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HYDRAULIC PRESS

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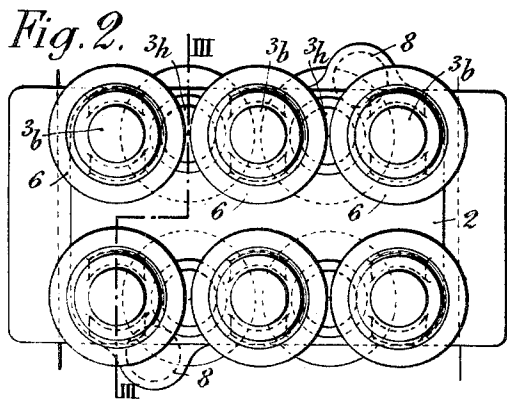
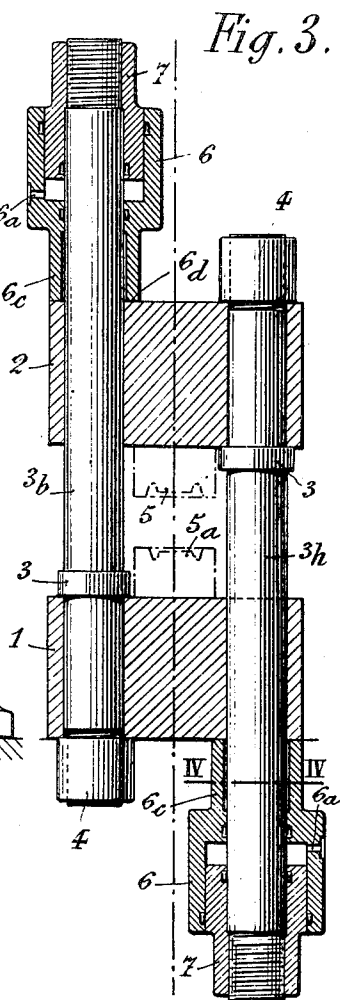
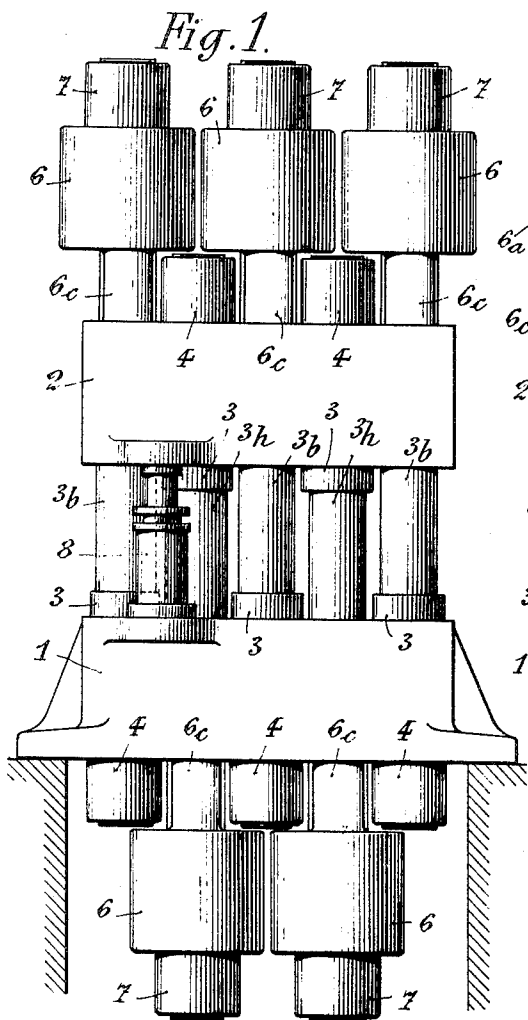
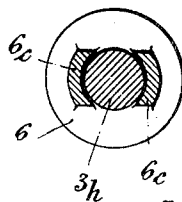


Fig. 4.



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## UNITED STATES PATENT OFFICE

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## HYDRAULIC PRESS

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7 Claims. (Cl. 100—71)

It is known that the carrying out of certain operations, such as the die-working and stamping of metal parts by means of a hydraulic press, necessitates, when these parts are of considerable dimensions, the use of great force which may attain 20,000 tons or even more.

The making of presses adapted to exert forces of this order leads, for the parts which constitute the said presses and in particular for the beds thereof, to dimensions and consequently to weights such that the said presses take up considerable space, whilst at the same time their cost price rapidly attains prohibitive figures.

Dealing with presses with multiple columns and usually equipped with individual hydraulic cylinders, each column necessarily comprises at one of its extremities a nut for its fixing on to one of the bed pieces and at its other extremity a hydraulic cylinder the surface of which bears on the other supporting bed or beam of the press. The multiplicity of the columns, usually arranged side by side in two rows and in each row at a minimum distance one from the other which is imposed by the necessity either of screwing their fixing nuts or of placing their hydraulic cylinders one alongside the others, leads to considerable dimensions of the bed or supporting pieces, and to the disadvantage that, the longer the bed pieces become (that is, as the number of columns becomes greater), the greater are the shearing forces and deflecting moments which these pieces must withstand.

The present invention relates to a hydraulic press of great power in which the principal members are made, arranged and distributed in such a manner as to permit the maximum reduction of their dimensions and consequently of their weight, as compared with the corresponding dimensions and weights of a press of the same power constructed according to the usual methods.

Dealing, for example, with the construction of a vertical press comprising a given number of columns arranged in two parallel rows, the maximum reduction of the dimensions of the principal members, and in particular of the supporting cross pieces or beds, is, according to the invention, obtained by the fact that in each row the columns are alternately fixed to the upper and the lower bed, the hydraulic cylinders of the said columns then alternating in a corresponding manner and being situated either below the lower bed or above the upper bed, at the same time that they are staggered axially with respect

to the nuts of the adjacent columns, so as to be beyond said nuts. This arrangement permits the columns to be brought as close to one another as possible and provides an extremely compact construction in which the parts operate under the best possible conditions.

The accompanying drawing shows a construction for carrying out the invention by way of example, the construction being applied to a vertical press with two rows each of five columns. In the drawing, wherein like reference characters indicate like parts throughout the several views,

Figure 1 is a front view,

Figure 2 is a corresponding plan view,

Figure 3 is a vertical section on the broken line III—III of Figure 2, and

Figure 4 is a horizontal section on the line IV—IV of Figure 3 and shows a detail of construction.

In these figures, 1 indicates the lower fixed bed of the press, whilst 2 indicates the upper bed which is movable.

These beds carry the die-working tools or the like, 5a and 5.

The force tending to bring the bed 2 towards the entablature 1 is exerted through the intermediation of a plurality of columns or tie rods arranged in two parallel rows, here comprising five columns each.

According to the invention, in each row the odd columns of the row (first, third and fifth), indicated at 3b, are fixed by their lower extremities to the fixed bed 1, each of them comprising to this end a collar 3 and a fixing nut 4 arranged below the said bed and bearing against the latter. At their upper parts the columns 3b pass freely through the movable bed 2 which they guide during its movements.

The even columns of the row (2nd and 4th), indicated by 3h, are, on the contrary, fixed to the movable bed 2 and comprise to this end, like the columns of the uneven row, collars 3 and fixing nuts 4 arranged above the said bed and bearing on its upper face.

The elementary hydraulic press which each column comprises is arranged at the extremity of the latter opposite to that which is fixed to one or the other of the beds 1 and 2.

The various presses of the same row are therefore alternately mounted at the upper extremity of the column (for the odd columns of the row) and at the lower extremity (for the even columns of the row) in such manner that, if the upper extremities of the five columns of the same row

be considered, the latter comprise alternately, and arranged side by side, a press, a nut, a press, a nut, and finally a press.

Each of the presses is constituted by a cylinder 6 and a piston 7, between which the liquid under pressure is admitted through a conduit 6a.

The cylinder 6 is movable with respect to its column along which its guiding piece 6c is adapted to slide, and also with respect to the piston 7 which is screwed to the end of the said column. The outer end 6d of the guiding piece 6c abuts against the surface of the bed 1 or 2 corresponding thereto, and thus transmits to the latter the effort of the press.

Each guide 6c has a length greater than the length of the nut-carrying extremity of the column or columns adjacent thereto, which alone permits of bringing the columns of the same row closer together, since the space occupied by the guiding parts 6c is less than that of the press cylinders 6.

Furthermore, in order to permit an additional reduction of the axial distance apart of two consecutive columns, the guiding parts 6c, instead of being constituted by complete cylinders, are reduced to two tongues, leaving between them two gaps facing the nuts 4 of the adjacent columns as shown in Figures 1, 2 and 4.

It will be seen at once that in each row the distance between any two consecutive columns has been reduced to a minimum, which permits also of reducing to a minimum the length and consequently the weight of the bed plates.

The operation of the individual presses above described is obvious: in the case of the upper hydraulic cylinders, the introduction of water or of any other liquid under pressure through the conduit 6a, below the annular fixed piston 7, causes the cylinder 6 to slide down and consequently to apply the guiding part or tongues 6c on to the bed plate 2, that is to say, to cause the approach of the bed plate 2 toward the bed plate 1.

As regards the hydraulic cylinders arranged at the lower part of the columns, the pressure of the liquid causes the sliding down of the piston 7 which carries with it the corresponding column 3h which, in its turn, also carries the movable bed plate 2 in the direction towards the fixed bed 1.

The added forces of all the hydraulic cylinders constitute the total effort which tends to move the bed plate 2 toward the bed 1.

There are also provided the usual auxiliary hydraulic return cylinders 8, for example to the number of two, intended to move the bed 2 back to its original position after each compression stroke.

Naturally, the hydraulic cylinders 6 may be supplied simultaneously with water under pressure in such manner as to cause the press to exert its maximum total effort, or only a reduced number of the said cylinders may be supplied so as to reduce in the same proportion the total effort of the press.

Although the invention has been described in its application to a vertical press, it is clear that it is equally applicable to a horizontal press.

What is claimed is:

1. A hydraulic press comprising a fixed bed, a movable bed, and a plurality of columns connecting said beds, each of said columns being fixed at one end to one of said beds and having a hydraulic cylinder associated with its opposite end adapted to cause said beds to approach one

another, adjacent columns being fixed alternately to the fixed and movable beds and having their hydraulic cylinders correspondingly positioned adjacent the movable and fixed beds alternately, whereby the spaces between adjacent columns may be reduced to a minimum.

2. A hydraulic press comprising a fixed bed, a movable bed, and a plurality of columns connecting said beds arranged in a row, each of said columns being fixed at one end to one of said beds and having a hydraulic cylinder associated with its opposite end adapted to cause said beds to approach one another, said columns being fixed alternately to the fixed and movable beds and having their hydraulic cylinders correspondingly positioned adjacent the movable and fixed beds alternately and staggered axially with respect to the fixed ends of the adjacent columns, whereby the length of said row of columns and the size of said beds may be reduced to a minimum.

3. A hydraulic press comprising a fixed bed, a movable bed, and a plurality of columns connecting and extending through both of said beds, each of said columns having an enlarged head fixed to one end thereof and abutting one of said beds, a piston connected to its opposite ends and a hydraulic cylinder associated with said piston and interposed between the latter and the other of said beds in thrust transmitting relationship with respect to the latter, adjacent columns having their enlarged heads abutting the fixed and movable bed alternately and their hydraulic cylinders correspondingly alternated adjacent the movable and fixed beds, whereby the spaces between adjacent columns and the size of said beds may be reduced to a minimum.

4. A hydraulic press comprising a fixed bed, a movable bed, and a plurality of columns connecting and extending through both of said beds and arranged in two parallel rows, each of said columns having an enlarged head fixed to one end thereof and abutting one of said beds, a piston connected to its opposite end and a hydraulic cylinder associated with said piston and interposed between the latter and the other of said beds in thrust transmitting relationship with respect to the latter, the columns of each of said rows having their enlarged heads abutting the fixed and movable beds alternately and their hydraulic cylinders correspondingly alternated adjacent the movable and fixed beds, whereby the lengths of said rows of columns and the size of said beds may be reduced to a minimum.

5. A hydraulic press comprising a fixed bed, a movable bed, a plurality of columns connecting and extending through both of said beds, each of said columns having an enlarged head fixed to one end thereof and abutting one of said beds, a piston connected to its opposite end and a hydraulic cylinder associated with said piston, adjacent columns having their enlarged heads abutting the fixed and movable beds alternately and their hydraulic cylinders correspondingly alternated adjacent the movable and fixed beds, and thrust transmitting members of less radial dimensions than said cylinders, but of greater axial extent than said enlarged heads, interposed between said cylinders and the adjacent beds so as to position said cylinders outwardly beyond said enlarged heads, whereby the spaces between adjacent columns and the size of said beds may be reduced to a minimum.

6. A hydraulic press comprising a fixed bed, a movable bed, a plurality of columns connecting

and extending through both of said beds, each of said columns having an enlarged head fixed to one end thereof and abutting one of said beds, a piston connected to its opposite end and a hydraulic cylinder associated with said piston, adjacent columns having their enlarged heads abutting the fixed and movable beds alternately and their hydraulic cylinders correspondingly alternated adjacent the movable and fixed beds, and a pair of thrust transmitting members of less radial dimensions than said cylinders, but of greater axial extent than said enlarged heads, interposed between each of said cylinders and the adjacent bed so as to position said cylinders outwardly beyond said enlarged heads, each pair of said members being positioned closely adjacent the associated column in diametrically opposite relationship with the spaces therebetween facing the enlarged heads of the adjacent columns, whereby the spaces between adjacent columns and the size of said beds may be reduced to a minimum.

7. A hydraulic press comprising a fixed bed, a movable bed, a plurality of columns connecting and extending through both of said beds and ar-

ranged in two parallel rows, each of said columns having an enlarged head fixed to one end thereof and abutting one of said beds, a piston connected to its opposite end and a hydraulic cylinder associated with said piston, the columns of each of said rows having their enlarged heads abutting the fixed and movable beds alternately and their hydraulic cylinders correspondingly alternated adjacent the movable and fixed beds, and a pair of thrust transmitting members of less radial dimensions than said cylinders, but of greater axial extent than said enlarged heads, interposed between each of said cylinders and the adjacent bed so as to position said cylinders outwardly beyond said enlarged heads, each pair of said members being positioned closely adjacent the associated column diametrically opposite one another on a line at right angles to the direction of said rows of columns and with spaces of substantial arcuate extent therebetween facing the enlarged heads of the adjacent columns of the associated row, whereby the lengths of said rows of columns and the size of said beds may be reduced to a minimum.

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