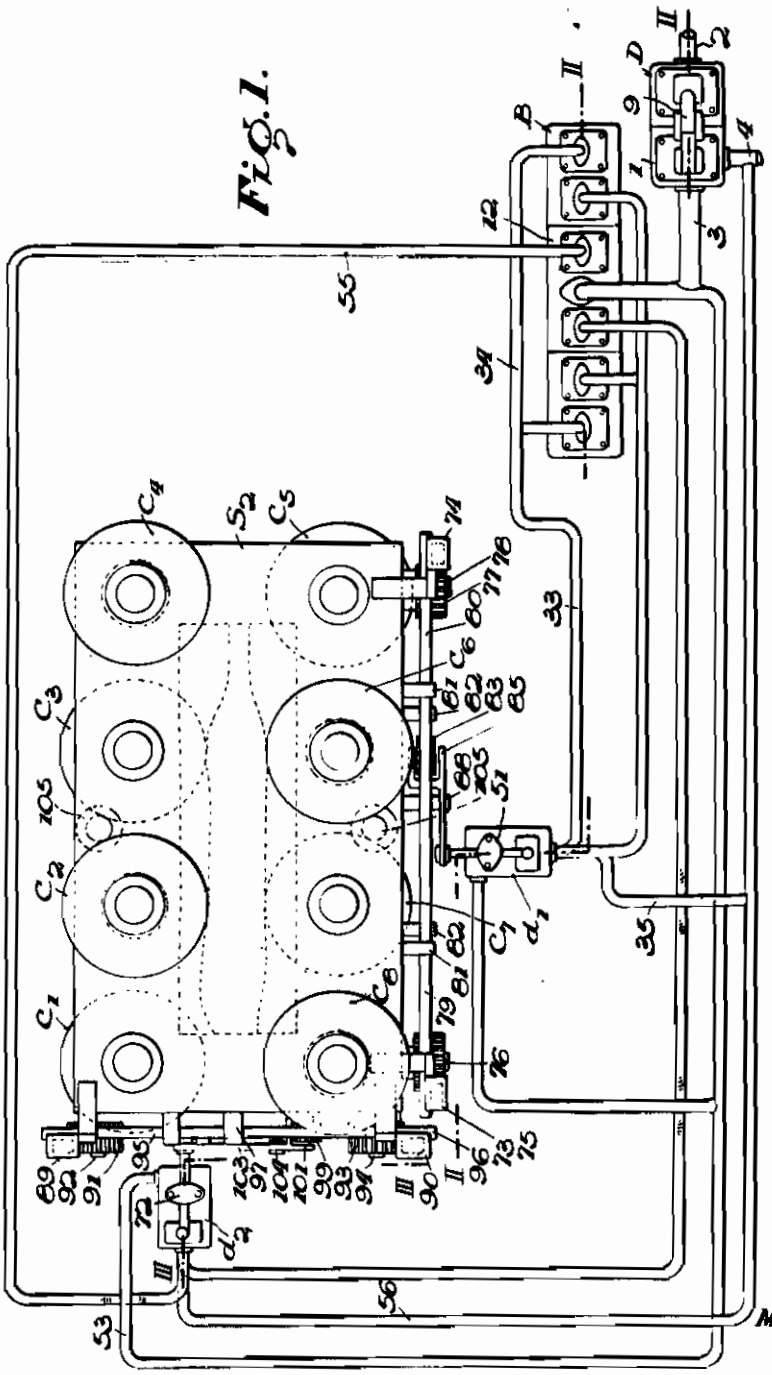
PUBLISHED
JUNE 1, 1943.
BY A. P. C.

M. A. MONIER
HYDRAULIC PRESSES
Filed Oct. 28, 1942

Serial No.
463,696
3 Sheets-Sheet 1

Fig. 1.



Inventor
Marius Adrien Monier

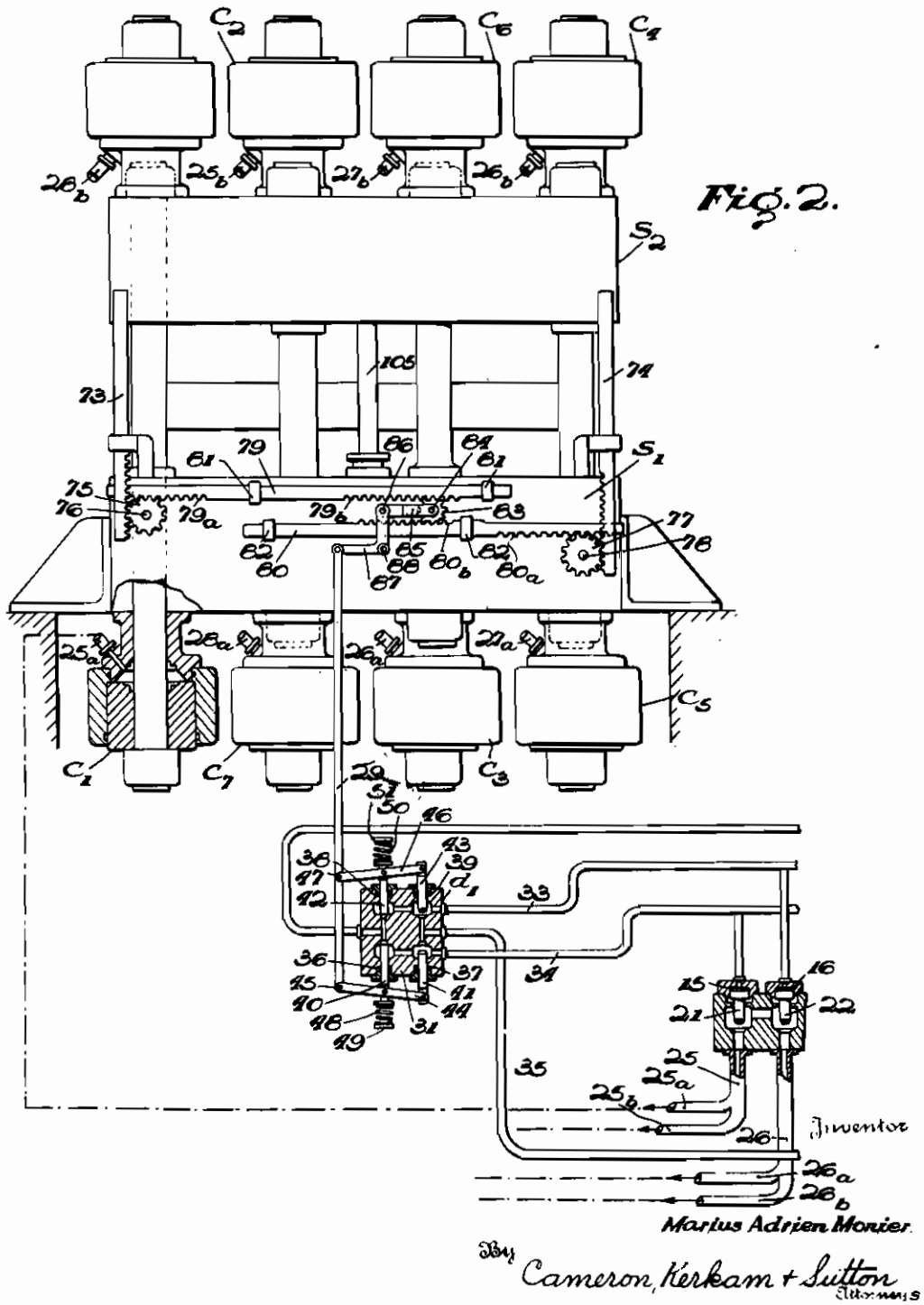
Cameron, Kirkham + Sutton
Attys

PUBLISHED
JUNE 1, 1943.
BY A. P. C.

M. A. MONIER
HYDRAULIC PRESSES
Filed Oct. 28, 1942

Serial No.
463,696
3 Sheets-Sheet 2

Fig. 2.



Inventor
Marius Adrien Monier

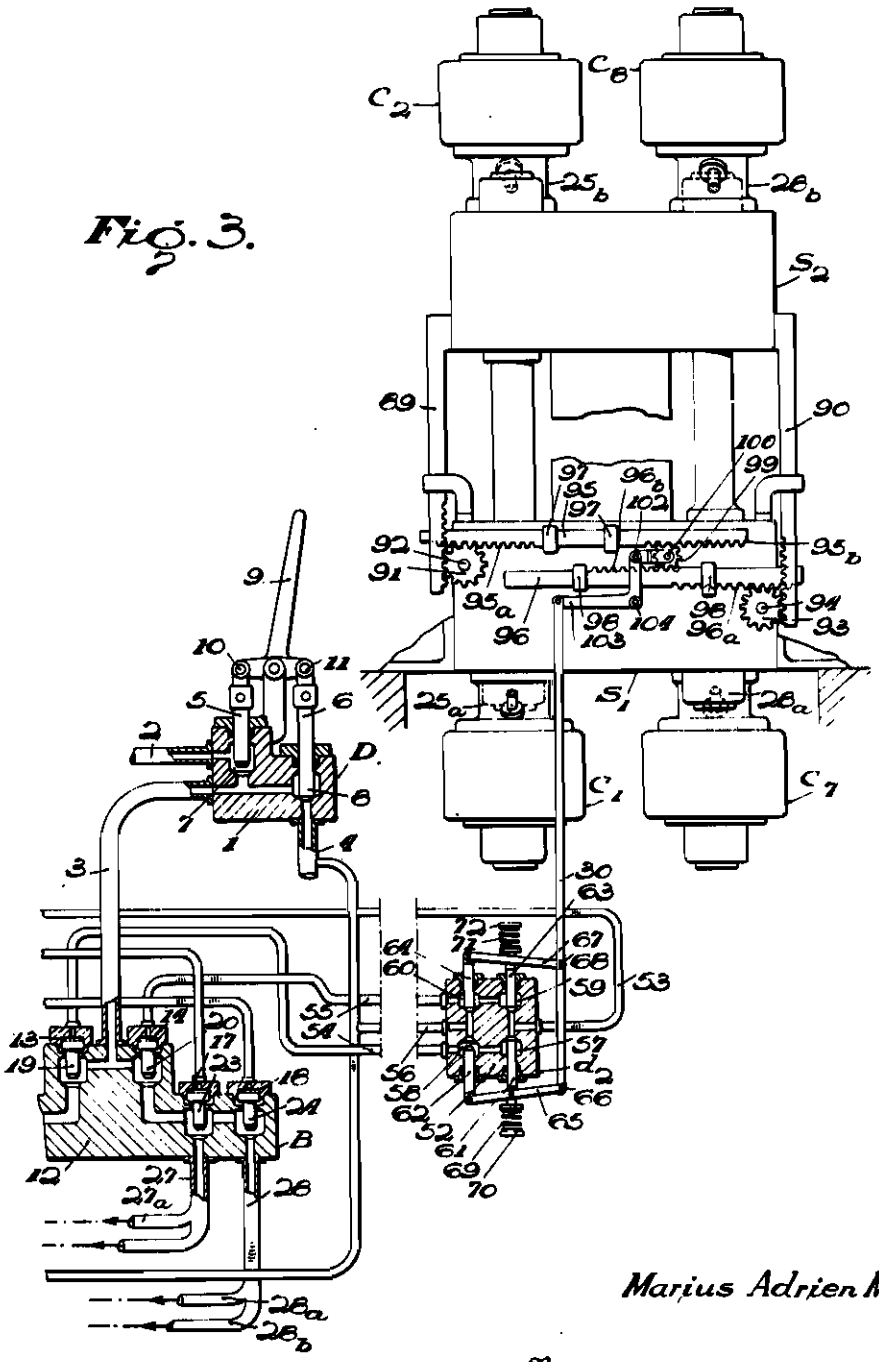
By Cameron, Kerkam + Sutton
Attorneys

PUBLISHED
JUNE 1, 1943.
BY A. P. C.

M. A. MONIER
HYDRAULIC PRESSES
Filed Oct. 28, 1942

Serial No.
463,696
3 Sheets-Sheet 3

Fig. 3.



Inventor
Marius Adrien Monier.

By Cameron, Kerkam + Sutton
Attorneys

Published June 1, 1943 Serial No. 463,696

ALIEN PROPERTY CUSTODIAN

HYDRAULIC PRESSES

Marius Adrien Monier, Grillon, by Valreas, France; vested in the Alien Property Custodian

Application filed October 28, 1942

Generally the correct operation of a press supposes that the resultant of the passive forces (resistance of the compressed article), the value of which is equal to that of the active forces (compression stresses), is directly opposed to this latter.

If, for any reason (abnormal distribution of the resistances or casual disappearing of certain ones of the same), this condition is no longer fulfilled, that is to say if a shifting occurs between the respective axes of application of both resultants in question, this shifting immediately gives rise to a reversing torque which in the case of presses of large dimensions can have serious consequences.

Without going so far as to cause in every case permanent deformations of the apparatus the above mentioned torque nevertheless imposes to the various organs of the press deflecting stresses which have as a visible consequence a lack of parallelism of the beds.

Without necessarily being dangerous these flexions give rise, in any case, to complementary frictions and even, on occasion, to jamming effects which are contrary to a satisfactory workings of the press.

In ordinary presses one generally relies on the operator of the press for stopping the work as soon as the above mentioned lack of parallelism of the beds appears.

For presses of a great power, on the contrary, and especially for the press which forms the subject matter of the chief patent, it has seemed necessary to provide a complementary safety device capable of automatically re-establishing the situation as soon as an abnormal shifting of the applied forces appears.

The safety device in question is characterized by the combination with the usual member controlling the admission and the outlet of the fluid under pressure which feeds the cylinders of the press (distributor) of an auxiliary control mechanism which, if necessary or advisable, automatically puts out of action one or more cylinders or cylinder groups, the said auxiliary mechanism comprising:

(1°) According to the case, i. e. according to the number of the press cylinders and according to the manner in which it is desired to group the said cylinders, one or more auxiliary distributors adapted for permitting separately to regulate the supply of fluid to the various cylinders or cylinder groups under consideration;

(2°) When two auxiliary distributors are provided, a box with complementary valves adapted for co-ordinating the action of the said auxiliary distributors;

(3°) Lastly, and still according to the arrangement of the press cylinders, one or two compensating controls having a differential action, combined with the above mentioned auxiliary distributor or distributors and connected with the movable bed of the press in such a manner that at the moment where the lock of parallelism of the two beds reaches a given value the said control or controls act on the auxiliary distributor or distributors with which they are combined so as to stop the admission of the driving fluid for one or more cylinders or cylinder groups.

If the press comprises only one row of cylinders it is, of course, sufficient to have a single auxiliary distributor which is suitably arranged and a single compensating control, since one has to care only for the longitudinal parallelism of the beds.

On the contrary, when the press comprises two rows of cylinders two auxiliary distributors are necessary with one complementary valve box and two compensating controls having a differential action, one of the said controls being assigned to the control of the longitudinal parallelism of the beds and the other to the control of their transversal parallelism.

A particular form of execution of a device suited for carrying out the invention is shown in the appended drawings and described by way of example, but, of course, the said form of execution could be modified in its details of construction without departing from the scope of the invention.

Figure 1 is a general diagrammatical plan view of the device.

Figure 2 is an elevational view of the outside of the device in the longitudinal direction with a partial tearing away showing the inner part of a cylinder and a partial sectional view through line II—II of Figure 1.

Figure 3 is also an elevational view of the outside in the lateral direction with a partial sectional view through the line III—III of Figure 1.

As shown in the drawing, the press which is described and shown by way of example comprises eight compression cylinders C_1, C_2, C_3, C_4, C_5, C_6, C^7, C_8 associated with fixed bed S_1 and with the movable bed S_2 according to what is said in the chief patent, the said cylinders being, as shown hereinafter and as regards their supply with driving fluid, distributed in four groups G_1, G_2, G_3, G_4, the group G_1 comprising the cylinders C_1 and C_2, the group G_2 the cylinders C_3 and C_4, the

group G_3 the cylinders C_5 and C_6 and the group G_4 the cylinders C_7 and C_8.

The control of the press is insured by means of a general distributor D and of two auxiliary distributors d_1 and d_2 which are respectively subjected to the action of the compensating control mechanism m_1 and m_2 the first of which corresponds to the longitudinal balance and the second to the lateral balance, the said auxiliary distributors being adapted for controlling the operation of a valve box B which regulates the supply of the driving fluid to the various cylinder groups.

The general distributor D, which could also be of another type as that which is shown in the drawing, is formed here of a three way cock comprising a block 1 to which leads the conduit 2 supplying the cylinders with fluid under pressure and from which extend on the one hand the conduit of distribution 3 and, on the other hand, the outlet conduit 4.

Two valve needles 5 and 6 respectively movable in the cavities 7 and 8 provided in the said block 1 insure, in function of the movements imparted to them by a control lever 9 to which they are linked at 10 and 11 respectively, either the connection of the inlet conduit 2 for the fluid with the distributing conduit 3 or the interruption of the said communication and the connection of the said distributing conduit 3 with the outlet conduit 4.

The valve box B which is supplied with driving fluid by the conduit 3 when the valve needle 5 of the general distributor is open is formed of a block 12 in which are arranged six differential valve casings 13, 14, 15, 16, 17 and 18 respectively in which the movable differential valves 19, 20, 21, 22, 23 and 24 can be moved.

From the lower seat of the valve 21 extends the conduit 25 with two branches 25_a and 25_b through which both cylinders C_1 and C_2 of the group G_1 are supplied with fluid respectively.

From the lower seat of the valve 22 extends the conduit 26 which has two branches and supplies both cylinders C_3 and C_4 of the group G_2 with fluid.

From the lower seat of the valve 23 extends the conduit 27 which has also two branches and supplies with fluid both cylinders C_5 and C_6 of the group G_3.

From the lower seat of the valve 24 extends the conduit 28 with two branches supplying with fluid both cylinders C_7 and C_8 of the group G_4.

Owing to this arrangement the advantage of which will be shown hereinafter the various cylinder groups are supplied with fluid independently from another.

Furthermore, the casings of the valves 21 and 22, which insure the control of the feeding of all the cylinders of the same row are supplied with driving fluid only then when the valve 19 is open, and the casings of the valves 23 and 24, which insure the control of the cylinders of the other row, are supplied with driving fluid only then when the valve 20 itself is open, owing to which the play of both valves 19 and 20 permits of neutralizing each one of both cylinder rows independently from another according to the needs.

The control of the opening and closing of the six differential valves of the valve box B is itself insured through the medium of both auxiliary distributors d_1 and d_2 which are identical, but the first of which is subjected to the action of the longitudinal compensating mechanism m_1, as for instance by means of a driving rod 29 of the like. whilst the second is subjected to the action of the transversal compensating mechanism m_2, which acts by means of the rod 30.

The distributor d_1, which has the duty of insuring the longitudinal control by putting out of action either both groups G_1 and G_4 or both groups G_2 and G_3 according to the case is formed itself of a block 31 to which leads a conduit 32 supplying the fluid under pressure and connected with the conduit 3 of the general distributor D and from which extend:

(1°) a conduit 33 which leads to the upper part of the casings of the differential valves 22 and 23 in view of controlling the feeding of both cylinder groups G_2 and G_3;

(2°) a conduit 34, which leads to the upper part of the casings of the differential valves 21 and 24 in view of controlling the feeding of both cylinder groups G_1 and G_4, and

(3°) lastly a discharge conduit 35 which joins the outlet conduit 4 of the general distributor D.

In the said block 31 are arranged four valve needle casings 36, 37, 38 and 39 respectively, adapted for receiving four valve needles 40, 41, 42 and 43 the two first ones of which are mounted and linked on a control link 44 itself linked at 45 on the master rod 29, whilst the two others are linked on a control link 46 itself linked at 47 on the master rod 29.

Moreover, the valve needle 40 and the link 44 are subjected to the action of a compression spring 48 which rests on a fixed point 49 and constantly tends to maintain the valve needle applied against its seat in order to prevent the driving fluid arriving through the conduit 32 to flow into the casing of the valve needle 41 and in a like manner the valve needle 42 and the link 46 are subjected to the action of a compression spring 50 which rests against a fixed stop 51 and constantly tends to apply the said valve needle onto its seat in order to prevent the driving fluid arriving through the conduit 32 to flow into the casing of the valve needle 43.

The casing of the valve needle 41 permanently communicates with the condult 34 and the casing of the valve needle 43 permanently communicates with the conduit 33, but since these two casings also communicate with the discharge conduit 35 so long as their respective valve needles remain in the opened position, the fluid under pressure can exert its action on the valves 21, 22, 23 and 24 of the valve box only if the rod 29 is moved sufficiently for first closing one or the other of the said valve needles 41 or 43 and for opening then either the valve needle 40 or the valve needle 42 while overcoming the force of the corresponding compression spring.

In a like manner, the auxiliary distributor d_2 which has for its duty to insure the lateral control by putting out of action either one or the other of both cylinder rows, according to the case, comprises a block 52 to which leads a conduit 53 for the supply with the driving fluid coming from the conduit 3 of the general distributor D and from which extend:

(1°) a conduit 54 which leads to the upper part of the casing of the valve 19 in order to control the feeding of both cylinder groups G_1 and G_2 of one and the same row;

(2°) a conduit 55 which leads to the upper part of the casing of the valve 20 in order to control the feeding of both cylinder groups G_3 and G_4 of the other row, and

(3°) lastly, a discharge conduit 56, which joins the outlet conduit 4 of the general distributor D.

In the said bloc 52 are arranged four valve

needle casings 57, 58, 59 and 60 which receive four valve needles 61, 62, 63 and 64 linked: the two first ones on a link 65 itself linked at 66 on the master rod 30 and the others two on a link 67 itself linked at 66 on the rod 30, the valve needle 61 and the link 65 being acted upon by a spring 69 which rests against a fixed stop 70, while the valve needle 63 and the link 67 are acted upon by a spring 71 resting against a fixed stop 72.

The casing of the valve needle 62 permanently communicates with the conduit 54 and the casing of the valve needle 64 permanently communicates with a conduit 55, but since each of these two casings also communicates with the discharge conduit 56 as long as its valve needle remains in the opened position, the fluid under pressure can exert its action on both valves 19 and 20 of the valve box only when the rod 30 is moved sufficiently for causing first the closure of one or the other of the said valve needles 62 or 64 and then the opening either of the valve needle 61 or of the valve needle 63 while overcoming the force of the corresponding compression spring.

On its side, the auxiliary mechanism adapted for insuring the longitudinal compensation comprises two vertical racks 73 and 74 integral with the bed S_2 and movable with it, the said racks engaging respectively, the first a pinion 75 capable of freely rotating about a fixed axis 76 integral with the bed S_1 and the second a pinion 77 also capable of freely rotating about a fixed axis 76 integral with the bed S_1.

It comprises, furthermore, two horizontal double racks 79 and 80 which can slide in guides 81 and 82 respectively on the fixed bed S_1.

The teeth 79_a of the rack 79 engage the pinion 75 and the teeth 80_a of the rack 80 engage the pinion 77. On the other hand, between the teeth 79_b of the rack 79 and the teeth 80_b of the rack 80 is arranged a pinion 83 which can freely rotate about an axis 84 mounted at one end of a yoke 85 the other end of which is linked at 86 on one of arms of a bell-crank lever 87 which can rock about an axis 88 integral with the bed S_1.

At the end of the other arm of the bell-crank lever is connected the upper end of the above mentioned rod 29.

In a like manner, the auxiliary mechanism adapted for insuring the lateral compensation carries first two vertical racks 89 and 90 integral with the bed S_2 and moving with it, the said racks engaging respectively, the first one a pinion 91 capable of freely rotating about a fixed axis 92 integral with the fixed bed S_1 and the second a pinion 93 also capable of freely rotating about a fixed axis 94 integral with the bed S_1.

On the other hand, it comprises two double horizontal racks 95 and 96 which can slide in guides 97 and 98 respectively on the fixed bed S_1.

The teeth 95_a of the rack 95 engage the pinion 91 and the teeth 96_a of the rack 96 engage the pinion 93.

On the other hand, between the teeth 95_b of the rack 95 and the teeth 96_b of the rack 96 is arranged a pinion 99 which can freely rotate about an axis 100 mounted at one of the ends of a yoke 101 the other end of which is linked at 102 on one of the arms of a bell-crank lever 103 which can rock about an axis 104 integral with the bed S_1.

At the end of the other arm of the said bell-crank lever is connected the end of the above mentioned rod 36.

The operation of the device is as follows:

When all the parts are in the position in which they are shown in the appended drawing, the driving fluid arriving through the conduit 2 can pass under the valve needle 5 and from here through the conduit 3 into the valve box B.

In the inner of the latter it can also pass under the valves 18 and 20 and then into the space under the valves 21, 22, 23 and 24 and finally reach the eight cylinders of the press through the conduits 25, 26, 27 and 29.

Under its action the movable bed S_2 is lowered and comes nearer to the fixed bed S_1.

So long there is no abnormal shifting between the axes of application of the resultant of the active forces and that of the passive resistances the four racks 73, 74, 89 and 90 which follow the bed S_2 in its downward movement are moved exactly by the same amount. The same is true for the horizontal racks 79, 90, 95 and 96 and, consequently, both pinions 83 and 99 rotate each about its own axis without the latter being compelled to move. The bell-crank levers 87 and 103 remain unmoved as well as the rods 29 and 36. The valve needles 40 and 42 of the auxiliary distributor d_1 and the valve needles 61 and 63 of the auxiliary distributor d_2 remain closed. The conduits 32 and 33 which lead to the said auxiliary distributors supply no driving fluid.

If, for any reason, an abnormal shifting occurs between the axes of application of the active forces and of the passive resistances acting between the beds, and if this shifting is sufficient for preventing the movable bed S_2 to move further parallely to itself and parallely to the fixed bed S_1 a certain difference appears between the respective displacements of the various racks 73, 74, 89 and 90.

In order to simplify the explanation it will be supposed first that the shifting in question is such that the movable bed S_2 of the press undergoes a certain tilting movement in the longitudinal direction as, for instance, from the right to the left, with respect to an observer looking at Figure 2, without undergoing any tilting movement in the lateral direction.

In this case, the rack 73 moves downward faster than the rack 74 and the rack 78 moves from the right to the left by an amount which is larger than that by which the rack 80 moves itself from the left to the right.

Accordingly, the axis 84 of the pinion 93 is compelled to move from the right to the left for compensating this difference, while carrying with it the yoke 85, which obliges the bell-crank lever 87 to rock about its axis, thus causing a downward movement of the rod 29.

This downward movement leaves the valve needle 42 of the auxiliary distributor d_1 in the closed position, but it causes first the closure of the valve needle 41 and then, when it has reached a sufficient value, the opening of the valve needle 43.

At this moment the driving fluid which arrives through the conduit 32 can pass under the valve needle 40 and round about the valve needle 41 and then through the conduit 34 above the valves 21 and 24.

Since the section of the upper end of both these valves is larger than that of their lower end the action of the fluid which acts on their upper face is greater than that of the fluid which acts on their lower face. Consequently, the said valves are moved against their seat and they cut off the communication between the conduit 3 supplying the driving fluid and the conduits 25 and 26 which feed both cylinder groups of the left hand G_1 and G_4, that is to say the cylinders C_1, C_2, C_7, C_8.

Since the latter are no longer supplied with driving fluid the axis of application of the resultant of the active pressures immediately tends to move from the left to the right in order to reestablish the desired balance.

As this movement proceeds the pinion **83** tends to return to its middle position, as well as the bellcrank lever **87** and the rod **29**.

The valve needle **40** rises to its closing position again and then the valve needle **41** opens, thus putting the conduit **34** and, accordingly, the space above the valves **21** and **24** in communication with the discharge conduit **35**. The valves **21** and **24** can open again in order to supply fluid to the cylinders C_1, C_2, C_7 and C_8.

A tilting movement of the movable bed S_2 in the other direction would cause the rod **29** to raise and the valves **22** and **23** to close.

If it is the lateral balance which is disturbed, without the longitudinal balance being affected, it is the axis **100** of the pinion **99** which moves and causes, according to the case, an upward or a downward movement of the rod **30**. According to the direction of the movement of the latter, an operation similar to that which has just been described causes the closure of one or the other of the two valves **19** and **20** of the valve box B. If it is the valve **19** which closes, the flow of the fluid towards the cylinders C_1, C_2, C_3 and C_4 of one of the cylinder rows is cut off. On the contrary, if it is the valve **20** which closes, it is the supply of fluid to the cylinders of the other cylinder row which is cut off.

Of course, two tilting movements, i. e. a longitudinal and a lateral movement can be combined and cause then the stopping of three cylinder groups.

When the operator of the press desires to stop his machine, he needs only to move the lever **9** from the right to the left. Thus he causes the closure of the valve needle **5** and the opening of the valve needle **6**. Consequently, he cuts off the supply of driving fluid and permits to the fluid in the cylinders to flow back through the valve box B and the conduit **3** and to escape through the conduit **4** at the moment when the usual control device **105** for the raising of the movable bed begins to work.

Although the form of execution which has been described and shown by way of example corresponds to a press with eight compression cylinders of the type of the press with ten cylinders which has been described in the chief patent, it is obvious that a man skilled in the art would be able, without any difficulty, to make in the same conditions a device applicable either to a press with another number of cylinders or to a press using cylinders of another type for the control of the beds, or finally to a press in which all cylinders would not be adapted for taking part in the compensating action of the mechanism in question.

It is also obvious that the above described compensating rack mechanisms and auxiliary distributors could be replaced by any other equivalent system without departing from the scope and spirit of the invention.

MARIUS ADRIEN MONIER.