May 17, 1927. 1,629,262

S. V. DILLON

CATCHING DEVICE FOR WELL TUBING

Filed March 27, 1926

Fig. 1.

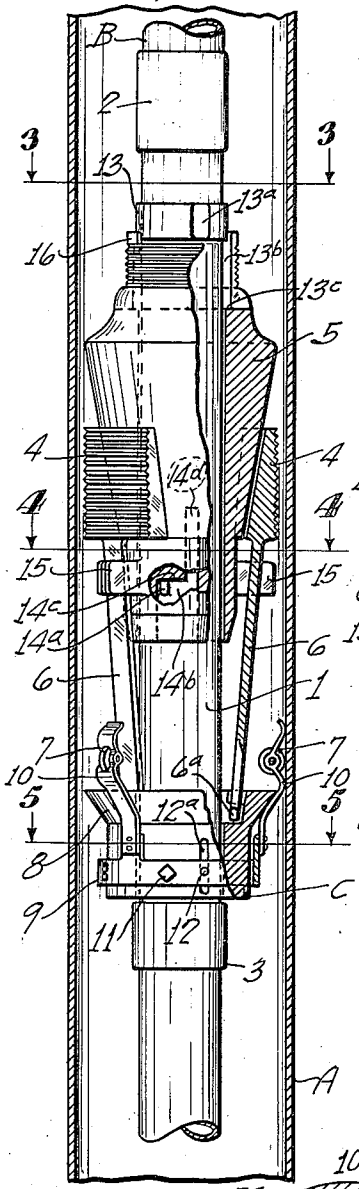


Fig. 2.

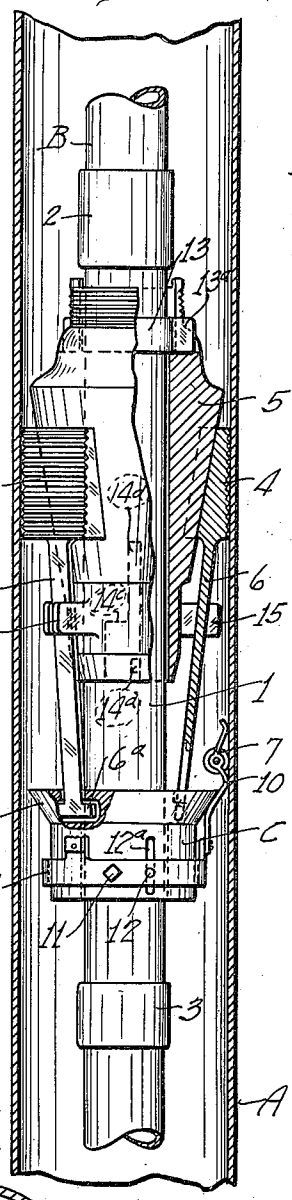


Fig. 3.

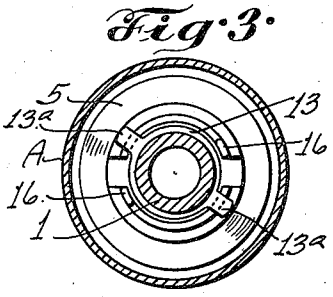


Fig. 4.

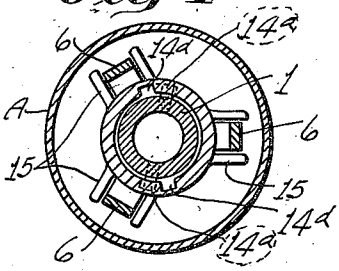


Fig. 5.

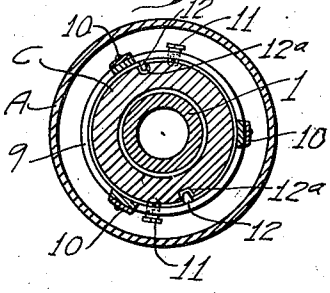
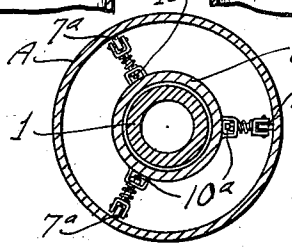


Fig. 6.



INVENTOR
Stephen V. Dillon
By Bakewell & Church
ATTORNEYS

Patented May 17, 1927. 1,629,262

UNITED STATES PATENT OFFICE.

STEPHEN V. DILLON, OF TULSA, OKLAHOMA.

CATCHING DEVICE FOR WELL TUBING.

Application filed March 27, 1926. Serial No. 97,919.

This invention relates to automatic catching devices for well tubing.

One object of my present invention is to provide a catching device for well tubing, which is so constructed that when the device is being positioned in the well or withdrawn from the well, the jaws of the device are arranged so that they will act automatically to instantly grip the casing or side wall of the well in the event the tubing starts to drop, and when the device is in its operative position in the well, said jaws are pressed tightly against the casing by a member which is so arranged that the gripping pressure of the jaws on the casing will be increased automatically if the tubing breaks away from its sustaining means or parts at a point above the catching device.

Another object is to provide an automatic catching device for well tubing, which is so constructed that gravity causes the head piece or tapered actuating member of the device to move relatively to the central guide member which it surrounds and force the jaws outwardly into engagement with the casing or side wall of the well when the tubing is turned slightly after the device has reached the desired position in the well.

Another object is to provide a catching device for well tubing in which the holding member of the device that sustains the jaws in a position to act automatically during the operation of arranging the device in the well, is so constructed that it can be adjusted easily to adapt it to well casings of different diameters and to vary the frictional pressure of the parts on said holding member that act on the casing or side wall of the well.

And still another object is to provide a catching device for well tubing that has the desirable characteristics above mentioned and the further advantage that it provides for the longitudinal movement of the tubing during the operation of pumping the well.

Figure 1 of the drawings is a side elevational view, partly in vertical section, of a catcher or catching device for well tubing constructed in accordance with my invention, illustrating the parts of the device arranged in the position which they occupy during the operation of introducing the device into the well.

Figure 2 is a similar view, illustrating how the catcher operates to sustain the tubing in the event the tubing breaks away from the means that supports it after the catcher has been set in the desired position in the well.

Figures 3, 4 and 5 are cross-sectional views, taken on the lines 3—3, 4—4 and 5—5, respectively, of Figure 1; and

Figure 6 is a detail view, illustrating a holding member of slightly different construction from that shown in Figures 1 and 2.

Referring to Figures 1 to 5 of the drawings, which illustrate the preferred form of my invention, A designates the casing or side wall of a well, and B designates the well tubing through which the liquid produced in the well is forced up to the surface of the ground by a conventional pump (not shown). The catcher or catching device that forms the subject-matter of my present application comprises a tubular guide member 1 that forms one section of the well tubing and which is connected at its upper and lower ends to the adjacent sections of the tubing by means of coupling collars 2 and 3, a plurality of jaws or gripping members 4 that are adapted to engage the casing or side wall of the well, a head piece or wedge-shaped actuating member 5 loosely mounted on the tube guide 1 and arranged so that downward movement of said actuating member causes the gripping jaws 4 to be wedged tightly against the casing or side wall of the well, and a holding member designated as an entirety by the reference character C that is connected by links 6 or other suitable devices to the jaws 4, said actuating member 5 being mounted on the guide 1 in such a way that it is capable of moving longitudinally relatively to said guide.

The holding member C is provided with friction devices 7 that are adapted to bear against the casing A or side wall of the well, and said holding member is so constructed that it can be easily adjusted to adapt it to well casings of different diameter and to vary the frictional pressure of the devices 7 on the well casing. In the form of my invention illustrated in Figure 1 the holding member C is composed of a center sleeve, loosely mounted on the tubular guide 1, and provided at its upper end with a flared portion 8, and a vertically-adjustable collar 9 on said sleeve provided with upwardly-projecting, resilient arms 10 that carry rollers which constitute the friction

devices 7. The resilient arms 10 bear against the under side of the flared portion 8 at the upper end of the center sleeve, and consequently, by raising or lowering the collar 9 the arms 10 which carry the friction devices 7 will be moved outwardly or inwardly, depending upon the direction in which the collar 9 is moved, and thus vary the frictional pressure which the devices 7 exert on the well casing. The collar 9 is provided with one or more set screws 11 that are adapted to be tightened to hold said collar in adjusted position on the center sleeve of the holding member C, and in most instances, the collar 9 and center sleeve which it surrounds will be joined together by a slot and pin connection, so as to prevent said parts from separating completely, the collar 9 being herein illustrated as provided with one or more pins 12, each of which projects into an elongated slot 12^a in the center sleeve of the member C. The links 6 which join the jaws 4 to the holding member C are preferably combined with the center sleeve of said member in such a way that they can be easily disconnected from said sleeve or combined with same. In the form of my invention herein illustrated each of the links 6 is provided at its lower end with a horizontally-disposed trunnion portion 6^a that is rockably mounted in an undercut recess formed in the center sleeve of the holding member C.

While I prefer to form the holding member C in two parts, one of which is adapted to be adjusted relatively to the other so as to cause a cam or inclined portion to act on resilient arms that carry the friction devices 7 in such a way as to expand or contract said devices or vary the frictional pressure of same on the well casing, the particular details of construction of the holding member C are immaterial, so far as my broad idea is concerned, and any other suitable means could be used for adjusting the friction devices 7 of said member without departing from the spirit of my invention. For example, as shown in Figure 6, the holding member of the device can consist simply of a one-piece member C′ loosely mounted on the center guide 1 and provided with adjustable elements 10^a that carry friction devices 7^a that are adapted to bear against the casing or side wall of the well during the operation of introducing the devices into the well.

The tubular guide 1 is provided with two sets of lugs arranged in spaced relation, as shown in Figures 1 and 2. The upper lugs 13^a are carried by a collar 13 and are adapted to bear upon the top edge or upper end of the head piece or actuating member 5, when the device is being introduced into the well, and the bottom lugs 14^a are connected in any suitable manner to the tubular guide 1 and are used to sustain the actuating member 5 at this time. As shown in Figure 1, the actuating member 5 is provided on its interior with relatively wide recesses 14^b that receive the bottom lugs 14^a, the upper ends of said recesses constituting stops or shoulders 14^c which bear upon the lugs 14^a, when the device is being introduced into the well, each of said recesses 14^b being provided at one side with an upwardly-projecting extension 14^d. The actuating member 5 is also provided at its upper end with vertically-disposed slots or grooves 13^b which are adapted to receive the upper lugs 13^a on the top collar 13, and said actuating member is provided adjacent its lower end with bifurcated ears 15 that straddle the links 6 which connect the gripping jaws 14 with the holding member C.

After the catcher has been combined with the well tubing by means of the coupling collars 2 and 3 at the upper and lower ends of the tubular guide 1, the holding member C is adjusted so as to expand the friction devices 7 far enough to cause them to exert some frictional pressure on the casing A or side wall of the well, and the center guide 1 is arranged in such relation with the head piece or actuating member 5 that the shoulders 14^c on the interior of said actuating member will rest upon the laterally-projecting lugs 14^a. The tubing B is then moved downwardly into the well until the catcher reaches the point where it is desired to set it or clamp it to the well casing. During this operation the friction devices 7 on the holding member C exert sufficient frictional pressure on the well casing to prevent the holding member C from moving downwardly at the same speed as the center guide 1, in the event the well tubing becomes accidentally disconnected from its sustaining means, but said friction devices 7 do not grip the well casing tightly enough to materially interfere with the operation of lowering the tubing into the well. If the tubing B breaks away from the means that is being used to lower the tubing into the well, or if for any other reason the tubing should start to drop when the parts of the catching device are arranged in the position shown in Figure 1, the jaws 4 will be instantly forced outwardly into engagement with the casing A or side wall of the well and thus arrest the downward movement of the tubing before it has gone more than an inch or so. This is a very desirable feature of a catching device for well tubing, and is obtained by combining the tapered actuating member 5 with the center guide 1 in such a way that it is sustained directly by said center guide in the operation of lowering the device into the well, and by connecting the jaws 4 to the holding member C whose elements 7 exert sufficient frictional

pressure on the well casing during this operation, to temporarily hold said jaws or arrest the downward movement of same with the actuating member 5, thereby causing said actuating member to force said jaws outwardly into engagement with the well casing. In other words, in a device of the construction above described a very slight downward movement of the tubular guide 1 with relation to the holding member C which sustains the jaws 4 results in the actuating member 5 moving said jaws outwardly into engagement with the well casing, due to the fact that the actuating member 5 is sustained by the bottom lugs 14^a, and thus moves as a unit with the tubular guide 1, and the jaws are sustained by a member which exerts some frictional pressure on the side wall of the casing.

If no accident occurs during the operation of lowering the tubing B into the well, the downward movement of the tubing is arrested after the catcher has reached the point where it is desired to set it in the well, and thereafter the tubing is rotated slightly so as to arrange the bottom lugs 14^a in alignment with the upwardly-projecting extensions 14^d of the recesses 14^b on the interior of the actuating member 5, whereupon the actuating member 5 will instantly move downwardly, due to the force of gravity, and thus cause the jaws 4 to be forced outwardly into snug engagement with the casing A or side wall of the well. The catcher is now in operative position in the well with the jaws of the catcher clamped tightly against the well casing and the upper end of the actuating member 5 spaced a short distance below the top collar 13 and the lugs 13^a on said collar arranged in alignment with the grooves 13^b in the interior of the upper end portion of the member 5. If the tubing breaks away from its sustaining means when the catcher is arranged in this position, the tubing will start to drop, but as soon as the lugs 13^a on the top collar 13 come into contact with the shoulders 13^c at the lower ends of the slots 13^b, as shown in Figure 2, the downward movement of the tubing will be effectively arrested, due to the fact that the load or weight of the tubing is imposed on the actuating member 5 which at this time is exerting pressure on the jaws in a direction tending to force them against the well casing. From the foregoing it will be seen that in a catcher of the construction above described the jaws are normally in gripping engagement with the casing and a very slight downward movement of the tubing, after the catcher has been arranged in operative position in the well, increases the clamping pressure of the jaws on the casing or side wall of the well, due to the fact that the entire weight of the tubing is exerted on the member 5 in a direction to cause the tapered portion of said member to co-operate with the oppositely-inclined surfaces on the jaws 4 to force said jaws outwardly. If it is desired to test the catcher after it has been arranged at the desired point in the well, it is only necessary to lower the tubing slightly, so as to cause the lugs 13^a of the top collar 13 to rest upon the shoulders 13^c, and after it has been ascertained that the catcher is anchored firmly enough to sustain the weight of the tubing, the tubing is raised, so as to position the lugs 13^a a short distance above said shoulders 13^c, said lugs remaining in alignment with the slots 13^b, so as to provide for the longitudinal movement of the tubing when the pumping apparatus of the well is set in operation.

In a deep well the operation of pumping the fluid upwardly through the well tubing B results in a considerable upward and downward movement of the tubing. With a catcher of the construction above described this longitudinal movement of the well tubing is permitted, without reducing the efficiency of the catcher, because when the catcher is set in the well the weight of the head piece or catching member 5 is sufficient to hold the jaws tightly against the casing or side wall of the well, and the elongated slots 13^b and 14^d in the interior of the actuating member 5 are long enough to provide for the up and down movement of the top and bottom lugs on the tubular guide 1 of the catcher. To remove the catcher from the well it is only necessary to move the tubing upwardly, which operation causes the bottom lugs 14^a to strike against the upper ends of the slots 14^d in the interior of the actuating member 5 and move said actuating member upwardly out of engagement with the jaws 4, the bifurcated ears 15 on the exterior of the actuating member through which the links 6 pass striking against the lower ends of the jaws and moving said jaws together with the holding member C upwardly through the well casing. In case it is desired to change the position of the catcher without withdrawing the catcher from the well, the tubing is moved upwardly, as above described, so as to disengage the member 5 from the inclined surfaces of the jaws 4 and then rotate the tubing in a direction to position the bottom lugs 14^a under the shoulders 14^c on the actuating member 5. Thereafter, the tubing can be raised or lowered so as to set the catcher in the desired position. In order to limit the rotary movement of the well tubing, when said tubing is being turned with relation to the actuating member 5, as previously described, said actuating member is provided at its upper end with abutments 16 that are adapted to co-operate with the laterally-projecting lugs 13^a on the top

collar 13. While I have herein illustrated and described one way of constructing my improved catcher, I wish it to be understood that various changes can be made in the construction of the catcher without departing from the spirit of my invention, so long as the catcher is designed so that a sudden slight downward movement of the tubing during the operation of introducing the device into the well will cause the jaws to automatically grip the well casing, and a sudden slight downward movement of the tubing when the device is set in operative position in the well will cause the pressure of said jaws on the casing to be increased sufficiently to insure their being able to sustain the weight of the tubing.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A catching device for well tubing, comprising gripping jaws, an actuating member for said jaws slidably axially on the tubing, a friction means adapted to act on the casing or side wall of the well for normally holding said jaws in such a condition that a sudden downward movement of the tubing during the operation of introducing the device into the well will cause said actuating member to force the gripping jaws tightly against the casing, and an independent means that is adapted to be operated after the device has reached the desired position in the well for causing the actuating member to normally hold the gripping jaws in gripping contact with the well casing.

2. A catching device for well tubing, comprising a guide, a tapered actuating member surrounding said guide and arranged to move longitudinally relatively to the same, gripping jaws adapted to be moved into engagement with the casing or side wall of the well by said actuating member, means on said guide for sustaining said actuating member during the operation of introducing the devices into the well, a friction means combined with said jaws for holding said jaws in an inactive condition at such times and for causing them to be moved automatically into engagement with the casing in the event the tubing starts to drop, said actuating member having a guide slot to receive the sustaining means whereby a slight rotary movement of the guide after the device has reached the desired position in the well will permit the actuating member to move longitudinally with relation to said guide and force the jaws into gripping engagement with the casing and maintained in this position.

3. A catching device for well tubing, comprising a tubular guide adapted to be combined with the well tubing, a tapered actuating member surrounding said guide and arranged to move longitudinally of same, gripping jaws surrounding said actuating member and adapted to be forced outwardly by same into snug engagement with the casing or side wall of the well, a member on the guide that sustains said actuating member during the operation of introducing the device into the well, a friction means that co-operates with said jaws to cause them to be forced into gripping engagement with the casing by pressure exerted on said jaws by said actuating member in the event the tubing starts to drop when the device is being introduced into the well, said guide being adapted to be manipulated to release said actuating member when the device reaches the desired position in the well, whereupon gravity moves said actuating member in a direction to force said jaws into gripping engagement with the casing and maintain them in an operative position, and a part on said guide that is normally spaced away from said actuating member when the device is set in the well and which is adapted to engage said actuating member and increase the pressure of said member on the jaws in the event the tubing starts to drop when the device is set in operative position in the well.

4. A catching device for well tubing, comprising a tubular guide connected to the well tubing, an actuating member surrounding said guide and arranged to move longitudinally of same, jaws adapted to be forced into engagement with the casing or side wall of the well by said actuating member, a holding member combined with said jaws, and an adjustable means on said holding member adapted to frictionally engage the casing or side wall of the well.

5. A catching device for well tubing, composed of a tubular guide connected to the tubing, jaws surrounding said guide and arranged so as to engage the casing or side wall of the well, a tapered actuating member for said jaws arranged between said guide and jaws and adapted to move longitudinally relatively to said jaws, and an adjustable means adapted to co-operate with the casing or side wall of the well for retarding downward movement of said jaws relatively to said tapered member.

6. A catching device for well tubing, composed of a tubular guide connected to the tubing, jaws surrounding said guide and arranged so as to engage the casing or side wall of the well, a tapered member arranged between said guide and jaws for forcing said jaws outwardly, and an adjustable means combined with said jaws and adapted to exert frictional pressure on the casing or side wall of the well for causing said jaws to be acted upon instantly by said tapered member in the event the tubing drops suddenly during the operation of lowering it into the well.

7. A catching device for well tubing, comprising a tubular guide adapted to be connected to the tubing, jaws surrounding said guide and adapted to engage the casing or side wall of the well, an actuating member arranged between said guide and jaws and adapted to move in a direction to render said jaws operative, a holding member combined with said jaws, and an adjustable friction means on said holding member adapted to act on the casing or side wall of the well.

8. A catching device for well tubing, comprising a tubular guide adapted to be connected to the tubing, jaws surrounding said guide, an actuating member interposed between said guide and jaws for forcing said jaws outwardly into engagement with the casing or side wall of the well, a holding member provided with an adjustable means for frictionally engaging the casing or side wall of the well, and links that connect said jaws to said holding member.

9. A catching device for well tubing, comprising a tubular guide adapted to be connected to the tubing, jaws for gripping the casing or side wall of the well, an actuating member for said jaws surrounding said guide, a holding member surrounding said guide and comprising an inner sleeve, means for connecting said jaws to said sleeve, a longitudinally-adjustable collar on said sleeve, resilient arms on said collar provided with friction devices for engaging the casing or side wall of the well, and a part on said sleeve that co-operates with said arms to vary the position of said friction devices when said collar is adjusted longitudinally of said sleeve.

10. A catching device for well tubing, comprising a tubular guide adapted to be connected to the tubing, jaws for gripping the casing or side wall of the well, an actuating member for said jaws surrounding said guide, a holding member comprising an inner sleeve that surrounds said guide, links which connect said sleeve to said jaws, a tapered portion on said sleeve, a longitudinally-adjustable collar surrounding said sleeve, and resilient arms on said collar arranged in engagement with the tapered portion of said sleeve and provided with friction devices for engaging the casing or side wall of the well.

11. A catching device for well tubing, comprising a tubular guide connected to the well tubing, jaws for engaging the casing or side wall of the well, an actuating member for said jaws surrounding said guide and arranged so that it can move longitudinally relatively to said guide, means on said guide for sustaining said actuating member during the operation of introducing the device into the well, and a friction means adapted to co-operate with the casing or side wall of the well for retarding the downward movement of said jaws in the event the tubing drops suddenly when the device is being introduced into the well.

12. A catching device for well tubing, comprising a tubular guide adapted to be connected to the well tubing, jaws for engaging the casing or side wall of the well, a tapered actuating member interposed between said guide and jaws and adapted to move longitudinally relatively to said guide, a part on said guide arranged in engagement with a shoulder on said actuating member for sustaining said member during the operation of introducing the device into the well, and a friction holding member combined with said jaws for maintaining them in a condition to automatically engage the well casing if the tubing starts to drop during the operation of introducing the device into the well, said guide being adapted to be turned or rotated after the device has reached the desired position in the well so as to disengage the part on the guide from the shoulder on said actuating member and thus permit said actuating member to move automatically in a direction longitudinally of said guide to render said jaws operative and normally hold them in engagement with the casing.

13. A catching device for well tubing, comprising a tubular guide adapted to be connected to the tubing, jaws surrounding said guide and adapted to grip the casing or side wall of the well, a tapered actuating member for said jaws interposed between the guide and the jaws and adapted to move longitudinally of said guide, a holding member combined with said jaws and provided with means for frictionally engaging the casing or side wall of the well so as to cause said jaws to act automatically in the event the tubing start to drop during the operation of introducing the device into the well, and means for holding said actuating member in an inoperative position with relation to said jaws constructed so that a slight rotary movement of the tubing after the device has reached the desired position in the wall causes said actuating member to move automatically longitudinally of said guide in a direction to render said jaws operative.

14. A catching device for well tubing, comprising a tubular guide adapted to be connected to the tubing, jaws surrounding said guide, an actuating member for said jaws interposed between said jaws and the guide and adapted to move longitudinally relatively to said guide, a lug on said guide arranged in a recess in the actuating member and adapted to co-operate with a shoulder on said member to sustain the same during the operation of introducing the device into the well, said recess being provided

with an upwardly-projecting extension that is adapted to receive said lug and thus permit the actuating member to move downwardly relatively to the guide when the tubing is rotated slightly after the device has reached the desired position in the well, and a holding member combined with said jaws and provided with a friction means for engaging the casing or side wall of the well.

15. A catching device for well tubing, comprising a tubular guide adapted to be connected to the tubing, jaws surrounding said guide, and actuating member for said jaws interposed between said jaws and the guide and adapted to move longitudinally of said guide, a lug on said guide arranged in a recess in the actuating member and adapted to co-operate with a shoulder on said member to sustain the same during the operation of introducing the device into the well, said recess being provided with an upwardly-projecting extension that is adapted to receive said lug and thus permit the actuating member to move downwardly relatively to the guide when the tubing is rotated slightly after the device has reached the desired position in the well and thus force the jaws into engagement with the casing, a holding member combined with said jaws and provided with a friction means for engaging the casing or side wall of the well, a separate lug on said guide, and a vertically-disposed groove in the upper end portion of the actuating member for receiving said separate lug and provided at its lower end with a shoulder that is adapted to be engaged by said lug in the event the tubing breaks away from its sustaining means.

STEPHEN V. DILLON.