F. N. BIERCE.

CREEPER.

APPLICATION FILED JAN. 13, 1914.

1,128,746.

Patented Feb. 16, 1915.

3 SHEETS—SHEET 1.

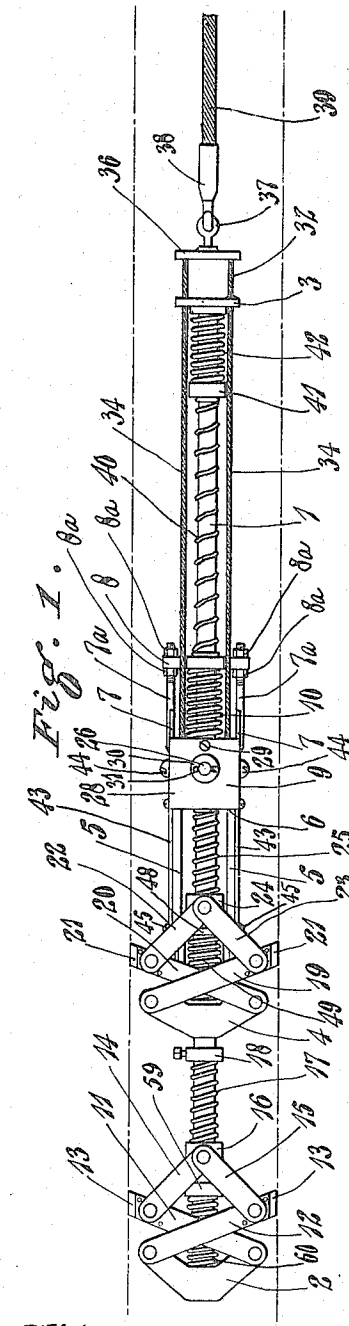


Fig. 1.

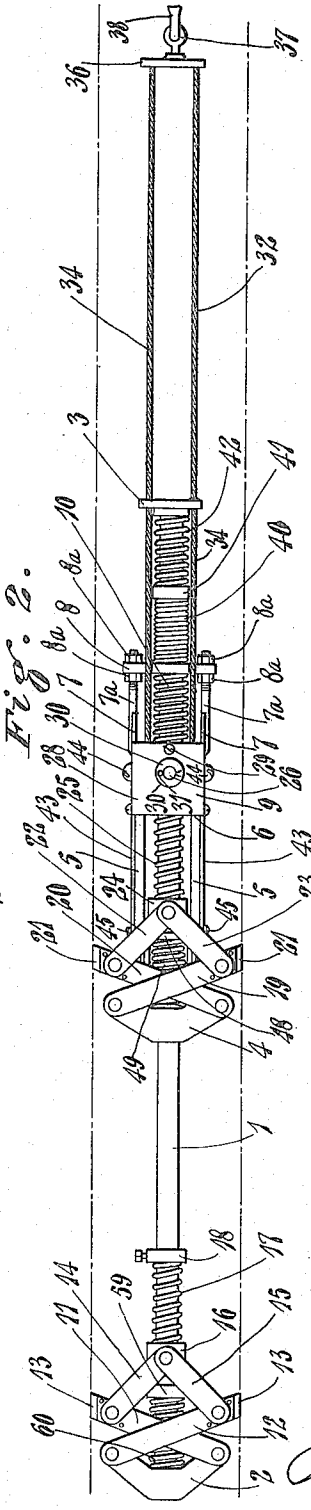


Fig. 2.

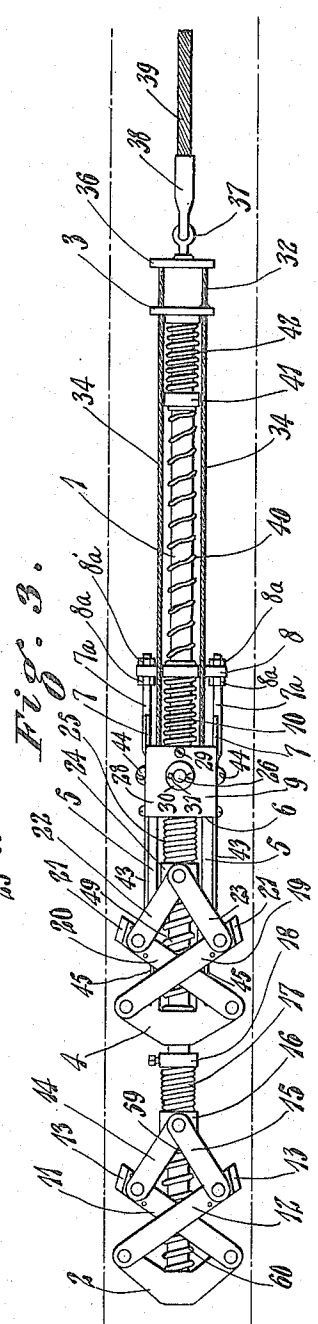


Fig. 3.

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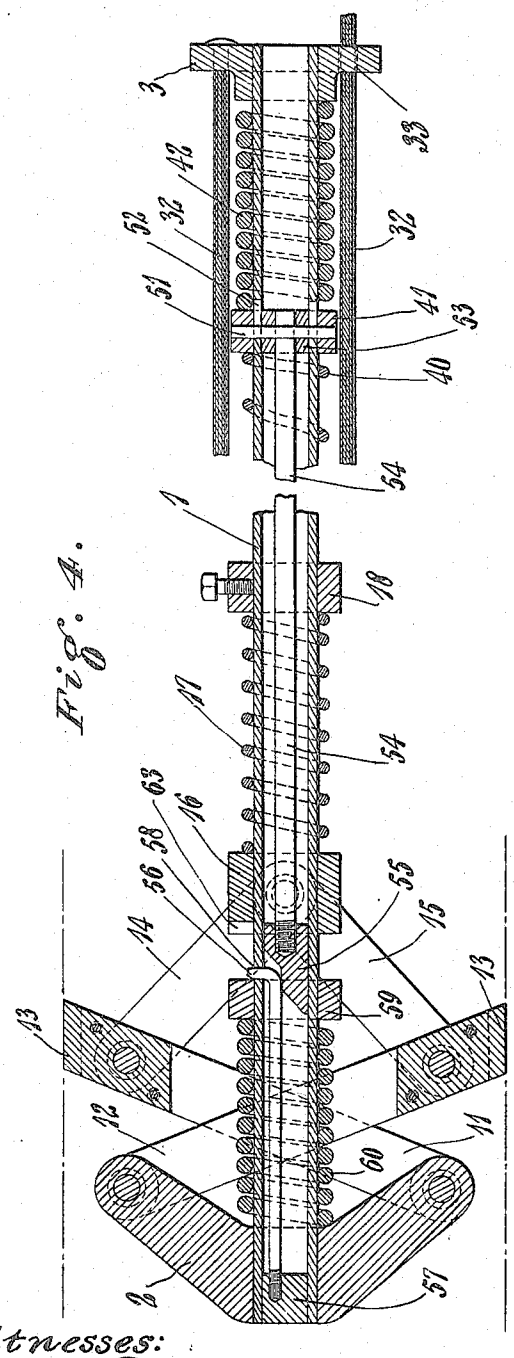


Fig. 4.

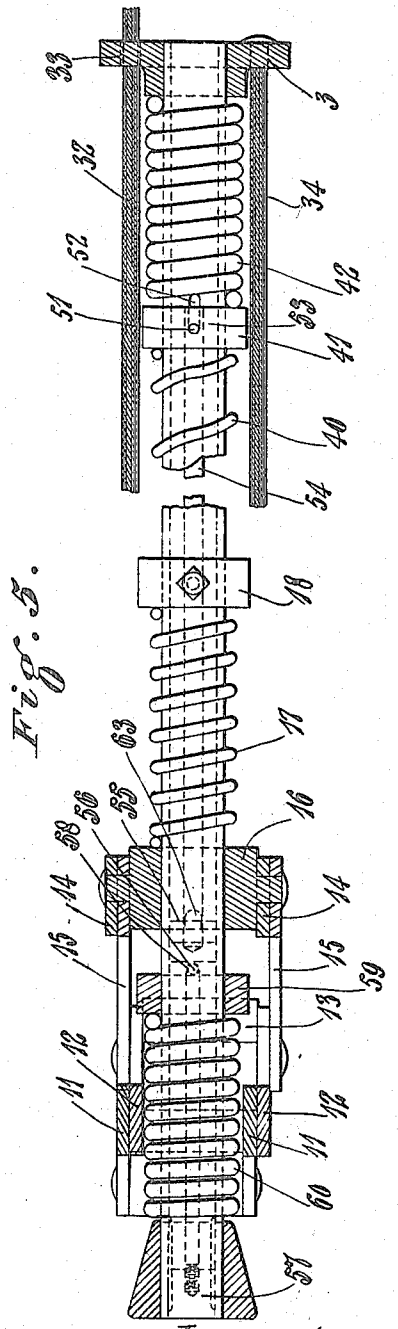


Fig. 5.

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3 SHEETS—SHEET 3.

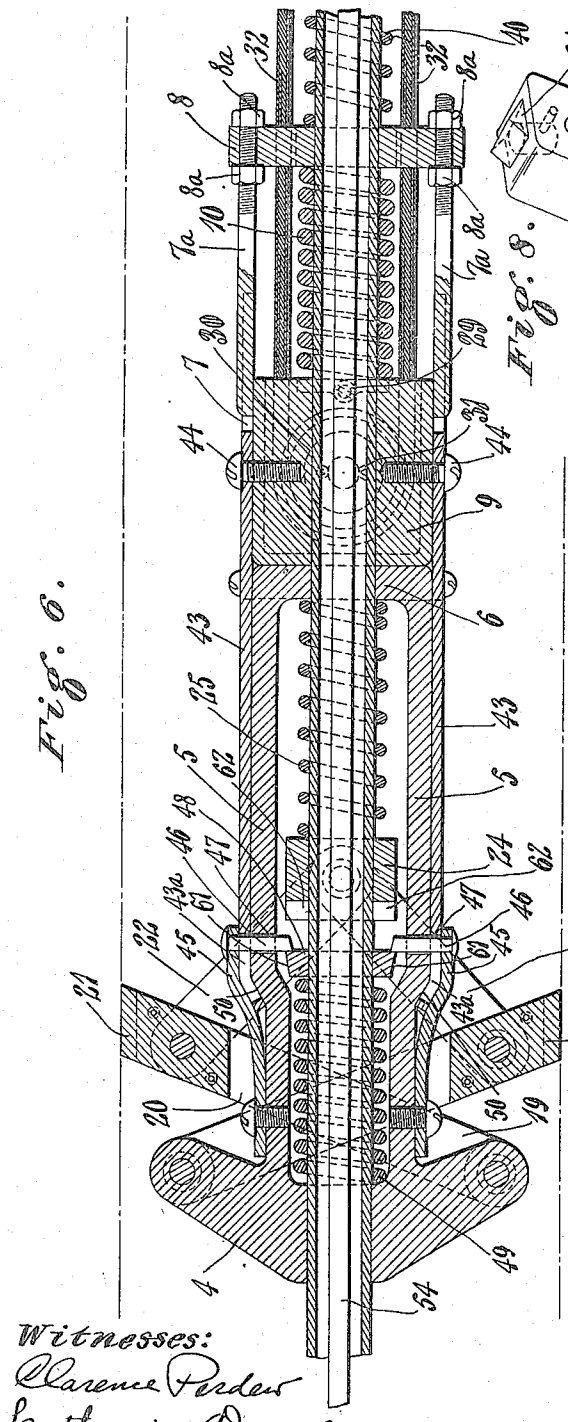


Fig. 6.

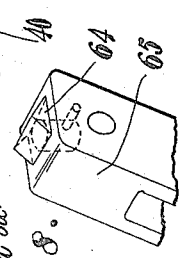


Fig. 8.

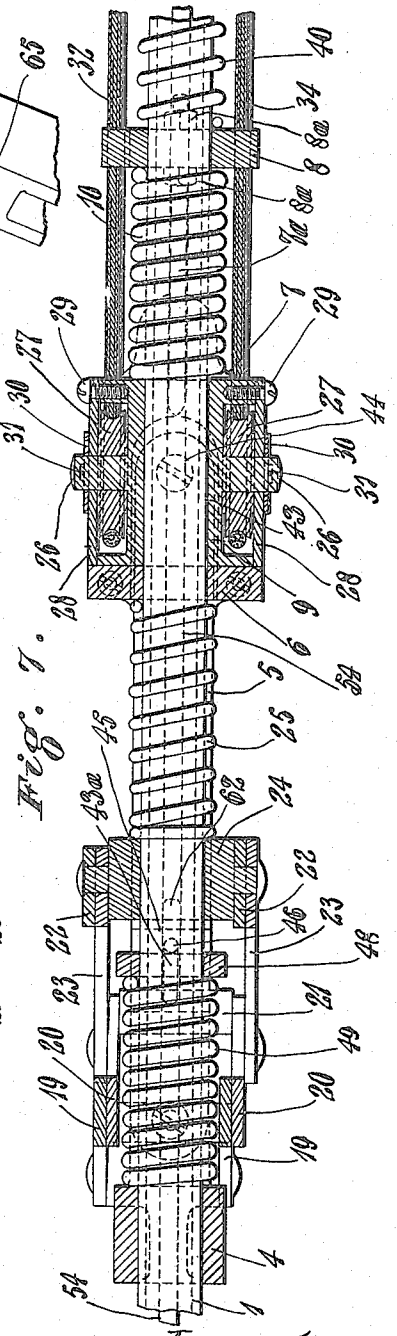


Fig. 7.

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UNITED STATES PATENT OFFICE.

FRED N. BIERCE, OF CINCINNATI, OHIO.

CREEPER.

1,128,746. Specification of Letters Patent. Patented Feb. 16, 1915.

Application filed January 13, 1914. Serial No. 811,843.

To all whom it may concern:

Be it known that I, FRED N. BIERCE, a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Creepers, of which the following is a specification.

My invention relates to means for laying of cables in conduits, and has for its object the facilitation of threading a line through the conduit, preparatory to pulling the cable into the conduit.

My invention consists in the parts and in the details of construction and arrangement of parts as will hereinafter be more fully described and claimed.

In the drawings: Figure 1 is a general side elevation of my invention in one of its positions during its operation; Fig. 2 is a similar view of the same in another position; Fig. 3 is a similar view of the device in retracted condition for withdrawal from the conduit where necessary, as in case the device meets with an impassable obstruction; Fig. 4 is a longitudinal vertical section of the extreme forward and rearward parts of the device, with the middle part broken away for lack of space; Fig. 5 is a longitudinal transverse section of the same but with the stem and the springs and collars thereon shown in full plan; Fig. 6 is a longitudinal vertical section of the middle part of the device; Fig. 7 is a longitudinal transverse section of the same, with the stem and the collars and springs thereon shown in full plan; and Fig. 8 is a detail of part of one of the shoes of modified construction.

The stem 1 is tubular and has the front head 2 rigidly secured to its front end and the stem yoke 3 rigidly secured to its rear end. A rear head 4 slides on this tubular stem 1 and has a rearwardly extending frame comprising side parts 5 flanking the stem and joined by a bracket 6 at the rear end, which bracket also has a bearing on the stem 1, so that the entire structure composed of this rear head 4 and its frame may slide on the stem together, all preferably being formed integral. Fixed to this bracket 6, at opposite sides, are plates 7 which have threaded rods 7^a that extend rearwardly and upon which an end piece 8 is adjustably held by nuts 8^a, which end piece may also slide on the stem 1. Directly to the rear of the bracket 6 is the pulley-block 9 with these plates 7 flanking it, this pulley-block being also slidable on the stem 1 and held up against the bracket 6 by a helical safety spring 10 which surrounds the stem 1 and is compressed between this block 9 and the end piece 8.

The front head 2 has the arms 11 and 12 pivoted to it at opposite sides, each arm extending over to the respective opposite side of the device, and said arms being of bifurcated construction so that each may extend through the other where they cross at the middle of the device. Each arm carries a shoe 13 adapted to bear against the inner side of the conduit. As shown in all of the illustrations except Fig. 8, the shoe is preferably composed of wood, presenting the ends of its fibers against the wall of the conduit so that efficient frictional contact is made with the wall. These arms 11 and 12 incline rearwardly across the device, so that when a backward pull is exerted on the head 2 these arms will tend to assume positions at right angles across the conduit, thus crowding their shoes against the walls of the conduit, so that an increased pull on the head results in an increased frictional contact of the shoes, and consequently these arms with their shoes will hold all the tighter the more the pull is increased. To normally hold the shoes out against the walls of the conduit, the arms 11 and 12 have toggle links 14 and 15, respectively, pivoted to them on each side of the device and pivoted to a forward toggle-head 16, on both sides of said head, while the head is slidable on the stem 1 and has a helical gripping spring 17 around the stem and compressed between the toggle-head and a collar 18 fixed on the stem. The rear head 4 is in a similar manner provided with arms 19 and 20 having shoes 21 bearing against the walls of the conduit and normally held outward by toggle links 22 and 23, respectively, on both sides of the device which are pivoted to a rear toggle-head 24 on both sides thereof, which toggle-head slides on the stem 1 and has a helical gripping spring 25 around the stem and compressed between the toggle-head and the bracket 6 of the frame which the rear head 4 has.

The pulley block 9 has studs 26 extending out from opposite sides, upon which grooved pulleys 27 are rotatably mounted, the sides of the block 9 preferably being recessed to receive these pulleys 27, and having plates 28 secured over the pulleys by

screws 29 with the studs 26 extending through the plates and receiving washers 30 with cotters 31, which thus supplement the screws 29 in holding the plates 28 in place and confine the pulleys 27 to the studs. At one side of the device, a cable 32 has one end fixed in the stem yoke 3 at one side at the top thereof and passes forwardly and down around the pulley 27 on that side and backward and loosely through an opening 33 in the lower part of the stem yoke 3 on that side. At the other side of the device another cable 34 has one end fixed in the stem yoke 3 at the bottom and passes forward and up around the pulley 27 on that side and backward and loosely through an opening 35 in the upper part of the yoke on that side. These two cables 32 and 34, after passing loosely through the yoke 3, extend a sufficient distance backward and have their other ends fixed in a cable yoke 36 which has an eye 37 receiving a snap hook 38 on the end of a cord 39.

A long helical motor spring 40 is confined between the rear side of the rear end piece 8 and the front side of the safety collar 41. This collar is held forward by a helical safety spring 42, this safety spring 42 being around the stem and compressed between the collar 41 and the stem yoke 3. The safety springs 10 and 42 are much stronger than the motor spring 40, and will yield only under conditions later to be described.

With the parts arranged as above described and in their positions as illustrated in Fig. 1, which is the condition of the device as it is placed in the conduit, the gripping springs 17 and 25 spread the arms on the heads 2 and 4 outward, with the shoes gripping the walls of the conduit, while the motor spring 40 is holding the rear head 4 and its associated parts forward on the stem. Now, when a pull is exerted on the cord 39, which extends backward out of the end of the conduit, the cables 32 and 34 will act around the pulleys 27 and upon the stem yoke 3, with the rear head 4 providing the stationary reaction, with the result that the entire stem and the front head 2 and associated parts thereon will be pushed forward, compressing the motor spring 40, so that, at the completion of this operation, the parts will be in the positions indicated in Fig. 2. It will be understood that the gripping spring 17 has yielded slightly when the head 2 travels forward so that the shoes 13 freely slide along the surfaces of the walls of the conduit, but as soon as the forward head 2 stops the shoes 13 will immediately grip the walls of the conduit again under the pressure of the spring 17; and then when the operator ceases to pull on the cord 39 the motor spring 40 will expand and push the head 4 and the entire structure associated therewith forward on the stem 1 until it again reaches a position, relative to the forward head 2, like that shown in Fig. 1. This latter action will have taken place with the forward head 2 having its arms gripping with their shoes and providing the stationary reaction for the action of the motor spring 40 in pushing the rear head 4 forward; and the shoes 21 on the arms of this rear head 4 will slide along the walls of the conduit, with the gripping spring 25 yielding slightly to permit this. Then, as soon as this rear head 4 stops, the shoes 21 will again grip the walls of the conduit; and upon the next pull on the cord 39 the stem 1 and forward head 2 and associated parts will again be extended forward and the operation repeated.

From the foregoing it will be seen that it is necessary only to repeat the alternate pulling and slacking of the cord 39 to cause the device to creep forward through the conduit; and when the device has reached the other end of the conduit and been withdrawn therefrom by an operator at that end the cord 39 will be threaded through the conduit and will be available for drawing the "fish-wire" through the conduit which in turn will be used for drawing the cable through the conduit. It is thus necessary to have but the one cord 39 pass through the conduit; and the device can be operated with one hand, since there is but one cord to manipulate.

Should the device meet an obstruction which cannot be removed by the pulling forward of the stem and front head because it overtaxes either the operator's strength or the strength of the cord 39, it becomes necessary to withdraw the device back through the conduit and to take some other measure for removing the obstruction.

In order to withdraw the device, it is necessary that all of the shoes 13 and 21 be retracted from the walls of the conduit, since, as above described, when these shoes grip the walls of the conduit, it is impossible to draw the device backward, because the shoes hold more tightly the stronger the backward pull upon them. It is to provide for this contingency that the pulley block 9 is made separate from the rear head 4 and its frame, and held up thereagainst by the safety spring 10 as above described; and it is also to provide for this that the safety collar 41, to the rear of the motor spring 40, is held up by the safety spring 42 as was described. Thus, the pulley block 9 has spreaders 43 fixed to it at the top and bottom by screws 44, the plates 7 being bifurcated for connection to the bracket 6, as hereinbefore described, thus permitting these spreaders 43 to be secured to the pulley block. These spreaders 43 extend forwardly along the top and bottom members

5 of the frame, and near the front end of the frame flat springs 45 are fixed to the frame close to the head 4 and extend rearwardly along the top and bottom members 5, and outside the spreaders 43 with pins 46 extending in through slots 43ª in the spreaders and through openings 47 in the frame members 5 and engaging with a collapsing collar 48 that is slidable on the stem 1. A helical collapsing spring 49 around the stem 1, is confined between the collapsing collar 48 and the rear side of the rear head 4. The spreaders 43 have their ends inclined inwardly around inclined shoulders 50 on the frame members 5, so that if these spreaders are pulled backward along with the pulley block 9, they will ride up on the shoulders 50, spread the flat springs 45, withdraw the pins 46, and release the collapsing collar 48 under the action of the collapsing spring 49. The collapsing spring 49 is made much stronger than the gripping spring 25, and this spring 25 is thus overpowered and completely compressed, so that the arms 19 and 20 are drawn inward, and their shoes 21 cannot make gripping engagement with the walls of the conduit.

The safety spring 42 bears the same relation to the forward head 2 and its arms 11 and 12 that the safety spring 10 does to the rear head 4 and its arms 19 and 20. Thus, the safety collar 41 has a transverse pin 51 which passes through longitudinal slots 52 in the walls of the tubular stem 1 and carries, inside the stem, a hub 53 in which the rear end of the connecting rod 54 is held by the pin 51. The entire structure, comprising this rod, the hub, the pin and the collar, is slidable along the stem 1 to the extent allowed by the length of the slots 52. Normally, this structure is held forward by the safety spring 42, and the forward end of the connecting rod 54, near the head 2 at the other end of the device, carries a wedge 55 which fits inside the stem 1 and, when held forward by the spring 42, this wedge has a shoulder under a spring hook 56 which is fixed in a plug 57 in the front end of the stem 1 and extends backward and then laterally outward through an opening 58 in the wall of the stem 1, where it engages with the rear side of the collapsing collar 59, between which collar and the rear side of the head 2 is compressed the helical collapsing spring 60. The spring hook 56 tends to spring inwardly of the stem and release the collapsing collar 59 and collapsing spring 60, and this collapsing spring 60 is much stronger than the gripping spring 17, and if it is released it will overpower and completely compress the gripping spring 17, and the arms will be drawn inward, and their shoes 13 cannot grip the walls of the conduit.

From the foregoing description of the safety collapsing devices for both rear and forward heads, it may be understood that when the device meets with an obstruction which offers sufficient resistance, a continued and stronger pull on the cord 39 will release both forward and rear heads. Now, suppose the forward head to be traveling forward from the position shown in Fig. 1 to that shown in Fig. 2 with the rear head gripping the conduit walls, and that at any part of its forward travel this forward head meets with an obstruction in the conduit: If the obstruction is loose and is light enough, or if it is only lightly attached to the walls of the conduit, neither of the safety springs 10 or 42 will yield, and the pull on the cord 39 will cause the forward head to dislodge the obstruction and push it along in the conduit. In fact the gripping power of the device is found in practice to be such that it is possible to dislodge any obstruction not so heavy or tightly fixed as to cause breakage of the cord 39.

The prevention of breakage of the cord 39 is the most important purpose of the safety collapsing and releasing devices. Thus, in the illustration above given, the safety springs 10 and 42 are made of such stiffness relative to the strength of the cord 39 that a wide margin of safety is assured, and when the forward head 2 meets the obstruction it will continue to act to dislodge the obstruction only to the extent that the safety spring 10 is able to resist backward movement of the pulley block 9, which as will be seen from the description hereinbefore given, must provide the stationary reaction for the action of the cables 32 and 34, in pulling the forward head 2 forward. If the obstruction offers sufficient resistance, and the safety spring 10 is thus overcome and permits the block 9 to move backward, the collapsing collar 48 will be released, owing to the spreading of the flat springs 45 and the withdrawal of the pins 46, and the collapsing spring 49 will overcome the gripping spring 25 as before described, whereupon the arms 19 and 20 of the rear head 4 are released from their gripping contact with the conduit walls. It then remains to render the forward head inoperative, since although it was traveling forward, if it is attempted to drag the device backward the arms 11 and 12 of the forward head will immediately grip the conduit walls and prevent this. Therefore, the operator continues to pull backward on the cord 39, which action will now compress the motor spring 40 by pulling the entire rear head 4 and pulley block 9 and the other parts backward along the stem 1, which is now held stationary by the gripping of the arms of the forward head 2. When this motor spring 40 has been completely compressed, the pull on the cord 39 will be positively exerted on the safety

collar 41, which will move backward with its pin 51 sliding in the slots 52 in the stem 1, the safety spring 42 being overcome and compressed by this action, and the wedge 55 being withdrawn from under the hook 56, which hook will spring inwardly on the stem and withdraw its lateral part from behind the collapsing collar 59, allowing the collapsing spring 60 to overcome the gripping spring 17, and withdrawing the arms 11 and 12 from their operative positions. The device will then assume an appearance somewhat as shown in Fig. 3, since the motor spring 40 will then force the stem and forward head backward in the device, and the entire device will be dragged backward bodily by the pull of the cord 39 thereon, and the motor spring 40 will incidentally expand and be only slightly compressed by the reaction due to the weight of the device as it is dragged backward through the conduit. It will thus be understood that, not only is a very simple means provided for releasing the device when it meets with an obstruction, but the safety releasing or collapsing mechanism is entirely automatic in its prevention of breakage of the cord 39, since it is necessary only to assure that the cord 39 is always of sufficient strength to successively compress the safety springs 10 and 42, and the weight of the obstruction, or the tightness with which it is lodged, can offer no danger of breakage of the cord 39 as long as the safety springs 10 and 42 are weak enough to yield before sufficient strain has been imposed upon the cord 39 to break it. The importance of thus safeguarding the cord 39 will be apparent, for if this cord breaks with the device far into the conduit the device will not only be difficult to reach from the end of the conduit, but it will have all of its arms tightly gripping the walls of the conduit and it will be necessary to perform the tedious and almost impossible operation of engaging some instrument either with the part of the cord left attached or with the yoke 36 or its eye 37. With the safety automatic collapsing device there need be no occasion for thus "fishing" the device out of the conduit as long as care is taken that the cord 39 is always strong enough to compress the safety springs 10 and 42, one at a time. Of course where the obstruction is such that the device must be collapsed and released and drawn backward out of the conduit as above described, it will be necessary to gain access to the obstructed part of the conduit by suitable means well known in the art, and remove the obstruction. The length of cord 39 which has passed into the conduit will afford an indication of the exact location of the obstruction along the conduit. It is not necessary for the device to meet with an obstruction however, in order to collapse it. Thus, should it be desired to withdraw the device at any time after having started it through the conduit, as for instance, if it should be found that it has been started through the wrong conduit, it is merely necessary to exert a continued and stronger pull on the cord 39 after the front head 2 has been fully extended forward and the motor spring 40 has been fully compressed. In this condition the two safety springs 10 and 42 will be directly opposed to each other and they will both yield and release the collapsing springs of both heads so that the arms of both heads will be retracted practically simultaneously. It is generally desirable that the safety spring 42 for the front head be somewhat stronger than the safety spring 10 of the rear head so that this latter spring will yield first under any of the above conditions.

The strength of the safety spring 10 of the rear head will determine the power of the device for moving an obstruction, since the obstruction is moved by the front head traveling forward with the pulley block 9 of the rear as the stationary reactive part held forward by said safety spring 10. It is for this reason that I prefer to make the rear end piece 8 adjustable along the rods 7ª. This adjustment enables the operator to increase the resistance of the safety spring 10 in cases where his judgment so dictates.

When the device has been collapsed and drawn backward out of the conduit for any reason, it may be set into operative condition again by pushing the toggle head 24 forward, carrying the collapsing collar 48 forward with it until the collar passes between the pins 46, which, with their flat springs 45 yield outward and then snap back behind the collar 48 again, confining the collapsing spring 49 as before and leaving the gripping spring 25 free to act upon the arms 19 and 20 through the toggle. To facilitate this, the collapsing collar 48 has slight bevels 61 on its sides where the pins must slide over it and the pins have their ends also slightly beveled as shown. This operation will set the mechanism of the rear head 4. Then, to set the mechanism of the forward head 2, the safety collar 41, at the rear end of the device, is pushed back against the pressure of the safety spring 42, to withdraw the wedge 55 from under the hook 56 at the front end, since the wedge will have immediately been moved forward after the collapsing of the mechanism of the front head. When the hook 56 has sprung back, the toggle 16 may be pushed forward, pushing the collapsing collar 59 forward until this collar has passed the lateral part of the hook, whereupon the safety collar 41, at the rear end of the device, is released, causing the wedge 55 to press the hook up behind the collapsing collar 59, which will

thus hold the collapsing spring 60 compressed and leave the gripping spring 17 again free to act on the arms 11 and 12 through the toggle. The toggle head 24 is provided with recesses 62 to fit around the pins 46 when the toggle head is pushing the collapsing collar 48 forward and the pins are coming behind the collar. Likewise the toggle head 16 has a recess 63 which fits around the lateral part of the hook 56 as it is forced behind the collapsing collar 59 when this toggle head is pushing this collar forward. These setting operations may be quickly accomplished by the operator without assistance, and the device may be immediately started through another one of the conduits, where several conduits are run parallel.

By providing the cord 39 with the snap hook 38 hooking into the eye 37 on the yoke 36, the cord may be quickly attached for running through the conduit, then detached at the other end and the device may be immediately connected to another cord at that end for running back through another one of the conduits, if several conduits are running parallel. As I have constructed the device, it will travel through the conduit at the rate of about one foot per second with ordinary exertion on the part of the operator in alternately pulling and releasing the cord 39, and it may be stated that obstructions offering resistance up to 15 or 20 lbs. may be readily pushed forward through the conduit, not only owing to the lightness of the device itself, which thus leaves practically all of the power of the operator to be used in such instances, but owing to the firmness with which the device grips the walls of the conduit and thus affords the stationary reaction necessary, and to the extremely smooth and direct application of the power to the device. Thus, although the rear head is pushed forward merely by the comparatively light action of the motor spring 40, the forward head is always pushed forward by the positive exertion of the power of the operator, with the rear head firmly gripping the conduit walls and providing the stationary reaction. Wherever obstructions are movable by the device, they will always be moved by the front head. Where the obstruction consists of mud or similar substance, the shoes of the front head will clear paths for the shoes of the rear head, the shoes of the two heads being always in alinement.

The device is able to pass through any conduit through which it is practicable to draw the sheathed cables, being capable of passing around such moderate bends as conduits are sometimes given, especially when in the position as described, with the shoes gripping top and bottom of the conduit. It will be understood that wherever the device would be unable to pass, owing either to obstruction or to sharpness of the bend, it would be impracticable to draw the sheathed cable through, on account of the risk of damaging the sheathing of the cable by drawing it past such obstructions or bends.

As shown in Fig. 8 a steel calk 64 is fastened in the end of the arm, which is provided with a solid end 65, whereas with the wooden shoes 13 and 21 the arms 11 are made in separate parts and riveted together through the wooden shoes. This calk 64 may be hardened, and when worn may be removed and a new one inserted. The choice between the wooden shoe and the steel calk or any other suitable gripping means will generally depend upon the nature of the material of which the conduit is made. It will also be understood that other details of the device may be modified as circumstances may dictate, and therefore, while I have illustrated and described certain constructions specifically, I do not wish to be understood as being limited precisely thereto, but

What I claim as new and desire to secure by Letters Patent is:

1. In a creeper, gripping mechanisms, a single tension element, means whereby successive tensions exerted on said element cause the mechanisms to grip alternately and cause each mechanism to travel with respect to the other while the other is gripping, and means whereby increased tension renders both of said mechanisms inoperative.

2. In a creeper, gripping mechanisms, each comprising springs causing it to operate, means acting by a succession of tensions to alternately cause each mechanism to travel while the other is gripping, another spring to each mechanism normally held inoperative, and means whereby extra tension releases these other springs to overpower the springs that cause the mechanisms to operate.

3. In a creeper, gripping mechanisms, means acting by successive tensions to alternately cause each mechanism to travel while the other is gripping, a gripping spring to each mechanism, causing it to grip, a collapsing spring to each mechanism, and means to each mechanism holding the collapsing spring normally inoperative, a safety spring for each mechanism, and operative connection from each safety spring to the respective collapsing spring, whereby when the safety spring yields, the collapsing spring becomes operative and renders inoperative the respective gripping spring, said safety springs yielding upon extra tension on the aforesaid means.

4. In a creeper, a forward head, a stem fixed thereto and extending rearwardly therefrom, a rearward head on the stem and movable relative to the stem and forward

ad, a motor spring on the stem acting forwardly against the rearward head, tension means connected with the rearward head and extending from said rearward head to have tension applied to it, whereby it will cause relative movement of the stem and rearward head against the action of said motor spring, a pair of arms on each head, each arm on the head being pivoted at one side of the head and rearwardly inclined across the other arm and past the point where said other arm is pivoted on the other side, and means to each head yieldably forcing the arms forward from their rearward inclinations.

5. In a creeper, a forward head, a stem fixed thereto and extending rearwardly therefrom, a rearward head on the stem and movable relative to the stem and forward head, a motor spring on the stem acting forwardly against the rearward head, tension means connected with the rearward head and extending from said rearward head to have tension applied to it, whereby it will cause relative movement of the stem and rearward head against the action of said motor spring, a pair of arms on each head, each arm on the head being pivoted at the side of the head and rearwardly inclined across past the pivoting of the other arm on the other side, a toggle head on the stem for each pair of arms, toggle links connecting the toggle head with the respective arms, and gripping springs pressing the toggle heads forward.

6. In a creeper, a forward head, a stem fixed thereto and extending rearwardly therefrom, a rearward head on the stem and movable relative to the stem and forward head, a motor spring on the stem acting forwardly against the rearward head, tension means connected with the rearward head and extending from said rearward head to have tension applied to it, whereby it will cause relative movement of the stem and rearward head against the action of said motor spring, a pair of rearwardly inclined arms on each head, a gripping spring to each head, and operative connection from the gripping spring to the respective pair of arms, whereby the gripping spring yieldably presses the arms forward and laterally outward from their rearward inclinations.

7. In a creeper, a forward head, a stem fixed thereto and extending rearwardly therefrom, a rearward head on the stem and movable relative to the stem and forward head, a motor spring on the stem acting forwardly against the rearward head, tension means connected with the rearward head and extending from said rearward head to have tension applied to it, whereby it will cause relative movement of the stem and rearward head against the action of said motor spring, a pair of arms on each head, a gripping spring to each head, operative connection from the gripping spring to the respective pair of arms, whereby the gripping spring yieldably presses the arms forward from their rearward inclinations, a collapsing spring to each head, adapted, when released, to compress the gripping spring of the head and to act through the operative connection to draw the arms backward, means to each head confining these collapsing springs, and means operated by extra tension on said tension means while one of the heads is held against travel to release these collapsing springs.

8. In a creeper, a forward head, a stem fixed thereto and extending rearwardly therefrom, a rearward head on the stem and movable relative to the stem and forward head, a motor spring on the stem acting forwardly against the rearward head, tension means connected with the rearward head and extending from said rearward head to have tension applied to it, whereby it will cause relative movement of the stem and rearward head against the action of said motor spring, gripping means on each head automatically bearing forwardly to grip, but released when drawn backward, a safety spring on said stem, receiving the rearward thrust of the motor spring, connecting means from this safety spring forward to the forward head, a collapsing spring in the forward head, and confining means for this collapsing spring, the connecting means releasing said confining means on backward movement whereupon said collapsing spring draws the gripping means backward and holds it back, said safety spring permitting the connecting means to move backward only upon extra tension applied to said cable and after the motor spring has been completely compressed, a movable mounting in the rearward head through which the tension means connects with said rearward head, operative connection extending forward from this movable mounting, a collapsing spring in the rearward head, confining means for the collapsing spring, released on backward movement of the operative connection with the movable mounting, whereupon said collapsing spring draws the gripping means back and holds it back, and a safety spring holding the movable mounting forward in the head and yielding to allow backward movement of the movable mounting only upon extra tension applied to said tension means.

9. In a creeper, a forward head, a hollow stem fixed thereto and extending rearwardly therefrom, a rearward head movable on said stem, a pair of arms to each head, each arm on the head being pivoted at one side and rearwardly inclined across past the pivoting of the other arm on the other side, a toggle head on the stem for each pair of arms, tog-

gle links connecting the toggle heads with the respective arms, a forward gripping spring around the stem, a collar fixed on the stem holding this gripping spring to press the forward toggle head forward, a rearward gripping spring around the stem, and a frame on said rearward head holding this gripping spring to press the rearward toggle head forward, a motor spring around the stem, and means on the stem holding this motor spring to press the rearward head and its frame and the parts carried therewith forward, a pulley rotatably mounted and carried with said rearward head and frame, a cable fixed to the stem near its rear end, passing forward around said pulley and backward, whereby when tension is applied to the cable, it pulls the stem forward through the rearward head, compressing said motor spring, and then when tension is released on the cable said motor spring pushes said rearward head forward on the stem.

10. In a creeper, a forward head, a stem fixed thereto and extending rearwardly therefrom, a rearward head movable on said stem, a pair of arms to each head, each arm on the head being pivoted at one side and rearwardly inclined across past the pivoting of the other arm on the other side, a toggle head on the stem for each pair of arms, toggle links connecting the toggle heads with the respective arms, a forward gripping spring around the stem, a collar fixed on the stem holding this gripping spring to press the forward toggle head forward, a rearward gripping spring around the stem, and a frame on said rearward head holding this gripping spring to press the rearward toggle head forward, a motor spring around the stem, a safety collar holding said motor spring, but movable on the stem, a safety spring around the stem, holding this collar forward, said stem having a longitudinal slot, an element on said collar extending through the slot into the stem, a rod inside the stem fixed to this element and extending forward near to the forward head, a collapsing collar around the stem forwardly of the forward toggle head, a collapsing spring confined between said collapsing collar and the forward head, said stem having an opening near this collar, confining means inside the stem and extending through the opening and engaging said collapsing collar, holding it forward against the pressure of the collapsing spring, means on said rod inside the stem holding the confining means outward to thus engage the collapsing collar, whereby when said rod is drawn backward with the safety collar said confining means releases the safety collar and safety spring, allowing them to push the forward toggle head backward, a pulley block movable in the frame of the rearward head, a safety spring in said frame pressing the pulley block forward, a collapsing collar on the stem forwardly of the rear toggle head, a collapsing spring confined between this collar and the rear head, a yieldable element at the side of the frame confining the collapsing collar and collapsing spring forward from the toggle head but releasing them upon yielding outward, allowing them to push the rear toggle head backward, a pulley rotatably mounted on the pulley block, a cable fixed to said stem near its rear end and passing forward around the pulley and rearward, to have tension applied to it and thereby pull the stem forward through the rearward head, compressing said motor spring, and then to have tension released on it, allowing said motor spring to push said rearward head forward on the stem, and, upon one of said heads being held against forward movement and extra tension being applied to said cable, the respective safety springs yielding as aforesaid.

11. In a creeper, gripping mechanism, comprising a gripping spring causing said mechanism to automatically grip and resist backward motion but to automatically yield and partake of forward motion, a collapsing spring capable of overpowering the gripping spring, a safety spring, and means whereby the safety spring confines the collapsing spring but releases the collapsing spring under extra exertion upon the mechanism.

12. In a creeper, gripping mechanism comprising a gripping spring whereby the mechanism automatically grips and resists backward motion, but automatically yields and partakes of forward motion, manipulative engaging means carried with the gripping mechanism, a collapsing spring capable of overpowering the gripping spring, operative connection from the manipulative engaging means to the collapsing spring whereby the collapsing spring is confined, and a safety spring yieldably holding the manipulative engaging means to confine the collapsing spring but yielding under extra exertion upon the manipulative engaging means.

13. In a creeper, gripping mechanism comprising a gripping spring whereby the mechanism automatically grips and resists backward motion, but automatically yields and partakes of forward motion, manipulative engaging means carried with the gripping mechanism, a collapsing spring capable of overpowering the gripping spring, operative connection from the manipulative engaging means to the collapsing spring whereby the collapsing spring is confined, a safety spring yieldably holding the manipulative engaging means to confine the collapsing spring but yielding under extra

exertion upon the manipulative engaging means, and means for adjusting the resistance of said safety spring.

14. In a creeper, a forward gripping mechanism, a rearward gripping mechanism, each of said mechanisms automatically gripping and resisting backward movement but automatically yielding and partaking of forward movement, manipulative engaging means carried with the rearward mechanism, manipulative means connected to the forward mechanism and engaging with the manipulative engaging means whereby the forward mechanism may be moved forward relative to the rearward mechanism, a motor spring compressed during this forward movement and afterward expanding to move the rearward mechanism forward relative to the forward mechanism, collapsing means for each mechanism, and a safety spring to each mechanism normally holding the collapsing means inoperative but yielding and allowing the collapsing means to operate under extra exertion upon the manipulative means.

15. In a creeper, a forward gripping mechanism, a rearward gripping mechanism, each of said mechanisms automatically gripping and resisting backward movement but automatically yielding and partaking of forward movement, manipulative engaging means carried with the rearward mechanism, manipulative means connected to the forward mechanism and engaging with the manipulative engaging means whereby the forward mechanism may be moved forward relative to the rearward mechanism, a motor spring compressed during this forward movement and afterward expanding to move the rearward mechanism forward relative to the forward mechanism, collapsing means for each mechanism, the manipulative engaging means of the rearward mechanism being movable relative to said rearward mechanism, operative connection from this movable manipulative engaging means to the collapsing means to confine the collapsing means, a safety spring carried with the rearward mechanism normally holding the manipulative engaging means to confine the collapsing means, but yielding either upon the forward gripping means being obstructed or upon complete compression of the motor spring by extreme advance of the forward gripping means, a safety spring carried with the forward gripping means, means carried with the forward gripping means for operatively engaging with the motor spring, this means being movable and normally held toward the motor spring by the safety spring of this forward gripping mechanism, operative connection from this operative engaging means to the collapsing means of the forward gripping mechanism, this safety spring of this mechanism yielding whereby the collapsing means of the mechanism is released upon the complete compression of said motor spring, either by extreme advance of the forward mechanism or extreme retraction of the rearward mechanism.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."