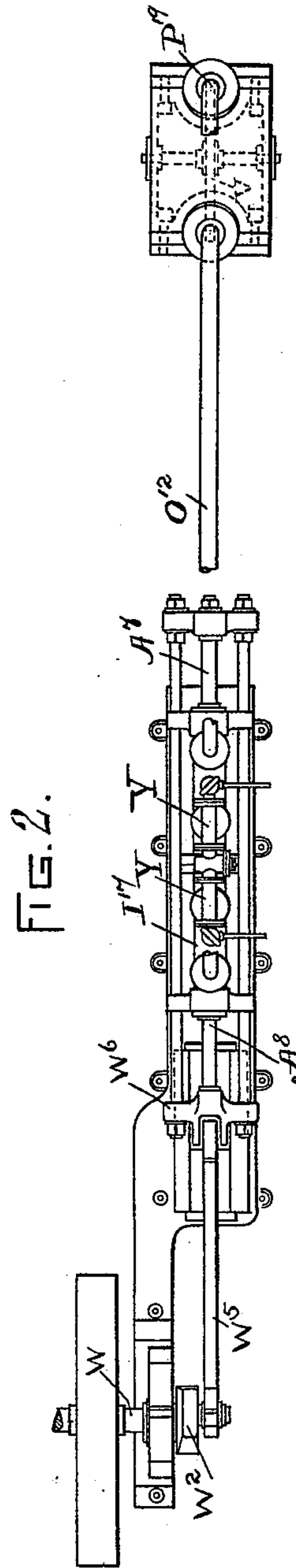
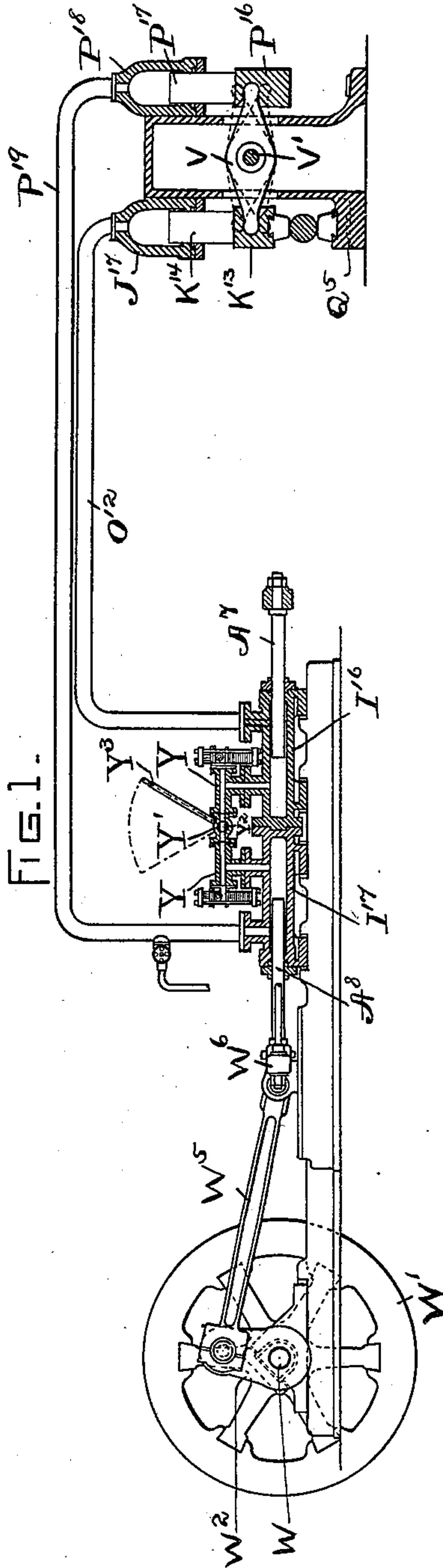
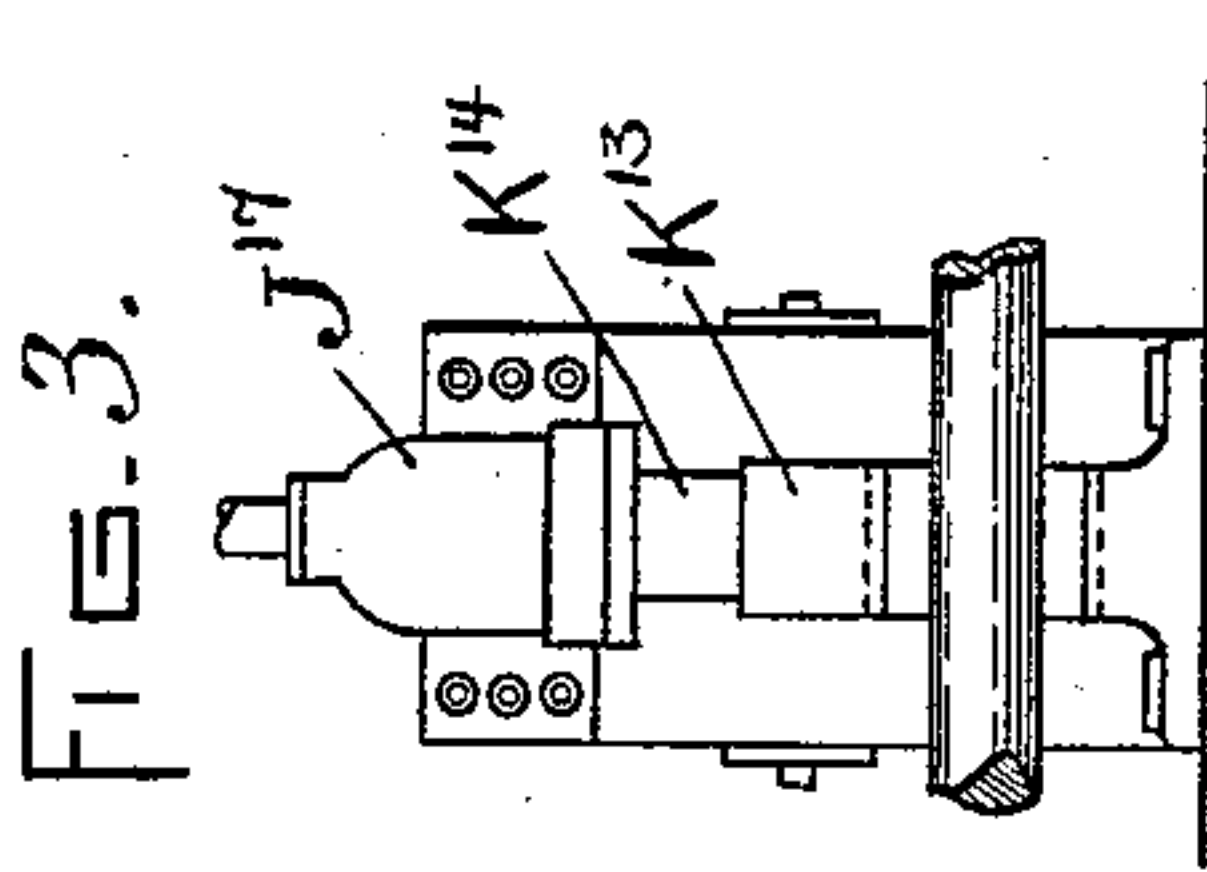


(No Model.)

J. ROBERTSON.  
HYDRAULIC PRESSING APPARATUS.

No. 560,934.

Patented May 26, 1896.



WITNESSES:  
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# UNITED STATES PATENT OFFICE.

JAMES ROBERTSON, OF MANCHESTER, ENGLAND.

## HYDRAULIC PRESSING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 560,934, dated May 26, 1896.

Application filed May 16, 1895. Serial No. 549,519. (No model.) Patented in England March 4, 1893, No. 4,722.

*To all whom it may concern:*

Be it known that I, JAMES ROBERTSON, of Manchester, in the county of Lancaster, England, have invented certain new and useful  
5 Improvements in Hydraulic Pressing Apparatus, of which the following is a specification, which improvements are shown and described in Letters Patent of Great Britain No. 4,722, dated March 4, 1893.

10 This invention relates to hydraulic pressing apparatus for use in shaping metals by the forging process, wherein liquid-actuating rams are reciprocated to transmit power to liquid-actuated rams of the press proper to  
15 alternately raise and lower the forging-head.

The particular object of the invention herein disclosed is to provide means under control of the operator for varying the degree of force in the fluid-pressure by allowing the  
20 fluid to circulate either restrictedly or freely, according as the force is to be modified or entirely removed, the operation of the ram-motor not being interrupted in either case.

The drawings which accompany and form  
25 part of this specification illustrate an embodiment of the invention.

Figure 1 shows a sectionalized side elevation of the apparatus. Fig. 2 shows a top plan view of the same, some parts being represented as broken away. Fig. 3 shows an  
30 end elevation of the press.

W designates the crank-shaft of a single-acting engine, W<sup>2</sup> the crank, and W' the fly-wheel. Said crank is connected by a coupling-rod W<sup>5</sup> with a cross-head W<sup>6</sup>, which constitutes part of a rectangular frame carrying the liquid-actuating rams A<sup>7</sup> and A<sup>8</sup>, pointing toward each other and operating in cylinders I<sup>16</sup> I<sup>17</sup>.  
35

40 The press itself is of the following construction: The forging-head K<sup>13</sup> is pivotally engaged by one end of lever V, which is supported by a pivot-pin V' in the base-support Q<sup>5</sup>, and the opposite end of said lever engages a counterbalance P<sup>16</sup>. The forging-head has  
45 a ram K<sup>14</sup>, entering a fixed cylinder J<sup>17</sup>, and the counterbalance has a ram P<sup>17</sup>, entering a cylinder P<sup>18</sup>. Pipes O<sup>12</sup> and P<sup>19</sup> connect the cylinders J<sup>17</sup> and P<sup>18</sup> with the cylinders I<sup>16</sup>  
50 and I<sup>17</sup>, which inclose the liquid-forcing rams.

The general operation will be readily understood, reciprocations of the liquid-actuating rams alternately forcing the liquid into the press-cylinders and producing reciprocations of the forging-head with oscillations of the  
55 lever V. T-shaped pipes Y and a valve-casing Y' form a waterway connecting the two cylinders I<sup>16</sup> and I<sup>17</sup>. A stop-cock Y<sup>2</sup> in the casing Y controls circulation of the liquid and is provided with a handle Y<sup>3</sup> for  
60 manipulation by the attendant. When the press-rams are to be wrought the full stroke of the liquid-forcing rams, the cock Y<sup>2</sup> is kept closed; but when the stroke of the forging-ram is desired to be reduced in length or in  
65 force the cock is partly opened, which allows a portion of the operating fluid to pass from one cylinder to the other. Forging operations can be entirely suspended by fully opening the cock, as will be apparent, while the  
70 engine continues running.

What I claim as my invention is as follows:

1. In hydraulic pressing apparatus, the combination with a press having a forging-head carrying advancing and retracting liquid-actuated rams and cylinders inclosing the same, of a pair of connected liquid-actuating rams, cylinders inclosing the latter, suitable waterways connecting the said cylinders respectively with those inclosing the  
80 press-rams, a motor connected with the liquid-actuating rams to reciprocate the same, a waterway connecting the two actuating-ram cylinders, and a hand-controlled valve in said waterway.  
85

2. In hydraulic pressing apparatus, the combination of a forging-head having a ram, a lever engaging said forging-head, a counterbalance engaged with said lever and having a ram, cylinders inclosing said rams respectively, and double-acting liquid-forcing means communicating with said cylinders.  
90

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 3d day of  
95 April, A. D. 1895.

JAMES ROBERTSON.

Witnesses:

ARTHUR C. HALL,  
JOHN H. THOMAS.