May 29, 1956 J. A. CONCHON 2,747,253

DEVICE FOR FORGING PARTS HAVING LARGE CROSS-SECTIONAL VARIATIONS

Filed Sept. 21, 1951 4 Sheets-Sheet 1

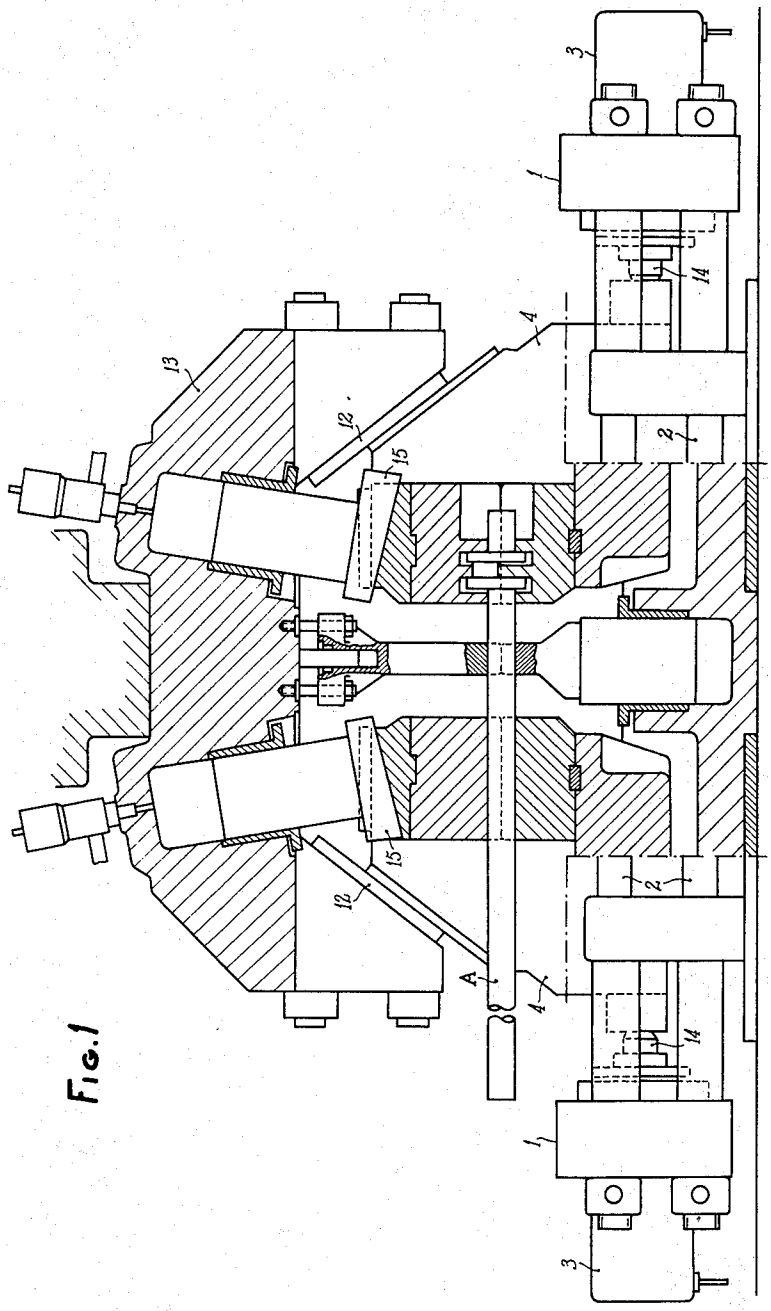

Fig. 1

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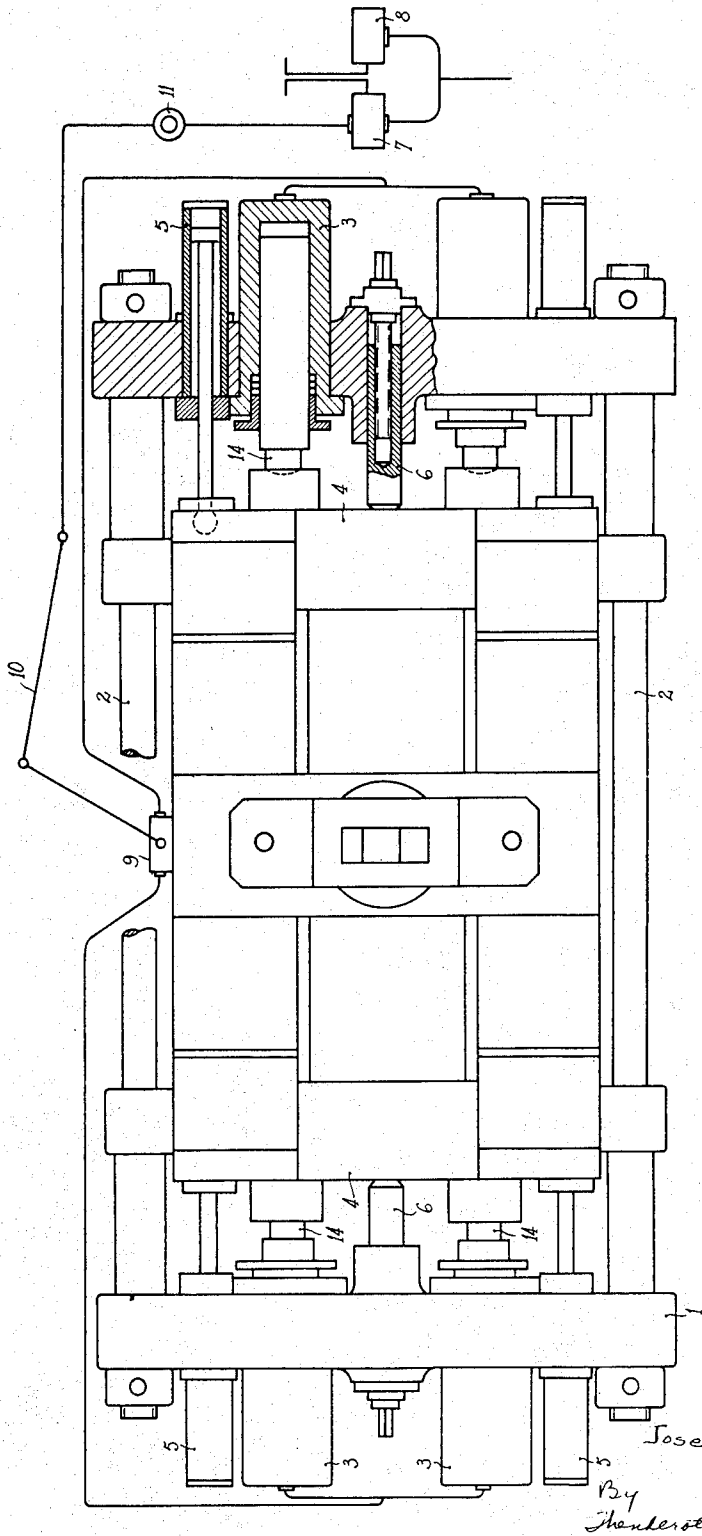

FIG. 2

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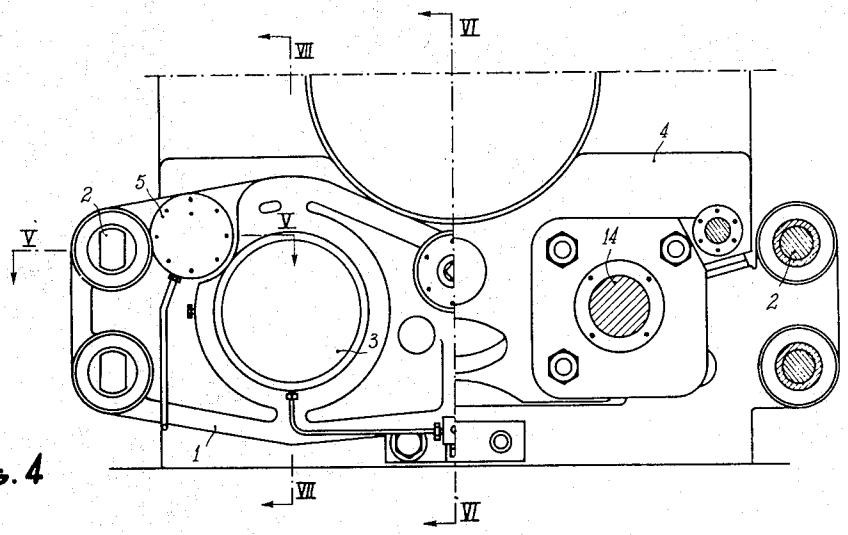

FIG. 4

FIG. 3

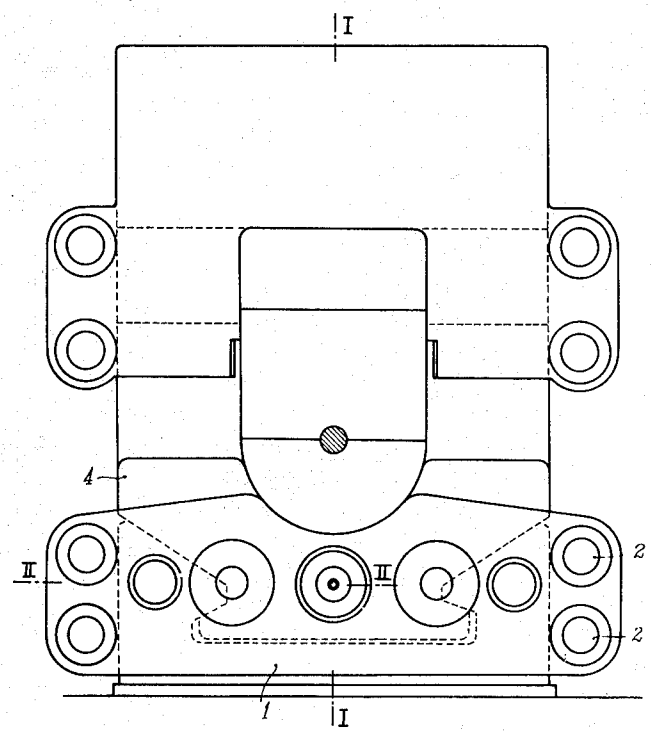

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FIG. 6

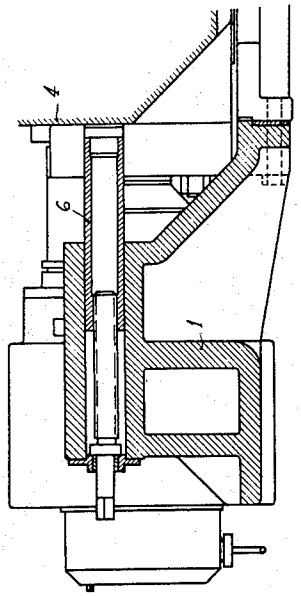


FIG. 7

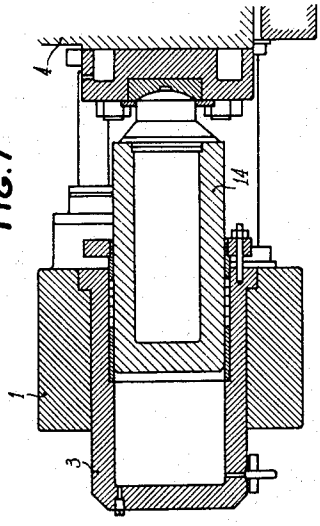
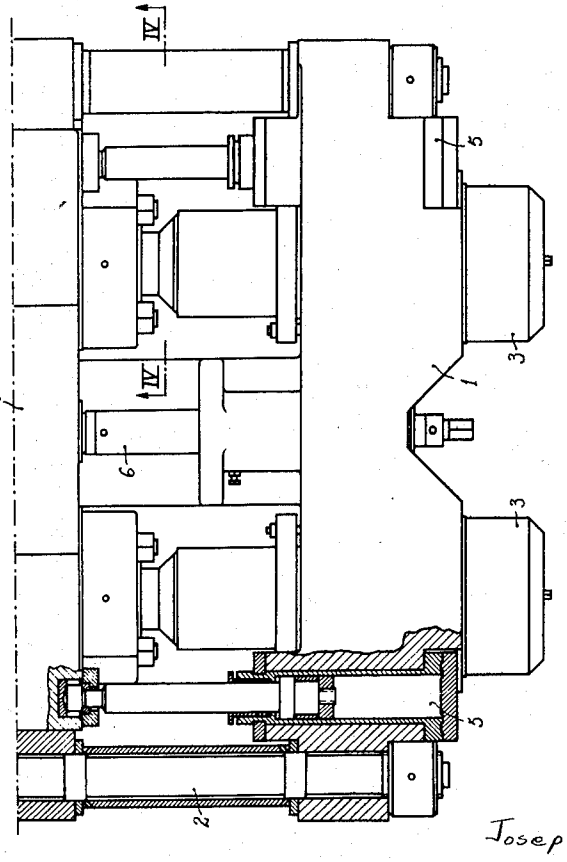


FIG. 5



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2,747,253

DEVICE FOR FORGING PARTS HAVING LARGE CROSS-SECTIONAL VARIATIONS

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Application September 21, 1951, Serial No. 247,636

Claims priority, application France February 19, 1951

1 Claim. (Cl. 29—6)

This invention relates to a modification in the forging apparatus described in U. S. Patent 2,534,613, issued December 19, 1950, assigned to the same assignee.

The forging process which resulted from the operation of the apparatus described in the said prior patent, essentially utilizes only the power of the press itself in order to camber or swage the blank, this action being exerted by means of two sliding cradles controlled in horizontal displacement by a corresponding pair of inclines or slopes of the upper cross-member of the apparatus, the said upper cross-member being secured to the movable cross-beam of the press.

Accordingly, the forging capacity of this prior apparatus is primarily dependent on the power of the press, allowance being made for the maximum lift of the movable cross-beam which conditions the dimensions of the apparatus.

Where the lift of the press allows an apparatus corresponding in capacity to the power capacity of the press to be installed, the capacities of both apparatus, viz. the press and the forging apparatus, are utilized in full. Where on the other hand the lift is low, and only enables an apparatus of reduced size to be installed, which does not correspond to the press capacity, there is an unbalance between the capacities of both apparatuses. In such cases, it is possible, by replacing the over-short posts or standards of the press by longer ones, to avail oneself of the necessary clearance required by an apparatus corresponding in power-capacity to that of the press. In some types of presses, a similar result may also be obtained by removing the movable press cross-beam and substituting for it the upper cross-bar of the forging apparatus, removable guideways then being adapted to said upper cross-bar, said guideways being supported on the press standards, and bearings for the press pistons being further provided.

Where the vertical lift of the press is high and allows of a large-capacity forging apparatus being installed, but at the same time such apparatus cannot be used in full because the press lacks the necessary power, it is advantageous to provide a compensating device which will impart the necessary complement of power.

It is the provision of this power compensating device which forms the main object of this invention. Another object is to provide such a compensating device for the purpose stated which is readily adaptable to a forging apparatus of the type described in the aforementioned U. S. Patent 2,534,613 and which will not alter the basic operation of such apparatus.

Generally speaking, owing to the provision of a compensating device according to this invention, the forging capacity of an apparatus as claimed in the said prior patent is no longer imperatively limited by the power capacity of the press, but will only depend on its maximum lift and the width dimension of its movable cross-beam. Accordingly, an object of the present invention, may be stated as taking the fullest advantage of medium-sized presses for the making of large forgings thereon.

One embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figs. 1 to 3 are general views, more or less diagrammatical;

Fig. 1 is an elevation, partly in central cross-section on line I—I of Fig. 3, the compensating device being shown in outer view;

Fig. 2 is an overhead plan, partly in section on line II—II of Fig. 3;

Fig. 3 is a transverse end view;

Figs. 4 to 7 illustrate a practical embodiment of the device;

Fig. 4, on its right side, is a half-section on line IV—IV of Fig. 6, and on itse left side, an outer end view;

Fig. 5 is an overhead view, its left-hand end part being a half-section on line V—V of Fig. 4;

Fig. 6 is a section on line VI—VI of Fig. 4; and

Fig. 7 is a section on line VII—VII of Fig. 4.

Similar elements bear the same references throughout the drawings.

In the example selected for illustration, the apparatus to be provided with a compensating device according to the invention is designed for use with a press 3,300 metric tons in capacity having a vertical lift of 3.75 m. Its use makes it possible to forge with this press, such parts as, say, crankshafts having a maximum stroke of 600 mm., with elliptical flanges, whereas if such crankshafts were to be forged with the apparatus as described in the aforesaid prior patent not provided with the compensating device, a press 6,000 tons in capacity would have to be used. In the present instance, the press supplies 1100 tons out of the total thrust on each cradle, while the compensating device supplies a complement of 800 tons.

The forging apparatus is identical with that described in the aforesaid prior patent, except that its under bed which supports the cradles and is to receive the compensating device, is modified.

As shown in Figs. 1 to 3, the compensating device is mounted on a pair of cross-arms **1** firmly secured on the respective ends of the bed by four tie-bolts or the like **2**. The compensating device comprises: (1) a pair of hydraulic cylinders **3** mounted on each cross-beam **1** and containing presser pistons therein adapted to exert their action on the lower ends of the cradles **4** vertically in line with the slideways. These cylinders supply the complementary force which the press itself is incapable of developing. (2) Two cylinders **5** are located on each cross-beam, serving to reset the cradle on the related side of the press. In the apparatus as described in the parent patent these cylinders were incorporated in the under bed. For greater simplicity they have here been shown as arranged on the respective cross-beams of the compensator. (3) An abutment screw-jack or piston **6** enables very accurate adjustment of the amount of recoil of each cradle after the forging operation. (4) A control distributor unit **7** for controlling the compensator cylinders is arranged adjacent the control distributor **8** controlling the press, for allowing a coordination to be made in the control of the actions of the press and the compensator.

A junction box **9** secured to the bed is adapted to interconnect the two opposite groups of auxiliary cylinders. Water is supplied under high pressure to the junction box **9** through a line **10** provided with a universal swivel connection whereby the delivery line **10** may follow the bed of the apparatus in its displacements.

A cut-off valve **11** is arranged adjacent to the distributor units **7** and **8** for disabling the compensating cylinders where their use is unnecessary as when forging small parts.

The above-described arrangement operates as follows: With the blank A (shown as a crankshaft blank) positioned in the apparatus and adjustments made as described

in the aforementioned prior patent, a check is made to see that the two slopes or inclines **12** of the upper cross-beam **13** are properly engaged over the ends of the corresponding inclines of the cradles **4**, and that all four pistons **14** of the compensator device are in contact engagement with the lower supports of the cradles. The two distributor units **7** and **8** are then appropriately operated to synchronize the downward movement of the press with the forward feed of the compensating pistons.

The assembly comprising the two cradles and the blank then behaves as a centrally loaded beam, the load being provided by the compressing stress acting on the crank flanges and said beam being at the same time subjected to forces at both ends, that is: the horizontal component of the press thrust at the top, and the combined action of the compensator pistons at the base of said beam. The upsetting couple which was present in the apparatus as initially described in the prior patent is thus herein eliminated. As a result, the friction between the slideways and the lower bed is greatly reduced, and the efficiency of the apparatus greatly improved.

The forging operation thus proceeds without any difficulty until the upper cross-beam **13** is brought to a stop against the adjusting shims **15** supported on the cradles **4**.

The following steps are then successively performed: the upper cross-beam **13** is raised, the blank is removed from its swages, and finally the two cradles are withdrawn rearwards by means of the pistons **5**, to positions in engagement with the stops **6**.

The apparatus is then ready for a further forging operation.

What I claim is:

In a forging apparatus of the type described for forging crankshafts and similar elements which includes a base having a longitudinal slide, two cradles sliding upon said slide having slopes on both sides, an upper cross-member having slopes complementing said cradle slopes for coaction therewith, a central pair of swages between said cradles adapted to engage a blank at the site of a crank to be formed therein, clamps in said cradles engaging said blank to either side of said site and first hydraulic means for simultaneously forcing said cradles towards each other longitudinally of the blank and for bodily urging said central swages transversely of the blank, the provision of complementary hydraulic means mounted on said base and acting on said cradles at the base thereof to urge them towards each other, a first hydraulic distributor control unit for operating said first hydraulic means, and a complementary hydraulic distributor control unit adjacent to said first control unit for operating said complementary hydraulic means in synchronism with said first control unit.

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