normal spread, we provide the basket members with recesses 38 in their inner walls and the slips with ears 39 slidable longitudinally within the recesses and anchored for such longitudinal movement on pins 40, mounted in the basket members and extended through the recesses. Seated on the bottoms of said recesses about the pins and bearing against the faces of the ears are expansion springs 41, which tend to normally yieldingly support the slips in their spread relation but which are compressed to permit the slips to close. The slips are in this way anchored to the clamp so that they cannot escape when the clamp is open but are free for the contraction and expansion which adapts them for the use described.

It is apparent that the slips may be easily and quickly removed from their mountings for substitution of sets of different sizes.

By forming the contact ears 21 integral with the slips, proper co-operation between the slips and the tubing or casing collars is assured, as the ends of the ears are located between the collars irrespective of the size of the slips.

It is essential that the frame of the

clamp be positively locked when applied to the tubing or casing. While any suitable form of lock may be provided, we prefer to employ the one illustrated in detail in the drawings. This lock comprises a block 43 formed integral with one of the frame members and carrying a plunger 44 in a socket 45 opening outwardly from the block and yieldingly urged outwardly by a spring 46 seated in a socket 47 opening inwardly of the plunger, the inner end of the spring bearing against the bottom of the socket in the block.

The socket 45 has a lateral opening 48 communicating with a slot 49 in the body of the frame, and pivoted on a pin 50 extending vertically through said lateral opening is a latch 51, having a tooth 52 adapted for engaging in a notch 53 in the plunger. Fixed on a pin 54 mounted in the frame member and extending through the slot 49 is a lever arm 55 having a tooth 56 engaging a lip 57 on the latch 51 so that when the lever is moved in one direction, it will retract the plunger against the tension of its spring. The plunger is adapted for seating in an opening 58 in a plate 59 formed integral with the other frame member when the parts are closed, the plunger having a beveled face 60 engageable with the edge of the plate to force the plunger back against the spring as the parts are closed so that the plunger may be projected outwardly into the opening when the parts are in registration.

Assuming the parts to be constructed and assembled as described, the operation is as follows:

Assuming tubing located in the well is to be pulled, when the well is to be cleaned or for other purposes, the clamp is closed about the top of the upper joint of tubing and elevated by means of cable running over the pulley at the top of the derrick in the customary manner. When the clamp is first applied to the body of the tubing, the slips are loose; that is, they do not grip the tubing. As the clamp is raised, the ears 21 on the upper ends of the slips contact with the bottom of the collar at the top of the tubing and the slips are forced downwardly into the basket. The slips, moving downwardly on the 7 degree angle of contact with the baskets, when brought in contact with the tubing, exert a leverage of about 8 to 1, which is sufficient to provide the required gripping engagement with the tubing. When this gripping engagement is effected while the clamp is being elevated, the weight of the entire string of casing is placed on the slips and this weight transferred through the basket to the frame. Because of the 60 degree angle of contact of the basket with the frame, there would be a tendency of the basket to climb out of the frame and destroy the grip of the slips on the tubing. With our hanger construction, however, the hanger heads are swung over the rims of the basket members and form an obstruction to prevent this climbing action so that as the slips progress down the wall of the basket, the basket members have a slight expansion during the first travel of the slips, their climbing action bringing their rims into contact with the hangers where the action is interrupted and a slight further movement of the slips into the basket effects the grip. The string of casing is then elevated to the proper height.

Then the string of casing is let down to support on the derrick platform, the weight is relieved from the clamp, and the springs 32 tend to expand or spread the hangers out of their holding relation to the basket members. The basket members are freed to rise under the climbing force and also by positive pull from the hanger members and the frictional contact of the slips with the basket members released so that the slips are easily spread from the tubing and the tubing released.

The clamp may then be let down for engagement with another joint of tubing and the operation just described repeated.

What we claim and desire to secure by Letters Patent is:

1. In a clamp of the character described, a frame, a basket in the frame and slips in said basket, the basket and slips having sliding contacts with their carrying members at angles respectively greater and less than the angle of repose.

2. In a clamp of the character described, a frame, a sectional basket having tapered seats in said frame, a set of slips having tapered seats in said basket, and automatically operable means for locking the basket against expansion.

3. In a clamp of the character described, a frame, a sectional basket having tapered seats in said frame, a set of slips having tapered seats in said basket, and means for holding the basket against expansion as the slips assume clamping relation and adapted to release the basket to permit the slips to open.

4. In a clamp of the character described, a frame, a sectional basket having tapered seats in said frame, a set of slips having tapered seats in said basket, means for locking the basket against expansion as the slips assume clamping relation and movable to release the basket to permit the slips to open, and yielding means urging the last-named means to expand the basket.

5. In a clamp of the character described, a frame, a basket adjustable in the frame and having frictional contact therewith at an angle greater than the angle of repose, and a set of slips adjustable in and having frictional contact with the basket at an angle less than the angle of repose to effect clamping action of the slips.

6. In a clamp of the character described, a frame, a basket adjustable in the frame and having frictional contact therewith at an angle greater than the angle of repose, a set of slips adjustable in and having frictional contact with the basket at an angle less than the angle of repose to effect clamping action of the slips, and means engageable with the basket to limit expansion of the basket under weight of the slips and their object.

7. In a clamp of the character described, a frame, a basket adjustable in the frame and having frictional contact therewith at an angle greater than the angle of repose, a set of slips adjustable in and having frictional contact with the basket at an angle less than the angle of repose to effect clamping action of the slips, and means engageable with the basket to limit expansion of the basket under weight of the slips and their object and automatically movable to release the basket and permit the slips to expand.

8. In a clamp of the character described, a frame having tapered seats, a basket in said frame, slips having tapered seats in the basket, hangers pivotally supporting the frame and having heads adapted for locking the basket against expansion, and means suspending the hangers at an angle to shift the hanger heads to locking relation with the basket under weight of the frame and its load.

9. In a clamp of the character described, a frame having tapered seats, a basket in said frame, slips having tapered seats in the basket, hangers pivotally supporting the frame and having heads adapted for locking the basket against expansion, and means suspending the hangers at an angle to shift the hanger heads to locking relation with the basket under weight of the frame and its load and automatically movable to release the basket when relieved of weight of the load.

10. In a clamp of the character described, a frame having tapered seats, a basket in said frame, slips having tapered seats in the basket, hangers pivotally supporting the frame and having heads adapted for locking the basket against expansion, means suspending the hangers at an angle to shift the hanger heads to locking relation with the basket under weight of the frame and its load, and yielding means resisting locking movement of the hangers and adapted for shifting the hangers to release the basket members.

11. In a clamp of the character described, a frame having tapered seats, a basket in said frame, slips having tapered seats in the basket, hangers pivotally supporting the frame and having heads adapted for locking the basket against expansion, means suspending the hangers at an angle to shift the hanger heads to locking relation with the basket under weight of the frame and its load, yielding means resisting locking movement of the hangers and adapted for shifting the hangers to release the basket members, and positive connection between the hangers and basket members.

12. In a clamp of the character described, a frame having tapered seats, a plurality of basket members having limited downward movement in said seats and having tapered inner faces, and a plurality of slips seated in the basket members.

13. In a clamp of the character described, a frame having tapered seats, a plurality of basket members having limited downward movement in said seats and having tapered inner faces, and a plurality of slips seated in the basket members, the slips having means engageable with a protuberance on the object to be clamped for setting the parts for gripping the object.

14. In a clamp of the character described, a frame having tapered seats, basket members in said seats having tapered inner faces, slips in said basket members, hangers pivotally suspending the frame and having stop portions, and bales pivotally suspending the hangers, the bales converging to swing said stop portions to holding position relative to the basket members under weight of the frame and its load.

15. In a clamp of the character described, a frame having tapered seats, basket members in said seats having tapered inner faces, slips in said basket members, hangers pivotally suspending the frame and having stop portions, bales pivotally suspending the hangers, the bales converging to swing said stop portions to holding position relative to the basket members under weight of the frame and its load, and yielding means tending means tending to spread the hangers from the frame.

16. In a clamp of the character described, a frame having tapered seats, basket members in said seats having tapered inner faces, slips in said basket members, hangers pivotally suspending the frame and having stop portions, bales pivotally suspending the hangers, the bales operable to swing said stop portions to holding position relative to the basket members under weight of the frame and its load, yielding means tending to spread the hangers from the frame, and link connection between the hangers and basket members.

17. In a clamp of the character described, a frame having tapered seats, basket members in said seats having tapered inner faces, slips in said basket members, hangers pivotally suspending the frame and having stop portions, bales pivotally suspending the hangers, the bales operable to swing said stop portions to holding position relative to the basket members under weight of the frame and its load, and lever connection between the hangers and basket members.

18. In a clamp of the character described, a frame, radially adjustable basket members

carried by said frame, slips having tapered seats in said basket members, and yielding means tending to expand the slips in the basket members.

19. In a clamp of the character described, a frame, radially adjustable basket members carried by said frame, slips having tapered seats in said basket members, and yielding means tending to expand the slips in the basket members, the slips having means engageable with a protuberance on the object to be clamped to shift the slips to holding position against the tension of said yielding means.

20. In a clamp of the character described, a frame, radially adjustable basket members carried by said frame, slips having tapered seats in said basket members, and yielding connection between the slips and basket members tending to expand the slips in the basket members.

21. In a clamp of the character described, a pair of frame members having tapered inner faces and radial slots, a pin hingedly connecting said members, basket members in the frame having arms loosely projected through the frame slots and pivoted on said pin and slips having tapered seats in said basket members.

In testimony whereof we affix our signatures.

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GUY M. MARTINET.