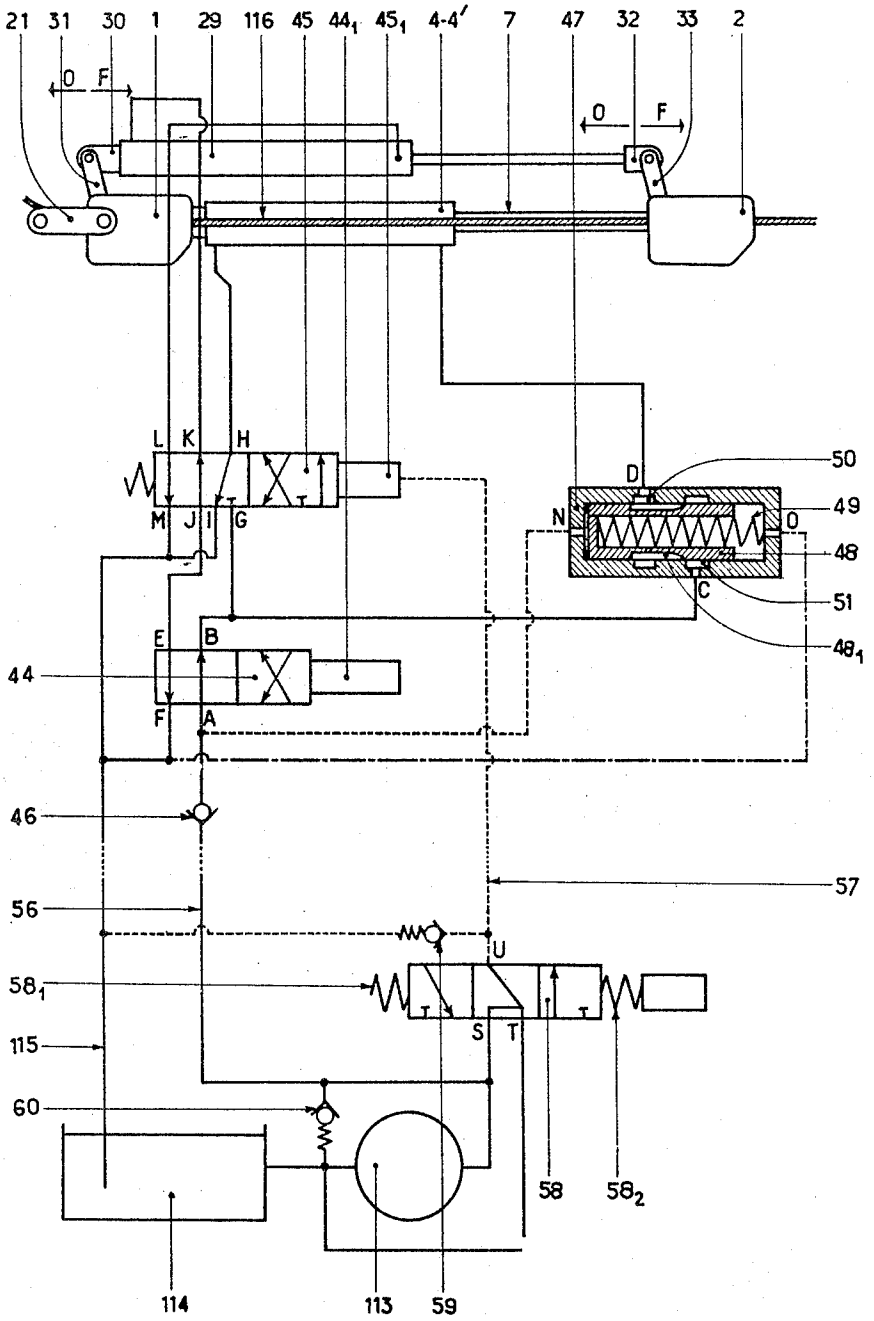
Aug. 16, 1966 P. E. H. CATU 3,266,776

HYDRAULIC WINCH WITH SELF-CLAMPING JAWS

Filed Aug. 10, 1964 8 Sheets-Sheet 1

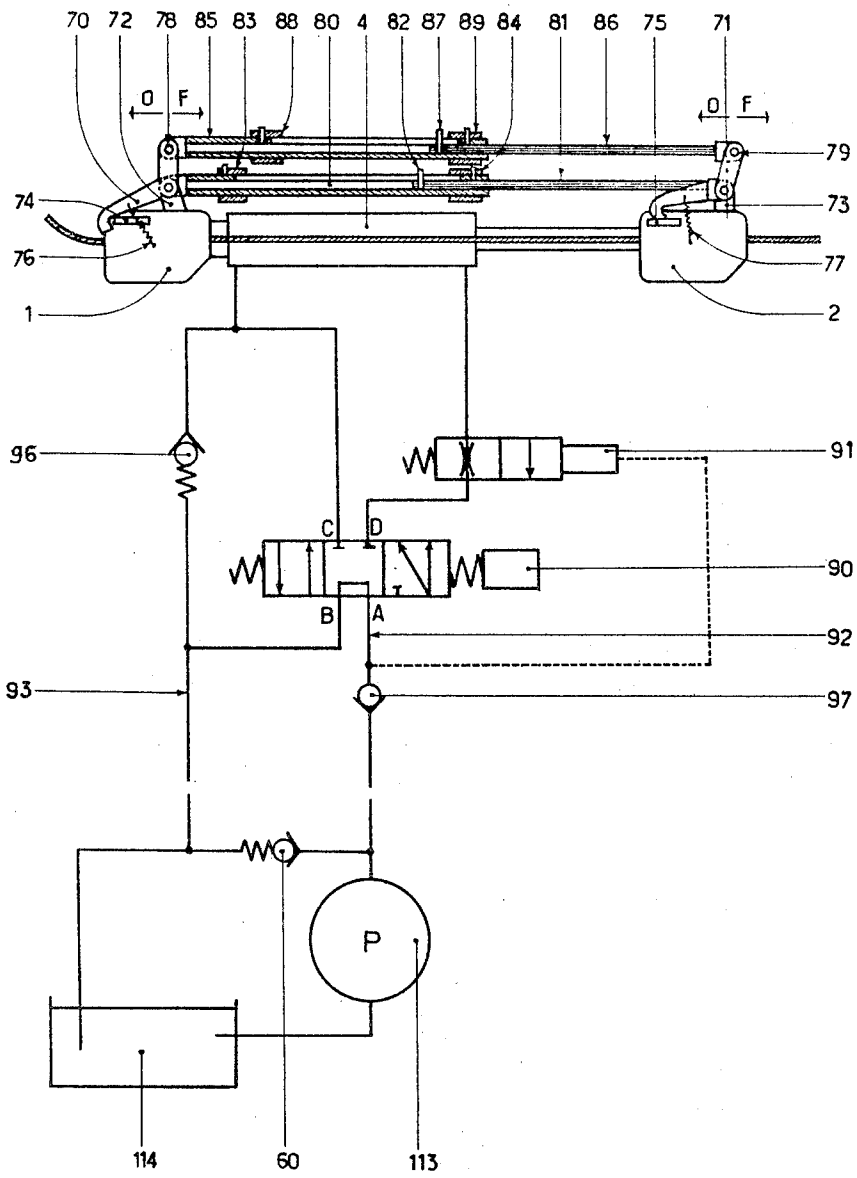
Fig. 1



HYDRAULIC WINCH WITH SELF-CLAMPING JAWS

Filed Aug. 10, 1964 8 Sheets-Sheet 2

Fig. 2



Aug. 16, 1966 P. E. H. CATU 3,266,776

HYDRAULIC WINCH WITH SELF-CLAMPING JAWS

Filed Aug. 10, 1964 8 Sheets-Sheet 3

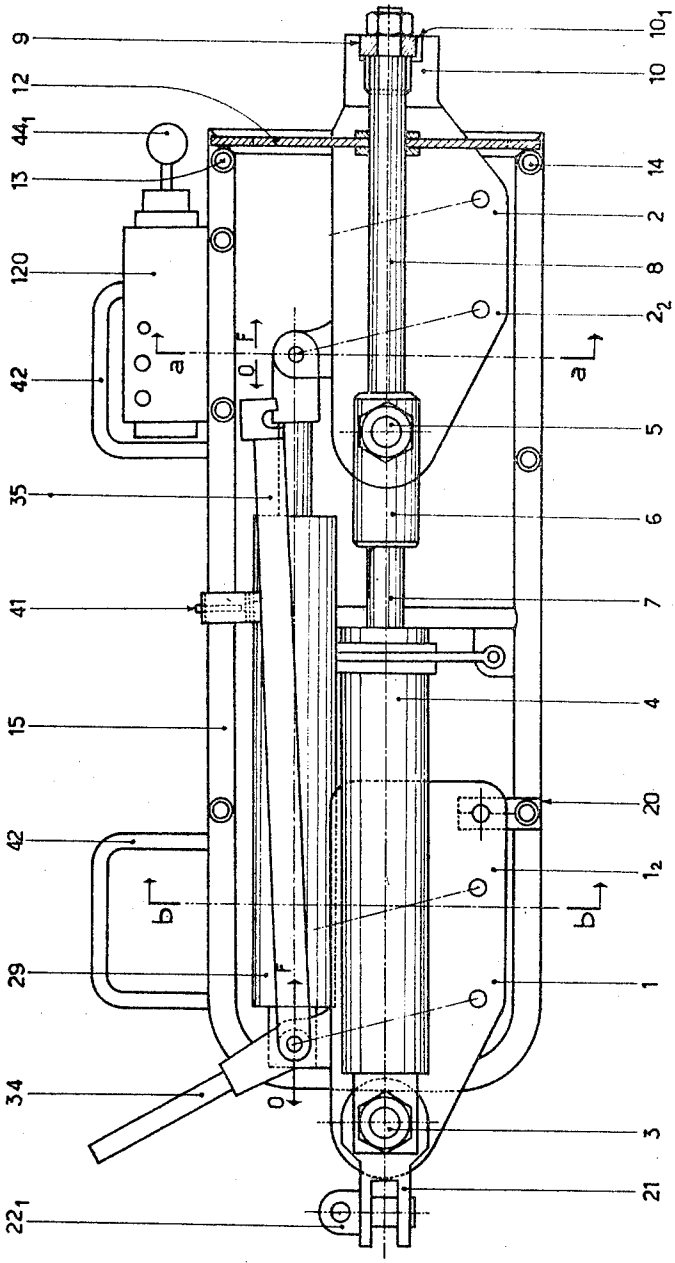
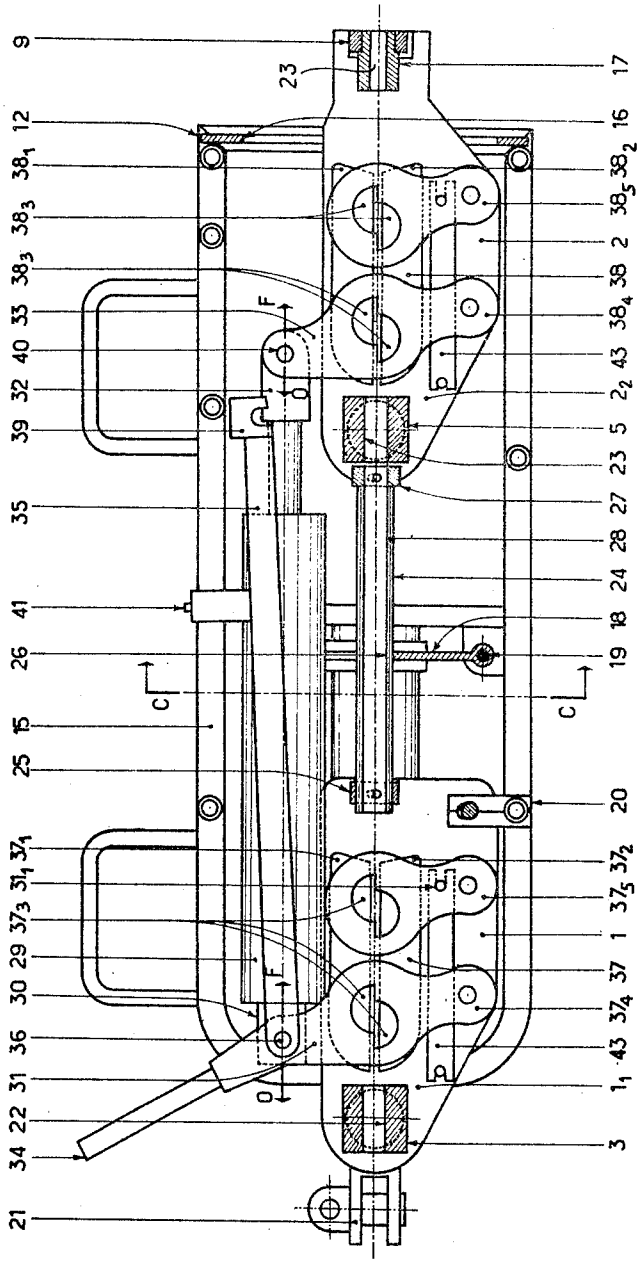


Fig. 3

HYDRAULIC WINCH WITH SELF-CLAMPING JAWS

Filed Aug. 10, 1964 8 Sheets-Sheet 4

Fig.4



HYDRAULIC WINCH WITH SELF-CLAMPING JAWS

Filed Aug. 10, 1964 8 Sheets-Sheet 5

Fig.5

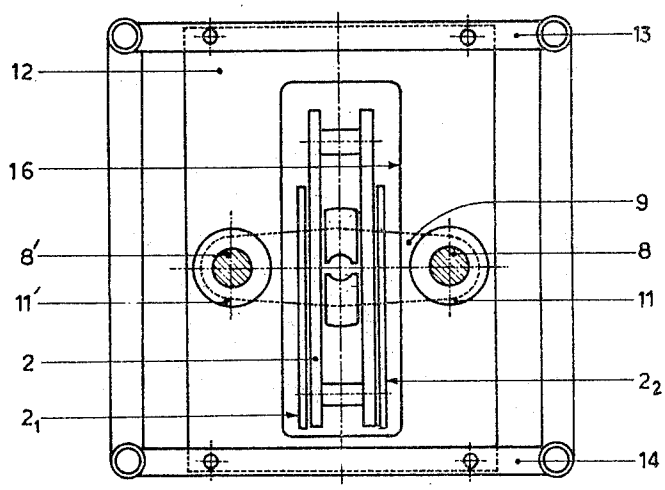
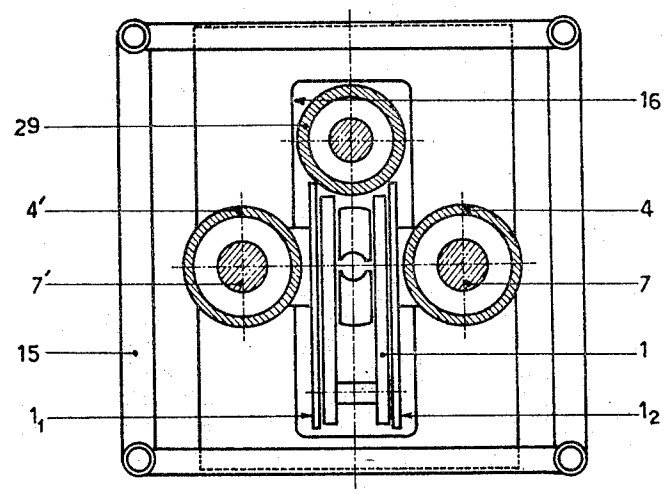


Fig.6



HYDRAULIC WINCH WITH SELF-CLAMPING JAWS

Filed Aug. 10, 1964 8 Sheets-Sheet 6

Fig.7

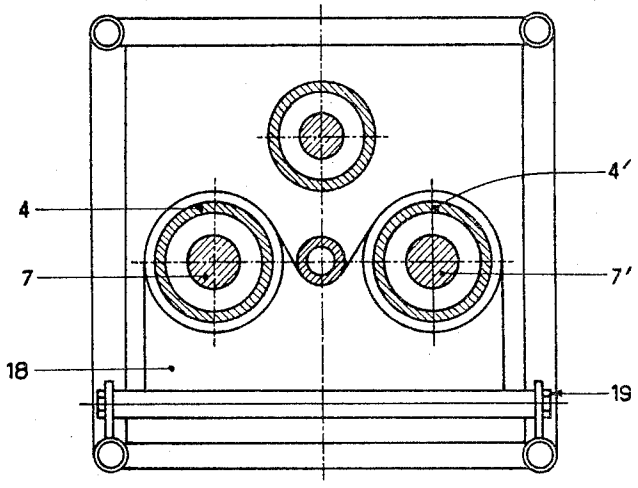
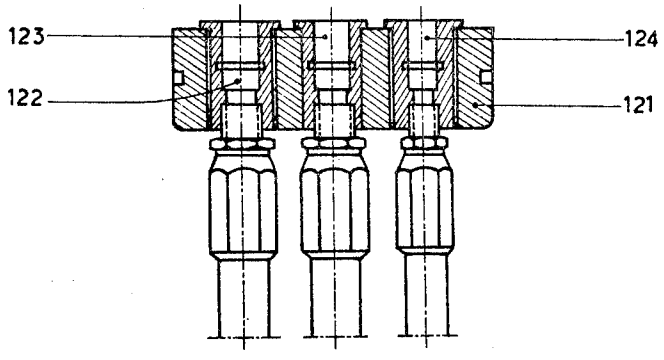


Fig.8



HYDRAULIC WINCH WITH SELF-CLAMPING JAWS

Filed Aug. 10, 1964 8 Sheets-Sheet 7

Fig.9

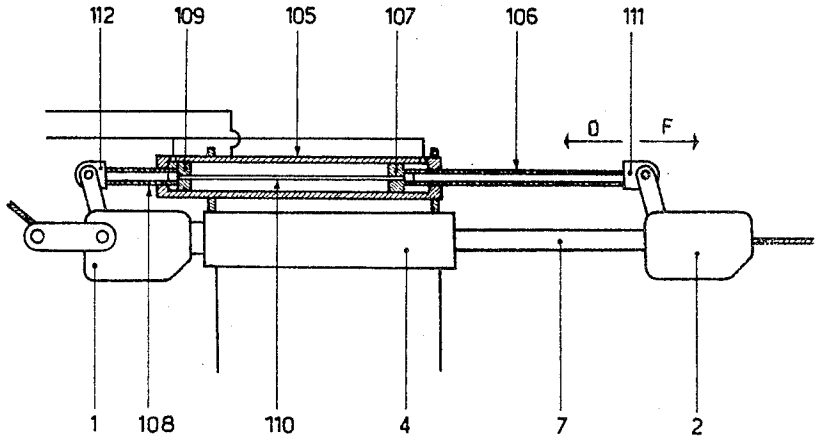
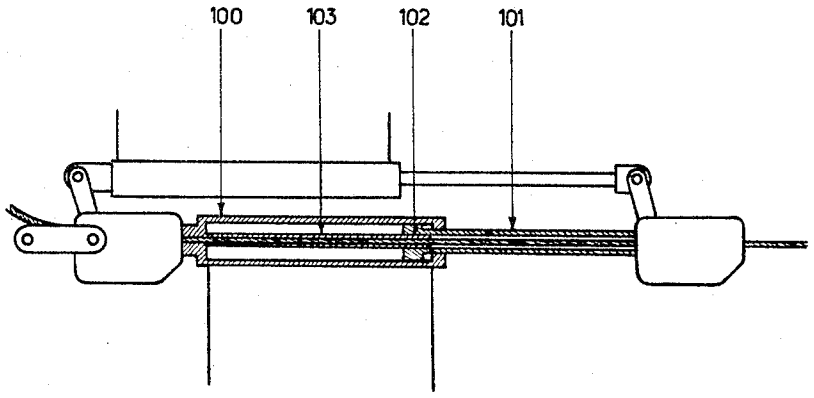


Fig.10



HYDRAULIC WINCH WITH SELF-CLAMPING JAWS

Filed Aug. 10, 1964 8 Sheets-Sheet 8

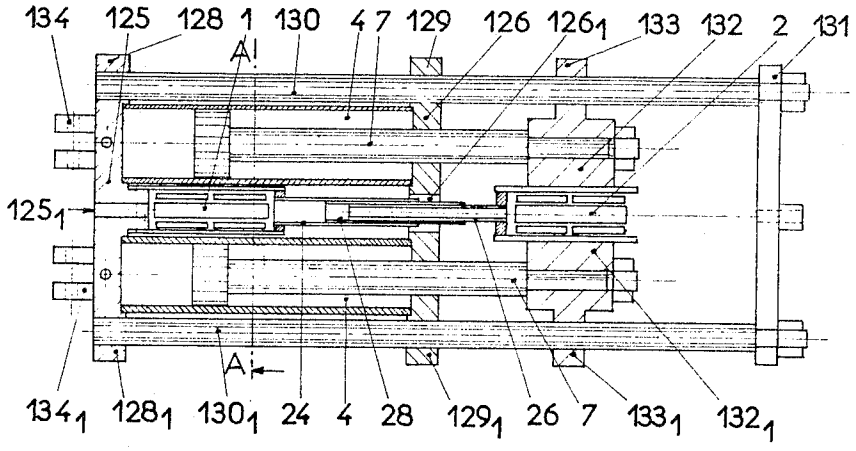


Fig 11

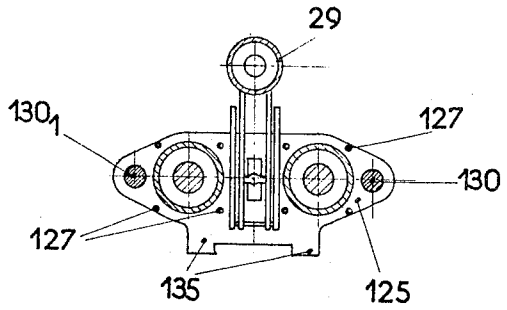


Fig 12

United States Patent Office 3,266,776 Patented August 16, 1966

3,266,776

HYDRAULIC WINCH WITH SELF-CLAMPING JAWS

Pierre Ernest Henri Catu, Nogent-sur-Seine, France, assignor to Office Central de Gestion et de Controle O.G.E.C., Paris, France, a society of France

Filed Aug. 10, 1964, Ser. No. 388,613
Claims priority, application France, Feb. 4, 1964 962,649, Patent 1,394,809
16 Claims. (Cl. 254—135)

One of the main objects of the invention is to produce a strong infallibly working winch for hauling or hoisting considerable loads rapidly.

Another object of the invention is to ensure the simultaneous opening of parallel grips and clamping jaws.

Other objects and advantages will be revealed by the following description, the claims connected therewith and the attached drawings, in which:

FIGURE 1 shows diagrammatically a winch with self-clamping jaws with its hydraulic circuit.

FIGURE 2 shows another method of embodiment of the winch, the control for opening and closing the jaws being obtained by a rod system.

FIGURE 3 shows another method of embodiment of the winch of FIGURE 1, the front face of the casing being removed.

FIGURE 4 is another view of the winch of FIGURE 3, the front cheeks of the jaws being removed.

FIGURE 5 is a section along *a—a* of FIGURE 3.

FIGURE 6 is a section along *b—b* of FIGURE 3.

FIGURE 7 is a section along C—C of FIG. 4.

FIGURE 8 shows a connection forming the hydraulic connections between the supply tanks of the winch.

FIGURE 9 shows another method of embodiment of the control device for opening and closing the jaws.

FIGURE 10 shows another method of embodiment of the driving device of the jaws.

FIGURE 11 shows another method of embodiment of the device according to the invention.

FIGURE 12 is a section along A—A of FIGURE 11.

The self-clamping jaws which are known can be produced in various ways. In the embodiment example shows in the attached figures (see FIG. 3 and FIG. 4), the jaws 1 and 2 consist of two cheeks 1_1, 1_2 and 2_1, 2_2 enclosing the jaws, effecting clamping on the cable for hauling any kind of load.

In the embodiment example shown in FIGURE 4, the clamps 37 and 38 each consist of two bars 37_1, 37_2, 38_1, 38_2, provided with semi-cylindrical bearings 37_3 and 38_3 able to pivot in openings made in pivoting connecting-rods 37_4, 37_5 and 38_4, 38_5.

In the embodiment method shown in FIGURES 1–4–5–6–7, the hydraulic winch according to the invention thus comprises two self-clamping jaws 1 and 2 placed one behind the other, the first being articulated on a strut 3 rigidly connecting the end straps, bottom side or left-hand end, of two identical hydraulic jacks 4 and 4', coupled up in parallel, the second jaw one being articulated on a strut 5, rigidly connecting the end straps 6 and 6' of the rods 7 and 7' of the jacks 4 and 4'.

The straps 6 and 6' extend by guiding rods 8 and 8' projecting beyond the right end of the jaws 2, and accommodating, outside the frame of the appliance, a strut 9 rigidly connecting these rods and acting as an abutment for the extension 10 of the external cheeks of the jaw 2. The guiding rods 8 slide in a plate 12 attached to the right end of the frame 15 holding the winch mechanism. The plate 12 has an opening 16 afford-free passage for the jaw 2 in its to and fro movement. The strut 9 has a tubular guide 17 at its center acting as guide for the cable at the entrance to the appliance. The jacks 4 and 4' are moreover maintained by a plate 18 mounted at 19. Also, a small bar 20 is provided for limiting clearance of the fixed jaw 1. Two straps 21 with spindle 22 articulated on the strut 3, act for securing the winch to a fixed point. The struts 3 and 5 are drilled in the middle with holes 22 and 23, enabling the free passage of the cable passing through the jaws.

The guiding of the cable in the part situated between the two jaws is effected by means of three coaxial tubes, sliding one in the other, the external tube 24 being integral with an end strap 25 connected between the two cheeks of the fixed jaw 1, the internal tube 26 being integral with a strap 27 connected between the two cheeks of the movable jaw 2, the middle tube 28 being loosely mounted between the other two, the relative displacement of the three tubes being governed by a double system of slots in which two spurs slide.

An auxiliary jack 29 is placed above the two jaws, the end strap 30 on the left end of this jack being articulated on the extension of one of the pairs of clamping links 31 of the fixed jaw 1, whereas the end strap 32 of the rod of this jack is articulated on the extension of one of the pairs of clamping links 33 of the movable jaw 2. The device comprises a lever 34 connected with the pair of links 31, and a pair of rods 35 articulated on the extension of the spindle 36 of the bottom or left end of the jack 29, enabling the simultaneous opening of the parallel clamps 37 of the 38 and two jaws 1 and 2.

To this end, the rods 35 have, at their right end, a common strap 39 which can engage on the ends of the articulation spindle 40 of the strap 32, when the rods of the jacks 4 and 4' are completely retracted. In its free state, the rod system 35 is held in a high position by means of a spring thrust rod 41, placed between the two rods. The self-clamping jaws 1 and 2 each comprise a spring, in a guide tube 43, acting permanently on the clamping links of the clamps 37 and 38 and holding the clamps 37 and 38 in their maximum clamping position, when the links 31 and 33 are not impelled by any external stress directed towards the left. The springs are compressed between studs 31_1 projecting from connecting rods 37_5 and 38_5 and studs projecting from the cheeks of the jaws, thereby urging bars 37_1, 37_2, 38_1 and 38_2 toward the right.

The fluid supply of the two haulage jacks 4 and 4' and the auxiliary jack 29 for releasing the jaws is effected by means of a control unit 120 (FIG. 3) fixed on the winch and comprising two distribution valves with two positions (FIGURE 1); the one 44 with two positions and four ways and with hand control at 44_1 in both directions, the other 45 with two positions and seven ways and hydraulic piloting at 45_1 with recoil spring. The entry A of the valve 44 is connected with the exit of a non-return valve 46 placed on the high-pressure supply piping, between this valve and the pump 113 outlet of a power-driven pump unit. This unit also comprises an oil tank 114 receiving the piping of the fluid recovery 115. This unit is connected to the winch by flexible pipes and a three-pipe 122, 123 and 124 intake 121 (see FIGURE 8) enabling the simultaneous branching of all the supply piping on the control unit 120. The outlet B of the valve 44 is connected, in the first place to the inlet of a hydraulic braking device 47, and in the second place, to the first inlet G of the seven-way valve 45.

The hydraulic braking device 47 comprising a slide-valve 48, is mounted in series between the rod side inlet of the haulage jacks 4 and 4' and the outlet B from the distributor 44. The outlet F of the valve 44 is connected to the pipe 115 of the fluid return, while its outlet E is connected to the second inlet J of the valve 45. The two outlets I and M of the seven-way valve 45 are connected

to the fluid return pipe 115, while the outlet H is connected to the inlet of the chambers on the bottom side of the two main jacks 4 and 4', and the outlet K is connected to the inlet, bottom side, of the auxiliary jack 29 and the outlet L is connected to the inlet, rod side, of the same auxiliary jack 29.

In one of the two possible positions of the valve 44, its inlet A communicates with its outlet B, while its opening E communicates with its opening F. For the second position of the slide-valve of this valve, its inlet A communicates with its outlet E while its opening B communicates with its opening F.

For one of the two positions of the valve 45, that for which the component 45_1 is not fed by the piloting circuit 57, the hydraulic connections effected in this valve are as follows:

Opening L with opening M
Opening K with opening J
Opening H with opening I
Inlet G isolated

For the second position of this valve 45, that for which the piloting component 45_1 is fed, the hydraulic connections effected in this valve are as follows:

Inlet G with outlet H
Inlet J with outlet L
Opening K with opening M
Opening I isolated

The hydraulic braking device 47 whose inlet D is connected to the rod side inlet of the haulage jacks 4 and 4' and whose exit is connected to the outlet B of the distributor, comprises a body 47 in which a slide-valve 48 can slide, held against the left end of the body 47 by a calibrated compression spring 49. The body 47 has an internal annular groove 50 communicating with the opening D and a second annular groove 51 communicating with the opening C. The slide-valve 48 has externally, isolated by its two ends, an annular distribution and braking groove 48_1 hydraulically isolating the grooves 50 and 51 when the slide-valve 48 is brought to the left by the spring and causing these two grooves to communicate when the slide-valve 48 is thrust to the right by the pressure of the piloting fluid. To this end, a hydraulic piloting opening N is made in the left end of the body 47 and connected to the inlet A of the distributor 44. A leakage draining opening O, made in the other end of the body is connected to the return pipe 115 leading to the tank 114.

The high-pressure pipe 56, the fluid return pipe 115, and the piloting circuit pipe 57 of the distributor 45 are connected by means of three flexes to the power-driven pump unit 113 and the supply tank 114. The power-driven pump unit comprises a three-way distribution valve 58, three position and hand control in both directions, with return to central position by springs 58_1 and 58_2. The inlet S of this distributor is directly connected to the outlet of the pump, its outlet T is directly connected to the tank and its outlet U is connected to the flex 57 of the piloting circuit. A pressure restricting valve 59 is mounted between the outlet U of the distributor and the tank 114, for limiting the pressure in the piloting circuit 57. A second pressure restricting valve 60 is mounted between the inlet and outlet of the pump 113, so as to limit the service pressure in the high-pressure circuit 56. In central position, the distributor 58 puts the outlet of the pump and piloting circuit 57 into communication with the tank; in one of its end positions, its inlet S communicates with its outlet U; in the other end position, the opening U communicates with the outlet T, the pump being isolated. The high-pressure circuit 56 is directly connected to the outlet of the pump while the return circuit 115 is directly connected to the tank.

The device thus described operates as follows: it must first of all be noticed that the advancing direction of the cable holding the load is directed to left from right while the haulage jacks provide a drive, whereas it is directed from left to right when the load is the drive and the jacks provide a braking effect.

In the diagrammatical representation of FIGURE 1, the reversing of the displacement direction of the rods of the main jacks 4 and 4' and the auxiliary jack 29 is set up by the hydraulic control of the distributor 45 independently of the position of the distributor 44. In the position shown in FIGURE 1, the chamber, rod side, of the jacks 4 and 4' is constantly supplied by the high-pressure circuit 56 through the braking device 47 whatever the position of the distributor 45. On the other hand, the chamber, left-hand end, or these two jacks is connected by the distributor 45, sometimes to the return circuit 115 (HI connection) at others to the high pressure 56 (GH connection). When only the rod side of the jacks 4 and 4' is supplied, the rods 7 retract into the body of the jacks. When both sides of these jacks are supplied, the rods 7 emerge from the jack bodies, by differential thrusts. During the haulage operation, the two ends of the auxiliary jack 29 are connected to the return circuit 115. For this position of the distributor 44, the rod of the auxiliary jack 29 slides freely in both directions, sucking in on the one side and discharging on the other, the fluid contained in the return pipe 115.

When the rod 7 returns into the jack 4 (case shown), the cable 116 engages in the self-clamping jaws 2 and 1 and is conveyed to the left by the jaw 2, whereas it slides inside the fixed jaw 1. When the hand action applied to the distributor and directed to the right is eliminated, this for any position of the rod 7, the pump delivers into the tank, the rod 7 comes to a stop as well as the cable which is held both by the jaws 1 and 2. When the valve is operated to the left, the piloting circuit 57 is put under pressure at the same time as the high-pressure circuit 56; the slide-valve 45 of the distributor is hydraulically piloted to the right while compressing the spring and the two ends of the jacks 4 and 4' are supplied at the same pressure, the connection GH being established. The rods 7 then move to the right taking the jaw 2 along which slides on the cable, held by the fixed jaw 1. For any position of the rods 7, movement stops as soon as hand action on the distributor 58 ceases, the pump again delivering into the tank. The succession of the movements is thus: advance of the cable at regular speed from right to left, stoppage of the cable, then rapid return movement of the rod 7.

In the case where the load is propulsive, it is necessary to check the cable in braking it in its withdrawing or descending movement, the method of action of the jacks and jaws being modified as follows:

The distributor 44 is maneuvered to the left. The bottom side of the jacks 4 and 4' permanently communicates with the return 115, either by the connection HI, or the connection HGBF; the rod side of the jacks 4 and 4' communicates with the return 115 through the braking device 47 and the connection HF of the distributor 44, the braking of the liquid only showing when the rod 7 emerges from the jack 4. The auxiliary jack 29 is supplied by double action by the high-pressure circuit by the distributor 45. When the piloting circuit 57 is at atmospheric pressure, the bottom side or left end of the jack 29 is fed, whereas the rod side is in the return circuit, the reverse occurring when the piloting circuit 57 is under pressure. The cable being impelled by any kind of stress or load, is first held by the fixed jaw 1 and the movable jaw 2. The rod side of the jack 29 being fed, its rod retracts while exerting a pulling stress on the opening component 33 of the jaw 2, which then slides on the cable held by the jaw 1. As soon as the direction of the stress on the piston of the jack 29 is reversed, the rod exerts a thrust on the component 33 tending to increase the clamping of the clamps of this jaw on the cable, whereas the strap 30 of this jack exerts an equal and opposite pressure on the component

31, tending to cause the opening of the clamps of the jaw 1.

The cable being loaded, when the thrust effect of the jack 29 reaches a certain value, the jaw 1 slightly relaxes, and the whole load is applied to the jaw 2 held by the rods 7 and the fluid in the front of the pistons of the jacks 4 and 4' and whose flow towards the return circuit is braked by its forcible passage into the braking device 47, whose working is as follows:

The jaws 1 and 2 being clamped on the cable, the bottom side of the auxiliary jack 29 is fed with fluid under pressure, whereas the slide-valve 48 of the braking device 47 is thrust to the right under the action of the same fluid penetrating through its opening N, which has the effect of putting the rod side of the jacks 4 and 4' into direct communication with the oil return. Under the action of the pressure, the jaw 1 relaxes more and more, the cable then starts to slide in this jaw and its travel speed increases so long as the delivery of the pump remains greater than the volume of fluid that can be absorbed by the end side of the jack 29 whose rod is driven by the jaw 2. When the speed of the cable reaches a value so that the delivery of the pump is entirely absorbed by the jack 29, the pressure of the supply fluid is then cancelled out in said jack, as well as in the supply circuit 56. The slide-valve 48 of the braking device 47 is then conveyed to the left by the spring isolating one from the other of the openings 50 and 51 and thus braking the fluid emerging from the jack 4, and limiting the outlet speed of the rods 7 and 7', which has the effect of slowing down the movement of the cable until the pressure again increasing in the circuit, slightly opening the passage to the fluid emerging from the jack 4. The phenomenon occurs at shorter time intervals during the descending movement. In this movement, the rod of the auxiliary jack 29 reaches the end of travel before the rod 7 of the jacks 4 and 4', and the movement of the jaw 2 continuing, the body and strap 30 of the auxiliary jack 29 being conveyed to the right, which causes the progressive closing of the fixed jaw 1 on the cable and prevents an abrupt stoppage of said cable when the rod 7 reaches the end of its travel.

In the second method of embodiment (FIGURE 2) of the hydraulic winch according to the invention, the auxiliary jack for releasing the jaws is replaced by a mechanical device, effecting, in the reversing operation, the complete opening of the jaws at the end of travel of the haulage jack or jacks. To this end, the jaws 1 and 2 are respectively provided with curved locking levers 70 and 71, articulated on the end of the control components 72 and 73 for opening the jaws and provided, at their lower ends with locking hooks able to cog on the end of horizontal ramps 74 and 75 integral with the external cheeks of the jaws, cogging being favorized and maintained by the action of spring 76 and 77 hooked on the levers and cheeks. The levers 70 and 71 carry an upper extension over their articulation on the components 72 and 73 and terminate in a second articulation 78 and 79. The lower articulation of the lever 70 accommodates the end of a tubular rod system 80, inside of which a rod 81 slides articulated at one of its ends on to the end of the opening component 73 of the jaw 2 and provided, at its other end, with a removable lug 82, able to slide in a longitudinal slot made in a tube 80. Fixed lugs 83 and 84 are arranged towards the ends of the tube 80 so as to come into contact with the removable lug 82, before the rod of the jack 4 reaches the end of travel in one direction or the other. The upper articulation 78 of the lever 70 accommodates a tubular rod system 85 identical to the rod 80 and in which a rod 86 slides articulated on the end spindle 79 of the lever 71 of the jaw 2. This rod 86 also carries a removable lug 87 able to slide in a longitudinal slot of the tube 85; fixed lugs 88 and 89 are arranged towards the ends of the tube 85, so that their distance apart is less than the distance between the lugs 83 and 84. The device described works as follows:

When the jacks 4 and 4' produce positive driving work, the lugs 82 and 87 are disengaged from the ends of the rods 81 and 86; thus, these rods can freely slide in their respective tubes without coming into contact, at the end of travel, with the fixed lugs 83, 84 and 88, 89 and without causing the jaws to open. When the jacks 4 and 4' provide a negative braking work of the load, the removable lugs 82 and 87 are restored to position on the ends of the rods 81 and 86.

In the position shown, the fixed jaw 1 is locked in the open position, whereas the movable jaw 2, clamped on the cable and carried along by it, is on the point of reaching the end of travel to the right. The movement continues to the right, the lug 87 comes into contact with the stop 89 which carries the tube 85 along which rocks the lever 70 to the right, thus causing the fixed jaw 1 to close on the cable. The cable being brought to a stop, the rod of the jack continues to emerge under the action of the supply fluid acting on the left isde of the piston, the lug 82 then comes into contact with the stop 84, causing the component 73 to rock to the left and locking the lever 71 on the ramp 75. The jaw having reached the end of travel, the movement is reversed, the jaw 2 returns towards the left while sliding on the cable. Before reaching the end of travel, the lug 87 comes into contact with the stop 88, which causes the lever 77 to rock to the right and closes the jaw 2 on the cable; the movement continues, the cable is carried to the left by the jaw 2, then, the lug 82 comes into contact with the stop 83 which carries the tube 80 along which makes the component 72 rock until the lever 70 locks on the ramp 74. Then the movement is reversed, and the cycle recommences.

The hydraulic control circuit of the haulage jack or jacks comprises a four-way and three-position distribution valve 90 hand-controlled in both directions, with automatic return to the center by a spring and a hydraulic braking device 91 identical to the device 47 of FIGURE 1 previously described, this device being mounted in series on the supply circuit of the jacks 4 and 4', rod side, between these jacks and the corresponding outlet D of the valve 90. The pilotage circuit of the braking device 91 is connected to the inlet A of the distributor 90. In neutral position, the valve 90 puts the outlet of the pump into direct communication with the tank, whereas the outlet C connected to the inlet of the jack, end side, is isolated as well as the second outlet D indirectly connected to the inlet of the jack, rod side. In one of its end positions, the inlet A of the valve 90 communicates with its outlet D, while the opening C communicates with the outlet B connected to the return circuit 93. In the other end position of the valve 90, the inlet A communicates with the two outlets C and D, while the opening B is isolated. In this latter case, the jack 4 operates as a differential jack, its piston being fed on both sides at once, the movement of the rod occurring towards the right. A pressure limitation valve 96 is mounted between the inlet to the jack, bottom side, and the return circuit 93, this valve being regulated for opening at a slightly higher pressure than the maximum pressure required for setting up this displacement of the rod of the jack to the right. Lastly, the non-return valve 97 is placed on the high pressure supply circuit 92. The inlet of the valve 97 and return circuit 93 are connected to the power-driven pump unit, by means of two flexible pipes.

The working of the hydraulic circuit described is as follows:

When the jack 4 operates as a driving unit, the manoeuvering of the valve 90 to the right puts the rod side of the jack under pressure through the braking valve 91, while the bottom side is connected to the tank. The cable is pulled. The manoeuvering of the valve 90, in the opposite direction, puts both sides of the jack under pressure, the rod emerges in a rapid return, while the cable is held by the jaw 1 and the fluid at the right end of the

jack passes to the left end, while traversing the valve **91** without braking and the valve **90**. The valve **91** is kept open in both displacement directions of the rod of the jack by the pressure of the supply circuit.

When the load effects the drive, the jack **4** must provide braking. The manoeuver also takes place by actuating the distribution valve **90**, the valve **91** remaining open under the action of the pressure when the rod of the jack returns and only remaining open under the action of the pressure when the rod emerges, as long as the delivery of the pump exceeds the volume of fluid that can be absorbed by the bottom side of the jack when its rod is impelled by the jaw **2**.

In another embodiment method (FIGURE 10) according to the invention, the two jaws are arranged at the two ends of a hydraulic jack **100** with a hollow rod **101**, in which a tubular liner **103** slides with a tight fit, integral with the end of the jack and approximately the same length as the body **100**, said liner never disengaging from the coaxial bore of the rod. The cable introduced into the movable jaw, then traverses the rod **101** then the liner **103** finally emerging at the end of the body **100** and then engaging in the fixed jaw integral with that body. The control device for opening the jaws is formed either by an auxiliary hydraulic jack as in the first embodiment method described (FIGURES 1–3–4) or by a mechanical device similar to that of the second embodiment method described (FIGURE 2).

In a fourth embodiment method according to the invention (FIGURE 9), the auxiliary jack for releasing the jaws comprises a body **105** axially at rest in relation to the haulage jacks and two hollow rods, the one **106** provided with a piston **107** and sliding through the right end of the body **105**, the other **108** provided with a piston **109** and sliding through the left end of said body. The rod **106** articulates on the end of the device for opening the movable jaw **2**, whereas the rod **108** articulates on the end of the device of the fixed jaw **1**. A rod **110** can freely slide inside the two rods while limiting the maximum distance between the pistons **107** and **109** to a degree less than the total stroke of the rod **106**. The stroke of the chief rod **106** is equal to the total stroke of the rod **7** of the jacks **4** and **4'**. The stroke of the rod **108** is such that it can ensure the total opening and closing of the fixed jaw **1**. The body **105** carries three supply openings, two being situated at the two ends of said body connected to each other, and a third emerging in the body between the two pistons **107** and **109** and so arranged that they are never closed by either of the two pistons. Moreover, the hydraulic circuit is identical to that of FIG. 1. When the appliance acts as a brake for the load the auxiliary jack **105** being fed between its two pistons, the rod system **110** makes the two rods integral with each other before the end of travel and effects the progressive closing of the fixed jaw on the cable before the rod **7** of the jacks **4'**, **4** reaches the end of travel, thus avoiding an abrupt stopping of the cable.

On the other hand, by feeding the jack **105** at its ends, the two pistons are brought together as well as the mobile jaw **2** and fixed jaw **1**, the jaw **2** sliding on the cable.

In another embodiment method according to the invention (see FIGURES 11 and 12), the juxtaposed cylinders of the two main jacks **4** and **4'** have a common closing plate **125** at their left end, and at their right end, rod side, a common closing plate **126**, the two plates in question being secured on the ends of the two cylinders **4** and **4'** by threaded rods **127**. The end plate **125** carries a central hole 125_1 for the passage of the cable, whereas the end plate **126** comprises a central hole 126_1 for the passage of the guiding device **24**, **26**, **28** of the cable between the two jaws **1**, **2**. These two plates also carry lateral lugs **128**, 128_1, **129**, 129_1 which rigidly hold two cylindrical fixed guiding rods **130** and 130_1, said guiding rods being placed parallel to the rods **7**, **7'** of the bodies of the two main jacks, for accommodating a common assembly plate **131** at their end. The rods of the two main jacks as well as the movable jaw **2** can move in the space comprised between the connection plate **131** and the plate **126**.

The movable jaw carries lateral bosses **132** and 132_1 accommodating the ends of the rods of the two main jacks and lateral lugs **133** and 133_1 slide on the fixed guiding rods **130** and 130_1. The fixed jaw is held by the end plate **125** which also carries the two straps **134** and 134_1 for securing the appliance. Bearing lugs **135** belonging to assembly plates **125** and **131**, enable the appliance to be placed on the ground. Moreover, the device is identical with that described in the preceding embodiment methods.

Provision is also made for arranging the fixed guiding rods of the movable jaw so that the rods **130** and 130_1 (FIGURE 11) in each of the various execution methods, have a single main jack, of the device previously described; the two fixed guiding rods then being arranged laterally, on either side of the body of said jack and accommodating at their free end, rod side of the jack, a common connection plate forming a bearing point with the ground and ensuring the guiding of the cable; the guiding rods in question being integral with the ends of said jack whose bottoms carry lateral lugs for this purpose.

Of course, the invention is not restricted to the embodiment examples described and shown above, from which other alternatives can be provided without going outside of the scope of the invention for that purpose.

In particular, in the embodiment methods described, the control of the distributors of the winch is obtained from hand controls; it would obviously be possible, if so desired, to have a still more automatic working, by replacing certain of the hand control distributors by distributors controlled by the end of travel.

In this case, the distributors would be controlled by the jacks or their rods when they reached the end of movement in order to automatically effect the reverse movement.

What I claim is:

1. Hydraulic winch comprising a fixed self-clamping jaw, a movable self-clamping jaw, means for moving said movable jaw toward and away from the fixed jaw, said means being formed by at least one hydraulic jack having a cylinder and a piston rod projecting therefrom, said cylinder being connected to one of said jaws and said rod being connected to the other jaw, and means for opening and closing the jaws alternately, said opening and closing means being formed by a rod system connecting the jaws, and means in said rod system for mechanically operating the jaws just before the end of travel of said jack.

2. Hydraulic winch comprising a fixed self-clamping jaw, a movable self-clamping jaw, means for moving said movable jaw toward and away for the fixed jaw, said means being formed by a pair of hydraulic jacks on opposite sides of the jaws, each jack having a cylinder connected to the fixed jaw and a piston rod projecting from the cylinder and connected to the movable jaw, means for opening and closing the jaws alternately, guide rods connected to the outer ends of said piston rods in alignment therewith, and a plate rigidly mounted on the end of the winch adjacent the movable jaw, said plate being provided with openings in which said guide rods slide.

3. Hydraulic winch according to claim **2**, in which said guide rods are connected by a strut provided with central opening for passage of a cable to said jaws.

4. Hydraulic winch according to claim **3**, including an assembly of telescoping tubes disposed between the two jaws in line with said strut opening for guiding a cable from one jaw to the other, and means for connecting one of said tubes with one jaw and connecting another of the tubes with the other jaw.

5. Hydraulic winch according to claim 4, including a rod pivoted at one end on the opening means for one jaw and adapted to be engaged at its opposite end with the opening means for the other jaw, whereby to permit the simultaneous opening of both jaws for insertion of a cable therein or its disengagement.

6. Hydraulic winch comprising a fixed self-clamping jaw, a movable self-clamping jaw, means for moving said movable jaw toward and away from the fixed jaw, said means being formed by at least one principal jack having a cylinder and a piston rod projecting therefrom, said cylinder being connected to one of said jaws and said rod being connected to the other jaw, and means for opening and closing the jaws alternately, said opening and closing means including an auxiliary jack having a cylinder for opening and closing one of the jaws and a piston rod projecting from that cylinder for opening and closing the other jaw, a remote control device for the jacks comprising a three-position and manually-controlled fluid distributor mounted on a pump, and a two-position distributor remotely controlled hydraulically by the first-mentioned distributor, the second distributor being mounted on the winch to ensure the differential working of the principal jack and the double-action working of the auxiliary jack.

7. Hydraulic winch comprising a fixed self-clamping jaw, a movable self-clamping jaw, means for moving said movable jaw toward and away from the fixed jaw, said means being formed by at least one principal jack having a cylinder and a piston rod projecting therefrom, said cylinder being connected to one of said jaws and said rod being connected to the other jaw, and means for opening and closing the jaws alternately, said opening and closing means including an auxiliary jack having a cylinder for opening and closing one of the jaws and a piston rod projecting from that cylinder for opening and closing the other jaw, fluid means for supplying high pressure fluid to the jacks, and a manually controlled distributor on the winch for obtaining a reverse action thereof by directing high pressure fluid to the auxiliary jack and by suppressing supply of high pressure fluid to the principal jack.

8. Hydraulic winch comprising a fixed self-clamping jaw, a movable self-clamping jaw, means for moving said movable jaw toward and away from the fixed jaw, said means being formed by at least one hydraulic jack having a cylinder and a piston rod projecting therefrom, said cylinder being connected to one of said jaws and said rod being connected to the other jaw, means for opening and closing the jaws alternately, and a hydraulic braking device mounted on the winch for limiting the speed of a cable in case a load is pulling on the cable, such as in the case of a descending load.

9. Hydraulic winch comprising a fixed self-clamping jaw, a movable self-clamping jaw, means for moving said movable jaw toward and away from the fixed jaw, said means being formed by at least one principal jack having a cylinder and a piston rod projecting therefrom, said cylinder being connected to one of said jaws and said rod being connected to the other jaw, and means for opening and closing the jaws alternately, said opening and closing means including an auxiliary jack having a cylinder for opening and closing one of the jaws and a piston rod projecting from that cylinder for opening and closing the other jaw, fluid means for supplying high pressure fluid to the jacks, a manually controlled distributor on the winch for obtaining a reverse action thereof by directing high pressure fluid to the auxiliary jack and by suppressing supply of high pressure fluid to the principal jack, a hydraulic braking device mounted on the winch for limiting the speed of a cable when a load is pulling on it, said braking device comprising a slide-valve distributor mounted in series between said reverse action distributor and the rod end of the principal jack, and said braking device opening under the pressure of the supply circuit and closing under the action of a recoil spring when the fluid pressure is canceled out in the auxiliary jack.

10. Hydraulic winch according to claim 9, in which the stroke of the auxiliary jack is such that the movable jaw ensures, before reaching the end of its travel, closing of the fixed jaw by means of the auxiliary jack.

11. Hydraulic winch comprising a fixed self-clamping jaw, a movable self-clamping jaw, means for moving said movable jaw toward and away from the fixed jaw, said means being formed by a hydraulic jack having a cylinder and a piston rod projecting therefrom, said cylinder being connected to one of said jaws and said rod being connected to the other jaw, and means for opening and closing the jaws alternately, said jack rod being hollow and sliding on a central tubular element rigidly mounted in said cylinder and said rod and tubular element being adapted to receive a traction cable extending through them and out of the cylinder.

12. Hydraulic winch comprising a fixed self-clamping jaw, a movable self-clamping jaw, means for moving said movable jaw toward and away from the fixed jaw, said means being formed by at least one hydraulic jack having a cylinder and a piston rod projecting therefrom, said cylinder being connected to one of said jaws and said rod being connected to the other jaw, and means for opening and closing the jaws alternately, said opening and closing means comprising two telescoping rod assemblies arranged one below the other, levers pivoted on the opening and closing components of the jaws, said levers being pivoted to the ends of the two telescoping rod assemblies, hooks on the levers, and lateral projections on the jaws for receiving the hooks and ensuring locking of the jaws in open position.

13. Hydraulic winch according to claim 12, including removable stops mounted on the sliding parts of the telescoping rod assemblies to ensure working of the winch in reverse action, and to ensure working of the winch in the oposite direction when said stops are removed.

14. Hydraulic winch according to claim 13, in which the stops are so positioned that the upper rod assembly acts before the lower rod assembly in both working directions of said jack, and both rod assemblies act before the jack rod reaches the end of its stroke.

15. Hydraulic winch according to claim 14, including a pressure limiting valve disposed in the fluid supply circuit for the bottom side of said jack to prevent damage to the winch from very high pressures.

16. Hydraulic winch comprising a fixed self-clamping jaw, a movable self-clamping jaw, means for moving said movable jaw toward and away from the fixed jaw, said means being formed by at least one hydraulic jack having a cylinder and a piston rod projecting therefrom, said cylinder being connected to one of said jaws and said rod being connected to the other jaw, and means for opening and closing the jaws alternately, said opening and closing means including a stationary fluid pressure auxiliary cylinder containing two pistons and a hollow rod connected to each piston and projecting from the adjacent end of the cylinder for opening and closing a jaw, one of the hollow rods being longer than the other, a strut in the auxiliary cylinder and slidably mounted in said pistons and hollow rods, and heads on said strut limiting separation of the adjacent pistons before the longer rod reaches the end of its travel.

References Cited by the Examiner

UNITED STATES PATENTS

1,117,516	11/1914	Petrie	254—135
1,120,741	12/1914	Petrie	254—135
2,585,101	2/1952	Faure	254—135

SAMUEL F. COLEMAN, *Primary Examiner.*