Dec. 30, 1930. E. SCHÖTTLER 1,787,328

DISTRIBUTING GEAR FOR BIG HYDRAULIC WORKING MACHINES

Filed Jan. 8, 1930 2 Sheets-Sheet 1

Fig. 1.

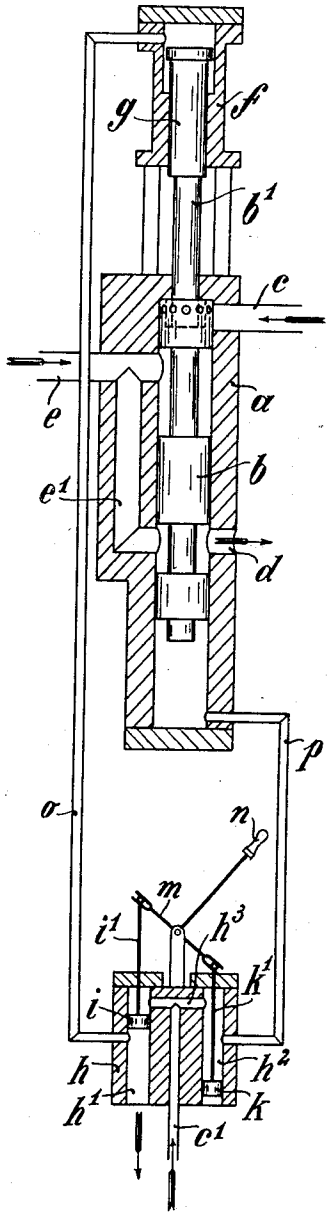


Fig. 2.

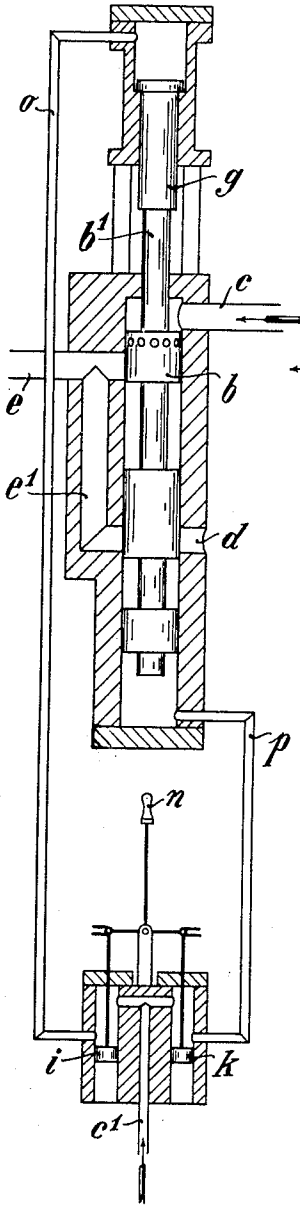
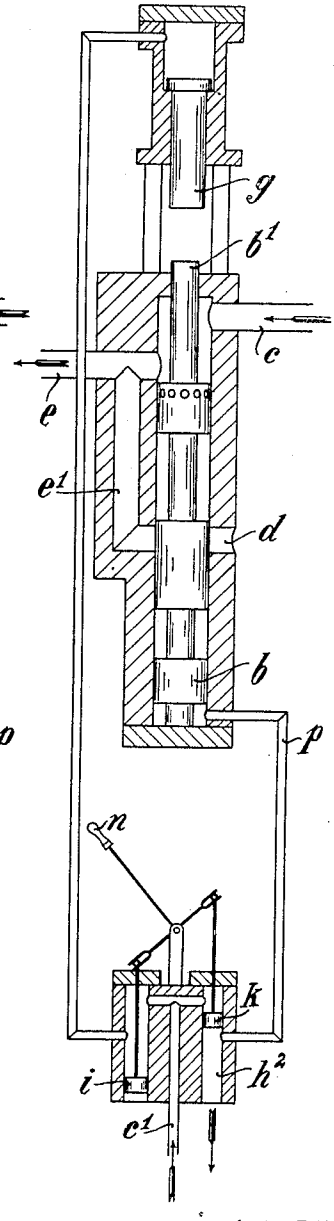


Fig. 3.



INVENTOR

Emil Schöttler

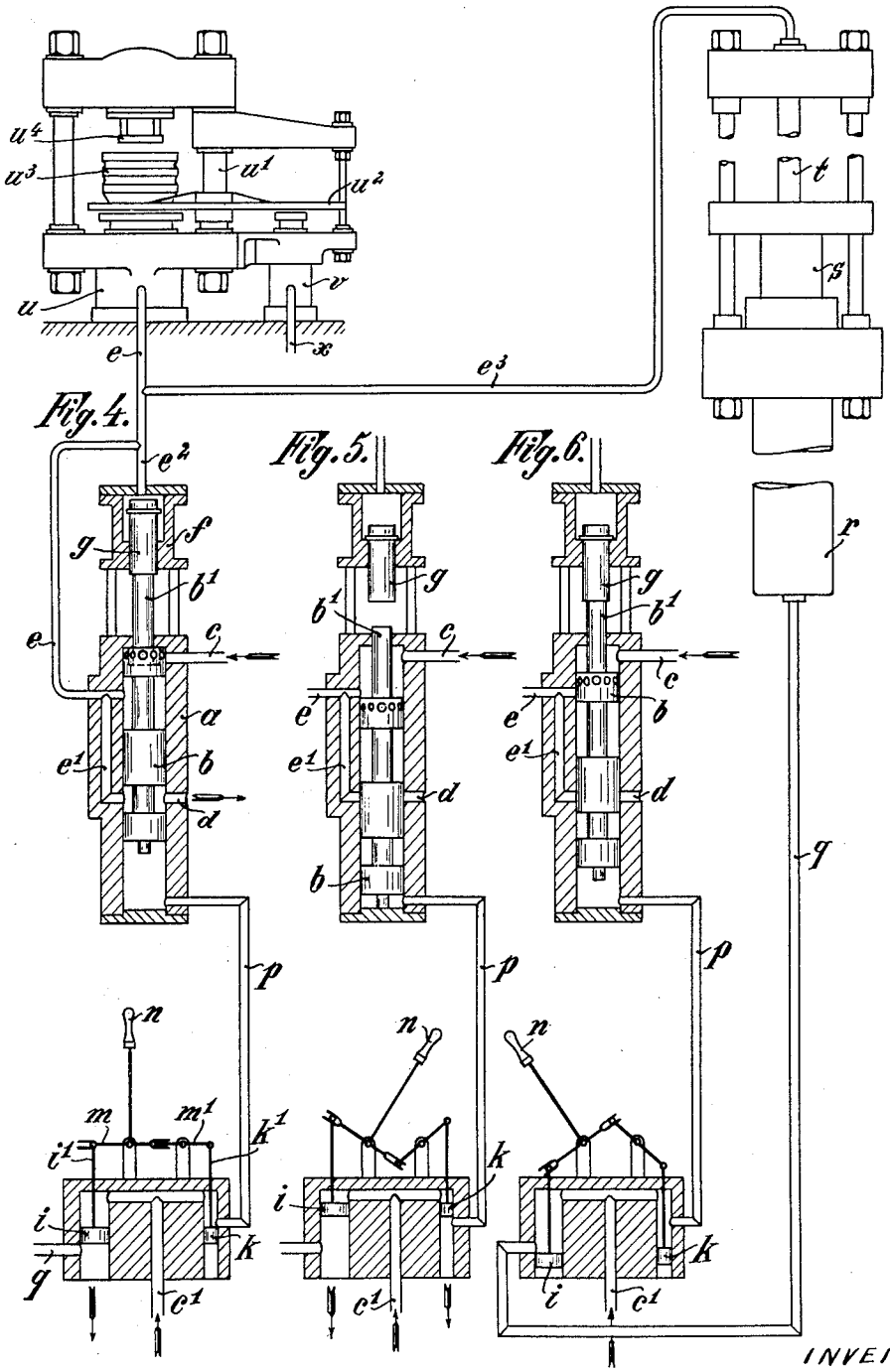
By William C. Linton

Attorney.

Dec. 30, 1930. E. SCHÖTTLER 1,787,328

DISTRIBUTING GEAR FOR BIG HYDRAULIC WORKING MACHINES

Filed Jan. 8, 1930 2 Sheets-Sheet 2



INVENTOR.

Emil Schöttler.

By William C. Linton
Attorney.

Patented Dec. 30, 1930

1,787,328

UNITED STATES PATENT OFFICE

EMIL SCHÖTTLER, OF ESSEN-RUTT, GERMANY

DISTRIBUTING GEAR FOR BIG HYDRAULIC WORKING MACHINES

Application filed January 8, 1930, Serial No. 419,400, and in Germany March 2, 1927.

I have filed application for patent in Germany on March 2nd, 1927, No. Sch. 81,895 XI/35b and on December 7th, 1929, No. Sch. 92,451 VI/80a1 and in France on December 4th, 1929, No. 285,990 of which the following is a specification.

The invention concerns a distributing gear for those hydraulic machines (cranes, presses, converter devices, etc.) in which the frictional resistance in the leather cups of the piston valve is so great that direct actuation of the distributing means is impossible and in which likewise the piston valve can be fixed in a central position.

In the known devices of this kind a large auxiliary piston is mounted loose on the piston rod of the distributing slide valve and the auxiliary cylinder is designed as a stepped cylinder. The drawback of this arrangement is that the piston rod must also work as a piston in the auxiliary piston, and the pistons therefore owing to their inaccessibility are very difficult to keep tight.

The invention aims at remedying this defect and creating a simpler arrangement inasmuch as the auxiliary piston is formed by a plunger or is provided with a piston rod, the plunger or piston rod projecting from the auxiliary cylinder into the path of the piston valve.

On the drawing two constructional examples of the invention are shown in diagram,

Figs. 1 to 3 illustrating in longitudinal section three different positions of a distributing gear for a hydraulic machine always working with the same pressure of liquid.

Fig. 4 is a side elevation of a hydraulic brick press working with high and low pressure with a longitudinal section through the distributing gear and .

Figs. 5 and 6 show the distributing gear in two different positions of the parts.

In a longitudinal bore of the housing a which serves as distributing cylinder, there is guided a freely suspended piston valve b which projects by a prolongation b^1 from the housing a. The pressure liquid is let in through the pipe c terminating in the upper end of the housing a; the outflow of the liquid is effected through the opening d in the housing a. The opening e provided a little below the mouth of the duct c is connected by a duct with the working cylinder (not shown). The opening e has a branch e^1 which ends in the longitudinal bore of the housing a at the level of the outflow opening d.

The form of the distributing piston b is so selected that in its upper end position (Fig. 1) the upper part of the piston separates the admission duct c from the duct e leading to the working cylinder while the latter is in communication with the outlet d by way of the branch e^1 and the space between the two bottom parts of the piston. In the middle position of the distributing piston b (Fig. 2) the pipe e is shut off by the two upper piston parts both from the pressure liquid duct c and also from the outflow duct d. In the bottom end position of the distributing piston b (Fig. 3) the feed duct c is in communication with the duct e by way of the upper free cylinder space, while the middle part of the piston separates the duct e, e^1 from the outflow opening d.

At the upper end of the housing a a small cylinder f is fixed in the bore of which a freely suspended plunger piston g is guided, the bottom end of which projects from the cylinder and is made so long that in its lower end position it is in contact with the free end b^1 of the distributing piston b which is in its middle position (Fig. 2).

In a separate housing h connected up to the pressure duct c^1 two bores h^1, h^2 are provided in each of which a piston i, k is guided. The pistons i and k are connected with each other by a rod gear i^1, k^1, in such manner that when the hand lever n is shifted they perform a counter directed movement. The bores h^1 and h^2 are in communication with the pressure duct c^1 and with each other by a transverse bore h^3.

The bore h^1 is in communication by a duct o with the space above the plunger piston g and the bore h^2 by a duct p with the space below the distributing piston b. The position of the connections o and p to the housing h is so selected that in the middle position of the

hand lever n and the pistons i and k both connections are directly above the piston.

In the position of the hand lever n according to Fig. 1 the spaces below and above the distributing piston b are in communication with the pressure duct c, c^1. The bottom larger piston surface therefore comes into action, the piston being driven into its upper end position. The water flows out from the working cylinder (not shown) by way of e, e^1 and d. The piston b reaching its upper end position has raised the plunger g; the duct o which is in communication with the space above the plunger then terminates beneath the piston i so that the water displaced by the upward forced plunger d has been able to escape through the bore h^1. The pressure duct c is separated by the piston b from the duct e.

If now the working piston is to be actuated, the hand lever n is shifted over into its position according to Fig. 3. In doing this the piston i is lowered while the piston k rises. The space above the plunger g is thus brought into communication by way of the duct o and the bores h^1, h^3 with the pressure duct c^1, so that the plunger is forced into its bottom end position. In doing this it pushes the distributing piston b in front of it. At the same time, however, the space below the distributing piston b has been put into communication by way of the duct p with the free space beneath the piston k so that the water lying beneath the piston b flows out and the pressure liquid entering through the duct c above the piston b forces this piston into the bottom end position shown in Fig. 3. The working cylinder now receives water under pressure from the duct c by way of the space above the upper part of the piston b and the duct connected up to e.

If now the working piston is suddenly to be stopped in the position reached, the hand lever n is moved over into its position according to Fig. 2 in which the two pistons i and k occupy their central position. The pressure means now passes by way of the duct p below the piston b which in this process is raised until it strikes against the plunger g which is also still under pressure and is held fixed in its bottom end position. In this position of the distributing piston b the duct e, e^1 leading to the working cylinder is shut off by the two upper parts of the piston b so that the working piston must remain immovable.

In order to secure the effect as described the piston face of the plunger g is made somewhat greater than the difference of the active faces of the piston b.

Instead of a plunger piston g a simple piston may also operate in the cylinder f projecting downwards from the cylinder by means of a piston rod. Furthermore the auxiliary distribution gear h, i, k illustrated may also be replaced by any other kind for example a slide valve distribution.

In the constructional form according to Figs. 4 to 6, u denotes the cylinder of a hydraulic brick press and v the cylinder of the brick ejection device. The press has a plate u^2 which can swing round the column u^1 on which plate there is the mould u^3 and a top back support u^4. r, s, t is a pressure converter which converts the existing liquid pressure into high pressure. The pressure duct e leading to the press is connected by a branch e^2 with the space above the auxiliary piston (plunger) g and by a second branch e^3 with the hollow piston t of the small cylinder s of the pressure converter the large cylinder r of which is connected by a duct q with the side of the hand controlled device in which the piston i operates. The cylinder v of the brick ejector device is connected by a duct x with a separate distributing (control) gear not shown.

The operation of this arrangement is as follows: In Fig. 4 the distributing gear is shown in the position of rest. The hand lever n is in its middle position and the pressure liquid flows from the duct c^1 by way of p beneath the piston b which it holds in its upper end position. The piston b therefore shuts off the the pressure duct c. From the large cylinder r of the pressure converter the water flows away through the duct q; the small cylinder s sinks and a part of the water flows out of the press u through the pipe e, e^3 back into this cylinder. The remaining water flows away out of the press through the pipe (duct) e, e^1, d. As soon as the working piston of the press u has reached its bottom end position the plate u^2 can be swung round the pillar u^1 until the mould u^3 is beneath the ejector press, the piston of which is actuated by a separate distributing gear, and ejects the brick. Lastly the plate u^2 after the filling of the mould u^3 is again swung back into the position shown on the drawing.

If now the lever n is shifted into its position according to Fig. 5 the water lying below the piston b can flow out through the duct p; the distributing piston b is therefore forced by the pressure liquid into its position shown in Fig. 5. The pressure liquid can now pass from the duct c into the duct e and from there into the press u which now presses the brick against the top back support u^4 with the pressure existing in the main duct for example 50 atmospheres.

If then the hand lever be shifted back into its position according to Fig. 4 then the pressure liquid passes out of the duct c^1 by way of the duct p once again beneath the piston b which is then again raised; as however the water under pressure can only flow away out of the press u and the duct e when the distributing piston b reaches its upper end position, therefore the plunger g is also still under

pressure during the upward movement of the piston *b*. The distributing piston can therefore only be raised to beneath the plunger *g* and must consequently now remain in the middle position (Fig. 6).

If the hand lever *n* is thereupon further put into its position according to Fig. 6, the bottom face of the piston *b* remains under pressure. The water under pressure now also flows through the duct *q* into the big cylinder *r* of the pressure converter and drives upward the small cylinder *s* from the piston *t* of which the water under pressure, with a pressure corresponding to the conversion, for example 300 atmospheres reaches the press *u* and the cylinder *f* by way of the duct e^3. The plunger *g* is therefore now held in its bottom end position by the high pressure and the distributing piston continues immovable in the middle position according to Fig. 6 in which it keeps the duct *e* shut off, so that the high pressure water cannot reach the low pressure duct *c*.

As soon as the hand lever *n* is again shifted back into its position according to Fig. 4 the pressure in the ducts *e*, e^3 and *q* disappears and the water again flows away out of the press *u* and the large cylinder *r*.

It is straightway evident that the hand lever *n* must be shifted from its position of rest according to Fig. 4 in the first place into the low pressure working position according to Fig. 5, and only then, by way of the position of rest, into the high pressure position according to Fig. 6, if the press is to work with the high pressure. Therefore in each case preliminary pressing is done with low pressure.

I claim:—

1. In a distributing gear for big hydraulic working machines in combination: a hydraulically actuated piston valve; hand controlled means to operate said piston valve; an auxiliary piston serving to hold said piston valve in a middle position; said auxiliary piston projecting by its free end into the path of the piston valve; and the cross section of said auxiliary piston being somewhat larger than the difference of the active faces of said piston valve.

2. In a distributing gear for big hydraulic working machines in combination: a hydraulically actuated piston valve; a hand controlled device to operate said piston valve; an auxiliary piston serving to hold said piston valve in a middle position; said auxiliary piston projecting by its free end into the path of said piston valve; and one side only of said auxiliary piston being controlled by pressure means.

3. In a distributing gear for big hydraulic working machines in combination: a hydraulically actuated piston valve; a hand controlled device to operate said piston valve; an auxiliary piston serving to hold said piston valve in a middle position; said auxiliary piston projecting by its free end into the path of said piston valve; a pressure duct leading from the housing of said piston valve to the machine; means for actuating the machine by liquids of different pressure; a high pressure duct connected up to said pressure duct; and a duct connecting the space above the said auxiliary piston up to the said pressure duct.

4. In a distributing gear for big hydraulic working machines in combination: a hydraulically actuated piston valve; a hand controlled device to operate said piston valve; an auxiliary piston serving to hold said piston valve in a middle position; said auxiliary piston projecting by its free end into the path of said piston valve; a pressure duct leading from the housing of said piston valve to the machine; means for actuating the machine by liquids of different pressure; a high pressure duct connected up to said pressure duct; and a duct connecting the space above the said auxiliary piston up to the said pressure duct, said piston valve shutting off said high pressure duct from said low pressure duct.

5. In a distributing gear for big hydraulic working machines in combination: a hydraulically actuated piston valve; a hand controlled device to operate said piston valve and adapted to be shifted into three operative positions; an auxiliary piston serving to hold said piston valve in a middle position; means for actuating the machine by liquids of different pressure; a low pressure duct leading to the housing of said piston valve and to the hand controlled device; and said hand controlled device being connected in such manner with the space beneath said piston valve and with a pressure converter, that in one position of the hand lever only the housing of said piston valve, but in the second said pressure converter also receives low pressure, while in a third position both are shut off from said pressure duct.

In witness whereof I have hereunto set my hand.

EMIL SCHÖTTLER.