

(No Model.)

J. ROBERTSON.  
HYDRAULIC PRESSING APPARATUS.

No. 560,935.

Patented May 26, 1896.

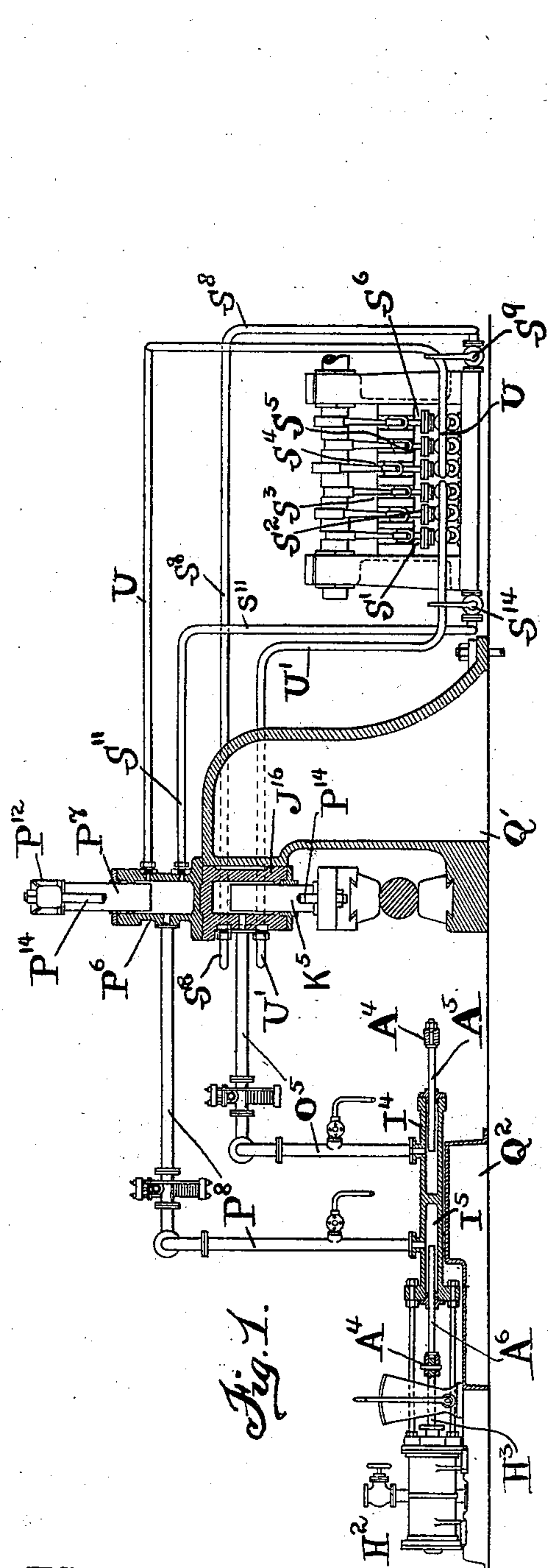


Fig. 1.

*Witnesses;*

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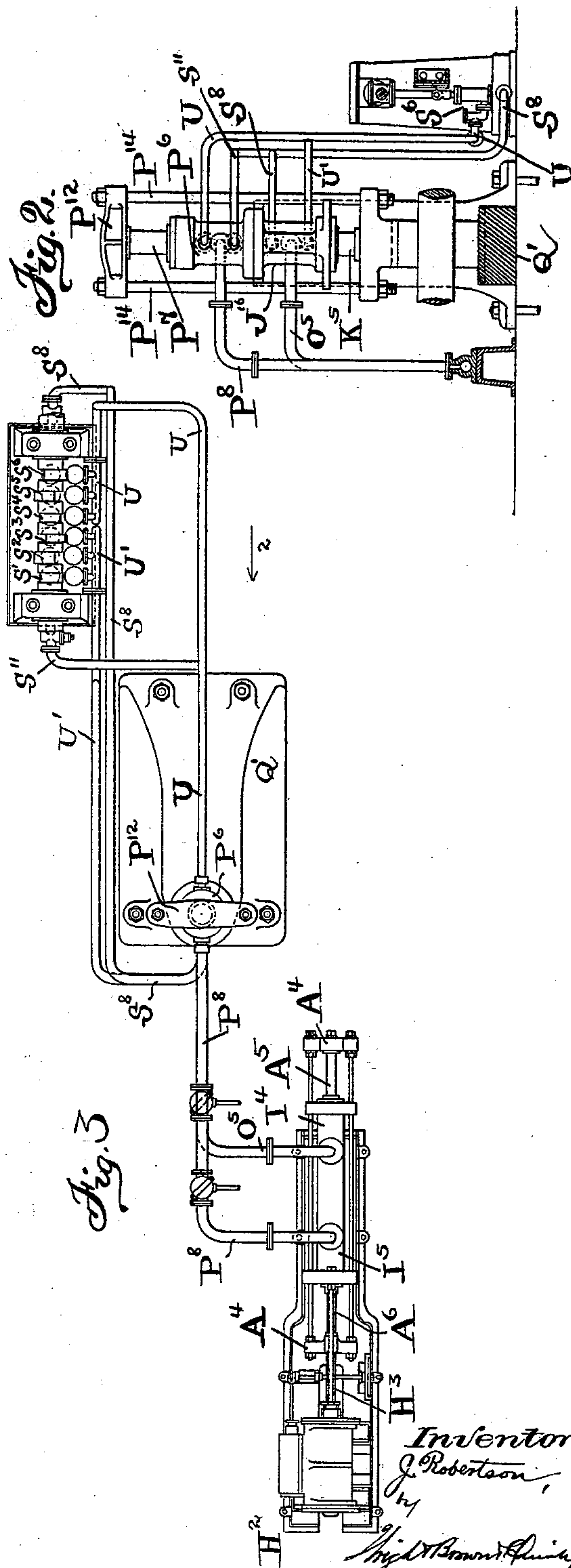


Fig. 3

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# UNITED STATES PATENT OFFICE.

JAMES ROBERTSON, OF MANCHESTER, ENGLAND.

## HYDRAULIC PRESSING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 560,935, dated May 26, 1896.

Application filed November 30, 1895. Serial No. 570,674. (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, (for which I have received Letters Patent in Great Britain No. 4,722, dated March 4, 1893,) of which the following is a specification.

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 here disclosed is to provide auxiliary liquid-forcing means to be brought into operation as desired to vary the stroke of the forging-head  
20 according to the work in hand, whereby I am enabled to employ a direct-acting steam-engine for driving the liquid-actuating rams and at the same time provide for different-length strokes of the forging-head without  
25 waste of steam. Using a short-stroke engine, the auxiliary liquid-forcing means are brought into play when a longer movement of the forging-head is desired than can be produced by the engine.

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

Figure 1 shows a sectionalized side elevation of the complete apparatus. Fig. 2 shows  
35 an end elevation of the same. Fig. 3 shows a top plan view.

Q' designates the base-frame of the press, in the overhanging portion of which there is arranged the cylinder J<sup>16</sup>, which receives the  
40 ram K<sup>5</sup> of the forging-head. On the upper side of this overhanging part of the frame there is mounted the cylinder P<sup>6</sup>, which receives ram P<sup>7</sup>, carried by cross-head P<sup>12</sup>, this cross-head being connected by side rods P<sup>14</sup>  
45 with the forging-head.

H<sup>2</sup> designates a direct-acting steam-engine, whose piston-rod H<sup>3</sup> is connected with a rectangular frame A<sup>4</sup>, carrying rams A<sup>5</sup> and A<sup>6</sup>, projecting toward each other and entering,  
50 respectively, cylinders I<sup>4</sup> and I<sup>5</sup>, which are supported on a suitable base Q<sup>2</sup>. Cylinder I<sup>4</sup> is connected by suitably-valved pipe O<sup>5</sup> with

press-cylinder J<sup>16</sup>, whereas cylinder I<sup>5</sup> connects by suitably-valved pipe P<sup>8</sup> with press-cylinder P<sup>6</sup>.

55 It will be obvious that the arrangement above described will operate to move the forging-head of the press up and down when a suitable supply of water has been introduced into the pipes and the engine is set in operation. Now this is all well enough for work  
60 capable of performance by the short stroke of the engine; but as frequently a longer movement of the forging-head is desired than can be imparted by this short stroke of the engine I provide a set of auxiliary pumps of  
65 common form, of which there are here shown six, (designated S', S<sup>2</sup>, S<sup>3</sup>, S<sup>4</sup>, S<sup>5</sup>, and S<sup>6</sup>,) and which may be employed, through means presently to be described, for the purpose of drawing  
70 liquid from the cylinder J<sup>16</sup> and forcing this liquid into cylinder P<sup>6</sup> for the purpose of raising the forging-head higher than the position to which it is brought by the engine, and vice versa for moving it downward  
75 through a greater distance.

Three of the pumps, S<sup>4</sup>, S<sup>5</sup>, and S<sup>6</sup>, have their suction ends in communication with a pipe S<sup>8</sup>, which enters the forcing-cylinder J<sup>16</sup>  
80 of the press, and the discharging ends of these three pumps communicate with a pipe U, which enters the return-stroke cylinder P<sup>6</sup> of the press. Thus with these pumps in action and the waterways properly opened liquid is drawn from the cylinder J<sup>16</sup> and forced into  
85 the cylinder P<sup>6</sup>, thereby raising the forging-head to a higher position than reached under impulse of the engine. The other three pumps, S', S<sup>2</sup>, and S<sup>3</sup>, connect by suction-pipe S'' with cylinder P<sup>6</sup> and by discharge-pipe U'  
90 with cylinder J<sup>16</sup>, so that when these pumps are brought into operation liquid is drawn from cylinder P<sup>6</sup> and forced into cylinder J<sup>16</sup>, thereby lengthening the downward movement of the forging-head over that produced  
95 by the engine. Stop-cocks S<sup>9</sup> and S<sup>14</sup> are provided in the pipes S<sup>8</sup> and S'' to control communication between the pumps and the press-cylinders, and these valves will have handles for the attendant to manipulate.  
100

When the work in hand only requires such movement of the forging-head as can be produced by the engine, then both cocks S<sup>9</sup> and S<sup>14</sup> are closed. When the pumps are used,



these cocks are alternately opened and closed to produce the lengthening of the forging-head's movement.

It may be here stated that each of the 5 liquid-forcing rams  $A^5$  and  $A^6$  is of but one-sixth the water-displacing mass of each of the forging-head pistons  $K^5$  and  $P^7$ .

What I claim as my invention is as follows:

1. In hydraulic pressing apparatus, the 10 combination with the 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, 15 suitable waterways connecting the said cylinders respectively with those inclosing the advancing and retracting rams of the press, means for reciprocating the liquid-actuating rams, and auxiliary pumping means communicating with the press-cylinders and arranged to transfer liquid from one to the 20 other, substantially as and for the purpose described.

2. In hydraulic pressing apparatus, the

combination with the press having a forg- 25 ing-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, 30 suitable waterways connecting the said cylinders respectively with those inclosing the advancing and retracting rams of the press, means for reciprocating the liquid-actuating rams, a set of auxiliary pumps communicating by suction and discharge pipes with the 35 press-cylinder inclosing the retracting ram, a similar set of pumps communicating in like manner with the cylinder inclosing the advancing press-ram, and valves in the suction-pipes, substantially as described. 40

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 29th day of October, A. D. 1895.

JAMES ROBERTSON.

Witnesses:

ARTHUR C. HALL,  
JOHN W. THOMAS.