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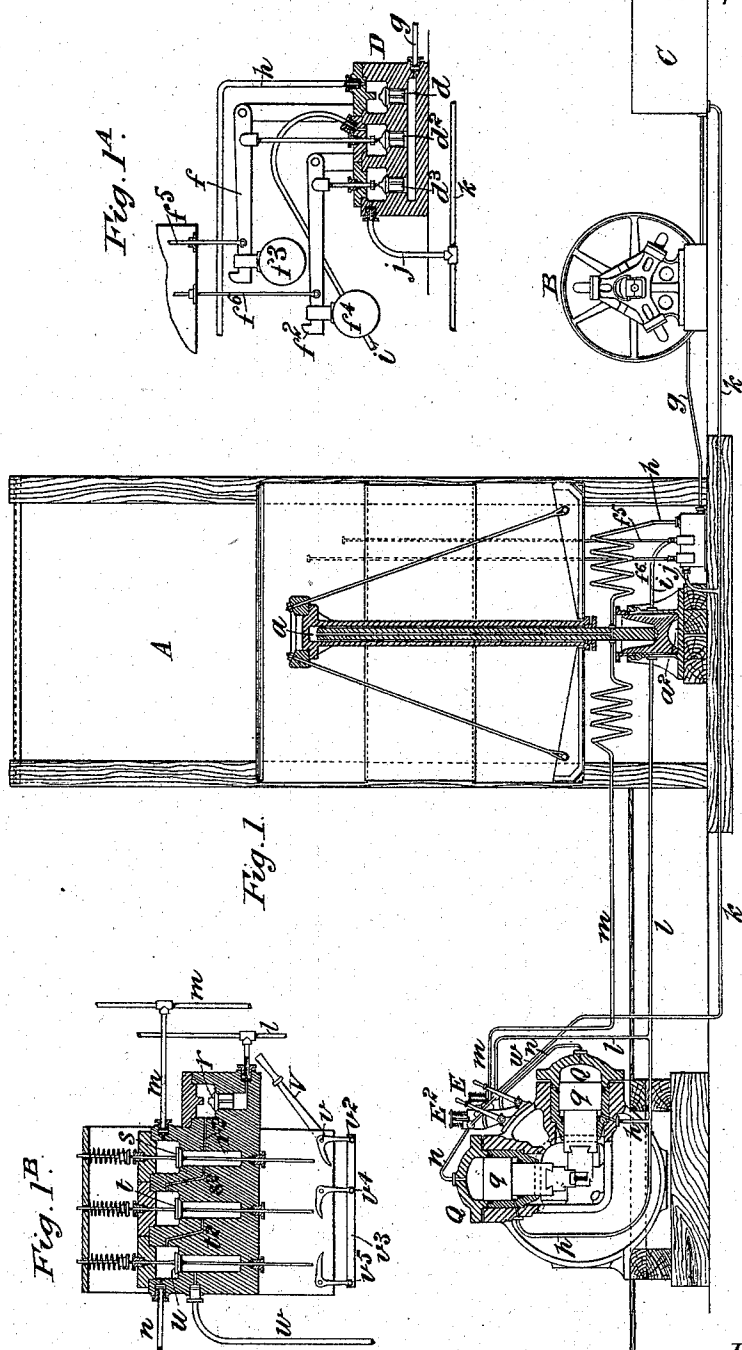
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A. H. TYLER & J. S. E. DE VESIAN.

HYDRAULIC APPARATUS FOR FORGING METALS, &c.

No. 530,313.

Patented Dec. 4, 1894.



Witnesses
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Edith J. Griswold

Inventors
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By their Attorneys
Howson and Howson

(No Model.)

3 Sheets—Sheet 2.

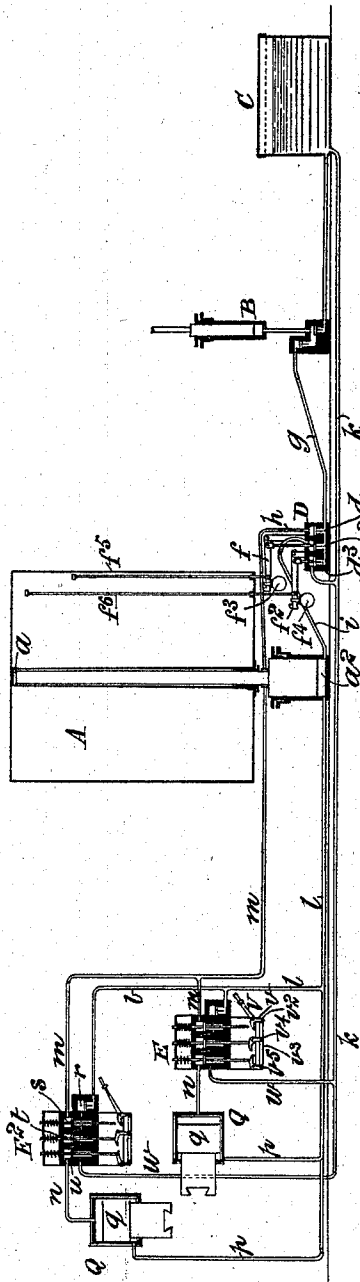
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Fig. 2.



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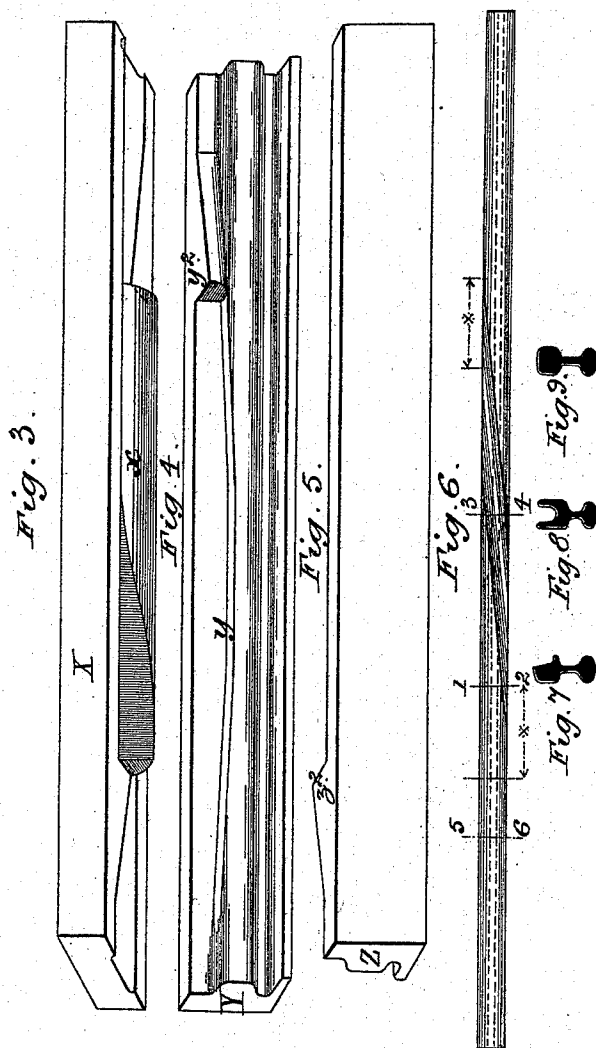
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UNITED STATES PATENT OFFICE.

ALFRED H. TYLER AND JOHN S. E. DE VESIAN, OF LONDON, ENGLAND.

HYDRAULIC APPARATUS FOR FORGING METALS, &c.

SPECIFICATION forming part of Letters Patent No. 530,313, dated December 4, 1894.

Application filed May 11, 1894. Serial No. 510,919. (No model.) Patented in England January 27, 1893, No. 1,881.

To all whom it may concern:

Be it known that we, ALFRED HUGH TYLER and JOHN STUART ELLIS DE VESIAN, engineers, subjects of the Queen of Great Britain and Ireland, and both of the firm of Tyler & Ellis, of 5 Crown Court, Cheapside, in the city of London, England, have invented certain Improvements in and Connected with Hydraulic Apparatus for Forging Metals, more especially intended for use in forging crossing grooves in railway or tramway rails, (for which we have obtained a patent in Great Britain, No. 1,881, dated January 27, 1893,) of which the following is a specification.

15 This invention has for its object to provide hydraulic forging apparatus as hereinafter described more especially intended for use for forging crossing grooves in railway or tramway rails, the arrangement being such
20 that pressure can be applied to the forging press in two stages, the first stage being effected by water at a lower pressure, than that used for giving the final pressure to the forging; but our invention is not limited to forging such grooves as it may be employed for the hydraulic forging of metals generally.

In describing our invention we will refer to the accompanying drawings, which show the best means with which we are acquainted for
30 carrying our invention into effect; but we do not limit ourselves to the precise details shown as it will be evident that they may be varied without departing from the nature of our invention.

35 Figure 1 is a vertical section and Fig. 2 is a diagram illustrating the general arrangement. Fig. 1^a shows the valves and passages in the valve box D drawn to a larger scale and Fig. 1^b shows the valves in the valve box
40 E (or E²) also drawn to a larger scale. Fig. 3 is a view of the top die, and Figs. 4 and 5 are views of the opposite side dies for forming a crossing groove in railway rails. Fig. 6 is a plan view of the rail, and Figs. 7, 8 and 9 are
45 cross sections of the rail, taken on lines 1—2, 3—4, and 5—6, respectively, of Fig. 6.

The accumulator A has two spaces a and a^2 of different cross sectional area, into which the water is pumped through valves so arranged that after the load has been raised to
50 the requisite height by the pumping of water through the pipes g and h and valve d into

the space a of smaller sectional area, the water is cut off from communication with that space, and communication is opened so
55 that the water is pumped into the space a^2 of greater sectional area, and when the load has been, by this, further raised, this communication is also closed and the water can be then pumped back to the receptacle C, from
60 which it was drawn, by the pump B, by reason of the return passage to this receptacle being opened when both the other communications are closed. The pump can thus be kept constantly at work to supply water to the accumu-
65 lator as pressure water is consumed therefrom. The valves may be operated by hand or the load box of the accumulator itself as it rises may as shown in the drawings automatically act upon weighted levers to allow the commu-
70 nications for the water to open as described. For this purpose there are three valves d d^2 d^3 in the valve box D, the valve d , being a simple check valve. The other valves d^2 d^3 also act as check valves, but are pressed to their seat
75 by the levers f f^2 and weights f^3 f^4 . These weights keep the valves d^2 d^3 closed, but when the load box reaches the proper elevation, it acts on a stop on the trip rod f^5 and so lifts the lever f and weight f^3 so that the
80 said valve d^2 opens, and the water is pumped through the pipe i , into the low pressure space a^2 the high pressure water being prevented from passing into the said space by the closing of the check valve d . When the load
85 box has been still further raised the trip rod f^6 is acted upon so as to raise the lever f^2 and weight f^4 when the valve d^3 opens (the valves d d^2 closing) and the water is pumped back by the pipes j and k to the tank C. When
90 the load box of the accumulator falls, the weighted levers again bear on the valves, and the operations described are repeated.

The cylinders Q of the press have pipes l and m for communicating (through the valves
95 hereinafter described and pipes n), from one side of the plungers q , with the space a a^2 of the accumulator containing water at the different pressures due to the difference of the cross sectional area of the said spaces, and
100 there may be pipes p , also leading from the reverse sides of the said plungers q , to the low pressure water space a^2 of the accumulator to apply pressure sufficient to move back

the plungers q , after the dies carried by them have acted upon the forging in the press. The supply of the high and low pressure water, to put the pressure on the plungers q , for bringing the dies into action may be admitted as required by means of one handle by an arrangement of valves in the boxes E E^2 . As the arrangement is the same in connection with both valve boxes, we will describe one, the description applying also to the other. The arrangement consists of a back pressure valve r , (see the letters on the larger Fig. 1^B) to beneath which the low pressure water enters by the pipe l , the space above this valve communicating by a by pass r^2 , with the space beneath another or second valve s and by another by pass s^2 with the space above a third valve t , thence passing when the last named valve is opened by another by pass t^2 to the space above a fourth valve u and by the pipe n , to the cylinder Q , of the press. The valve handle V , is so connected to bell crank levers, or other appliances, that when the handle is operated, the valves can be opened in such wise as to allow either low or high pressure water to pass to the cylinder of the press, or to allow water to escape therefrom, or to allow all the valves to close as desired. The arrangement shown in the drawings is a convenient means for effecting this. The handle V is centered at v , and has fixed to its axis a bell crank lever v^2 which is connected by the rod v^3 with the other bell crank levers v^4 and v^5 , the said levers being arranged as clearly shown in the drawings, so as to operate as hereinafter described.

When the lever is first operated by being turned downward, the valve t is operated (against the pressure of its spring) by the bell crank lever v^4 acting on its spindle, and the low pressure water passes by the pipe l , valves r and t , and passages r^2 s^2 t^2 , and pipe n , to the cylinder Q of the press, and the plunger q , is thus moved up to its work. When this is done, by a further movement of the handle in the same direction, the bell crank v^2 acts on the spindle of the valve s , which is thus also opened (against the pressure of its spring) so that the high pressure water enters by the pipe m , past the said valve s (and by its superior pressure, it closes the retaining valve r , and shuts off the low pressure water) the said high pressure water then passing by the two valves s , t , which are now open, and by the passages s^2 t^2 , and pipe n , and into the cylinder Q of the press to apply the final or forging pressure. By operating the handle in the reverse direction the valves s , t , close (by the action of their springs) and the valve u is opened by the bell crank lever v^5 acting on the spindle of the said valve and the low pressure water which communicates with the space on the opposite side of the plunger will move the plunger (and its die) back the water by which the pressure was applied passing from the cylinder, through the pipe n , valve u and pipe w , back through the pipe k , to the

reservoir C from which the pump B , of the accumulator A draws its supply.

When the handle V , is in the position shown in the drawings all the valves are closed. An arrangement as described is as shown applied to each of the cylinders where (as in the case illustrated) more than one cylinder is used in the press so that the dies operated by the plungers in the cylinders can be operated at different times or there may be one such arrangement of valves for two or more cylinders in cases where the dies are to act both or all at the same time.

When the press is used for the forging of diagonal crossing grooves in railway or tramway rails the forging is preferably effected by means of dies so made and operating that the metal which is displaced by the formation of the groove is so disposed that the rail is practically of the same strength throughout the parts which would otherwise be weakened by the formation of the groove being reinforced by the displaced metal. With this object the dies are made with hollows or recesses in such places as correspond with those parts of the rail which are to be reinforced by the metal displaced by the diagonal projections of the dies which form the grooves. We preferably provide three dies as shown in Figs. 3, 4 and 5, one X for acting on the top of the rail and two (Y Z) for supporting the rail and for acting upon it at its sides, the dies Y Z each containing the recesses (as at y) for the displaced metal and having each a diagonal projection (y^2 z^2) on it for forming respectively by sidewise action on the rail those parts (at $*$ in Fig. 6 which is a plan of the crossing rail) of the opposite ends of the groove which open at the sides of the rail one of the said dies being stationary, and the other movable by the hydraulic press. The die X which acts on the top of the rail has a projection x on it which is shaped so that it forms the main part of the groove in the rail, viz: that part which lies between the portions formed by the projections y^2 z^2 .

Figs. 7, 8, and 9 are cross sections of the rail respectively taken on the lines 1—2, 3—4 and 5—6 of Fig. 6.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. In hydraulic apparatus for forging metals, &c., the combination of an accumulator having differential spaces, a pump and a supply tank, with valved pipe connections between the pump and the low pressure space, between the pump and the high pressure space and from the pump back to the supply tank, and means for controlling the valves in the two last named connections to open them in succession or to close them to allow the other valve to open, all substantially as set forth.

2. In hydraulic apparatus for forging metals, &c., the combination of an accumulator

having differential spaces, a pump, a supply tank and a forging press, with valved pipe connections from the pump to the high pressure space and from the high pressure space to the press, from the pump to the low pressure space and from the low pressure space to the press, and from the pump back to the supply tank whereby the one pump may supply either high pressure fluid or low pressure fluid or both to the press, substantially as set forth.

3. In hydraulic apparatus for forging metals, &c., the combination of an accumulator having differential spaces, a pump, a supply tank and a forging press, with pipe connections from the pump to the high pressure space and from the high pressure space to one side of the plunger of the press, from the pump to the low pressure space and from the low pressure space to both sides of the plunger of the press, and from the press back to the

source of supply, and a system of valves to control the admission of either high or low pressure liquid to or exhaust from the press, all substantially as set forth.

4. A hydraulic apparatus for forging crossing grooves in rails, provided with dies having diagonal projections to form the crossing groove, and recesses to receive the metal displaced by the projections, whereby the rail is practically of the same strength throughout, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

A. H. TYLER,
J. S. E. DE VESIAN.

Witnesses:

WM. JOHN WEEKS,
S. CRANSON,
Both of 31 Lombard Street, London, E. C.