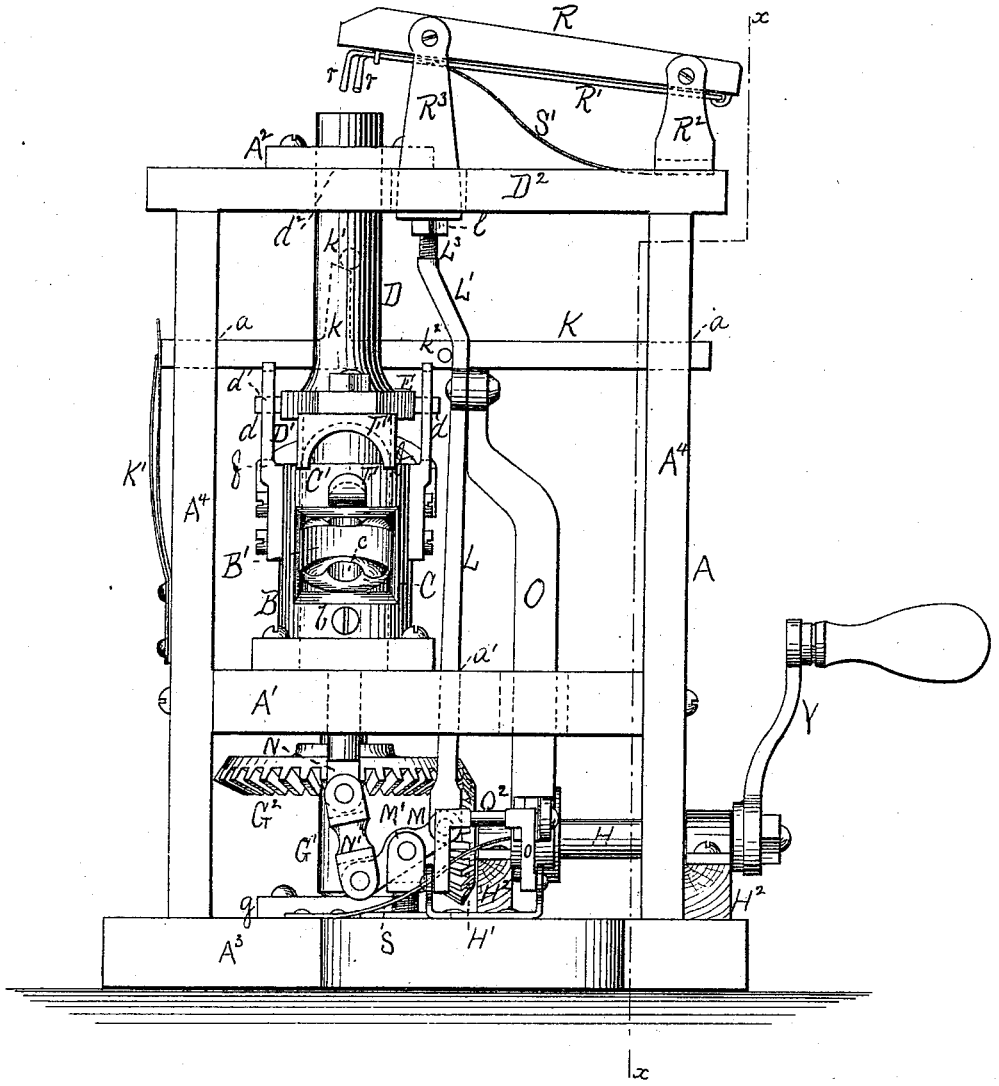
2 Sheets--Sheet 1.

B. HERSHEY.

Machine for Welding Chain Links.

No. 166,374. Patented Aug. 3, 1875.

Fig 1.



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per J. E. F. Holmead,
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Fig. 2.

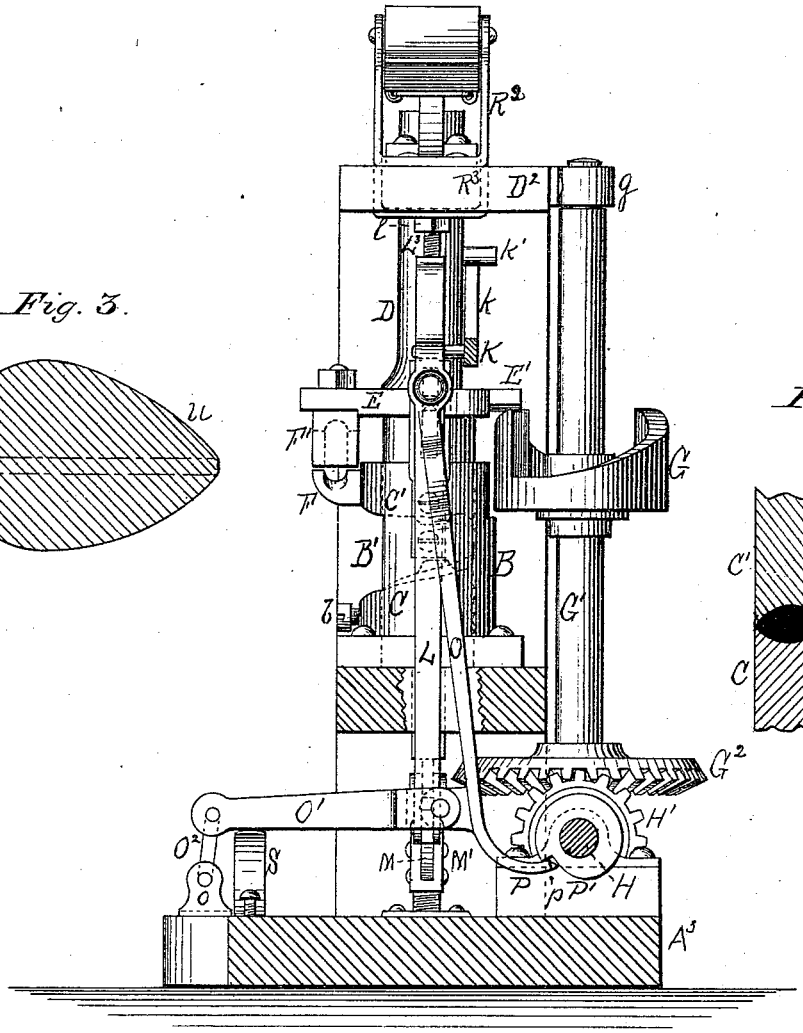


Fig. 3.

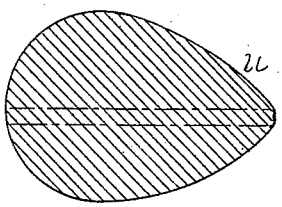
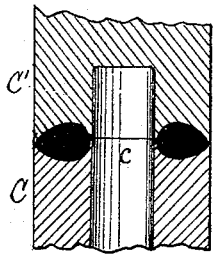


Fig. 4.



Witnesses:
Edwin James
John K. Jones.

Inventor:
Benjamin Hershey.
per J. E. F. Holmead
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UNITED STATES PATENT OFFICE.

BENJAMIN HERSHEY, OF ERIE, PENNSYLVANIA, ASSIGNOR TO PITTSBURGH CHAIN AND CAR LINK MANUFACTURING COMPANY.

IMPROVEMENT IN MACHINES FOR WELDING CHAIN-LINKS.

Specification forming part of Letters Patent No. **166,374**, dated August 3, 1875; application filed March 17, 1875

CASE E.

To all whom it may concern:

Be it known that I, BENJAMIN HERSHEY, of the city and county of Erie, and State of Pennsylvania, have invented certain Improvements in Welding-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing and the letters of reference marked thereon, making part of this specification, in which—

Figure 1 is a front view. Fig. 2 is a vertical sectional view on the line *x x*, Fig. 1. Fig. 3 is a view showing the form of print effected by the action of the first set of dies. Fig. 4 is a vertical sectional view of the dies.

With the exception of the dies, which are provided with cavities of a novel form, and which are designed to effect a most important result in connection with the distribution of the surplus or excess of metal which the lapping of the scarfed ends of the link provides, and which renders the dies that effect the first stage of the welding in my present invention new in themselves, my present machine is merely an improvement on the chain-machine embraced in and covered by Letters Patent of the United States issued to me May 20, 1873, No. 139,151—that is, the different mechanical features in the two inventions are designed to produce corresponding or similar results; but the mechanical combinations in the present invention are far more simplified, and consequently far more practical, than are those described and claimed in the patent referred to, and in this is found the chief value of my present improvement.

The first part of my invention consists in the form of the cavities in the welding-dies, which are counterparts of each other, and which are of such outline as will give to the welded section of the link an obovate form in cross-section, the thicker portion being at the inside of the link, said cavities being of semi-obovate form at the center of their curved portion, and gradually approaching the original form of the blank, until, at the junction of their curved and their straight portions, they are of said original form.

My invention consists, further, in employing, in connection with the dies referred to, finishing-dies consisting of a horn-die and a female cap-die, the form of whose cavities are such that through their action the obovate print produced at the welded section of the link through the action of the first of the series of dies shall be reduced and rendered uniform with that of the original or unwelded sections of the link.

My invention also consists in so arranging the stationary dies of the two sets in connection with the die-box or sleeve, and the two movable dies in connection with the plunger, as to permit of their simultaneous movement, and which allows of the two different stages of the process of welding and finishing the link being carried on in connection with different links at one and the same time.

My invention also consists of a novel arrangement of stop-bar, and which is similar to the stop-bar of my former patent, in conn ction with springs and suitable mechanism worked through a treadle, so that while the tension of the spring is constantly employed to drive the stop-arm to such a position as to cause its shoulder to engage with a bearing-pin on the plunger, to catch and retain the same, and thus arrest the downward movement of the traveling dies, yet simply, by depressing the treadle, it, through its connections with the bar, so pushes the latter as to free its shoulder from all contact with the plunger, leaving the latter free to act as impelled by the cam, and so continue to act until the pressure is removed from the treadle, when instantly the bar is automatically returned, its shoulder again engaging with the bearing on the plunger, and again holding the latter free from all contact with its operating-cam.

My invention also consists in a novel form, arrangement, and connection of a lever with a traveling tongue, the bed-plate of a spring, and a bearing on the stop bar, that, simply by depressing the treadle, the lever shall be caused simultaneously to drive up the traveling tongue, to steady the link in the stationary die during the process of welding, to so push the stop-bar as to release the plunger, and to so draw on the bed-plate of the spring as to bring the latter in such position

that its utmost tension and power can be employed in adding force to the downward movement of the plunger and the hammer-dies which it carries.

My invention also consists in arranging on the driving-shaft a cam-wheel, and which, in connection with the bent or shoe-shaped end of a bearing-arm, so draws on said arm that, through its connection with the lever-arm attached to the bed-plate of the spring, just as the downward movement of the plunger begins, the full tension of the spring shall be developed, and the cam shall continue to so act against its bearing as to relieve the operator of the pressure on the treadle during the movements of the plunger, which he would otherwise be required to exert.

The construction and operation of my invention are as follows: A is a rectangular frame, and which supports the entire operating mechanism. On an intermediate cross-plate or bed, A^1, of the frame A is bolted or otherwise firmly secured the base-plate of the die-box or cylindrical sleeve B, a portion of whose front face is cut away, as shown at B′, to allow access to the lower or stationary die C, and which is secured, by a detachable fastening, *b*, in the lower section of the die-box or cylindrical sleeve B. C′ is the movable die, that acts in conjunction with the stationary die C, and through whose joint action the first stage of the welding of the link is effected. The cavities in these dies C C′ are counterparts of each other, and are of such outline as will give to the welded section of the link an obovate form in cross-section, the thicker portion being at the inside of the link, said cavities being of semi-obovate form at the center of their curved portion, and gradually approaching the original form of the blank, until, at the junction of their curved and their straight portions, they are of said original form. This die C′ is movable, and is attached to a vertical traveling plunger, and which enters and works in the upper section of the die-box or cylindrical sleeve B; and its action is further directed by means of its lateral bearing-pins *d d* entering and working in the slots d^1 d^1 of the vertical bearing-plates D^1 D^1, and which are secured to, and project above, the upper surface of the die-box or sleeve B. The upper section of the plunger passes through an opening, d^2, of the bearing-plate A^2, and which is secured to the upper cross-section D^2 of the frame A. The arrangement of the plunger D and its various bearings is clearly shown in Fig. 1.

To the plunger D, and above the die C′, is secured a longitudinal bearing-plate, E. At its rear section this plate E is provided with an inclined bearing, E′, and against which the cam-wheel G acts. To the front section of this plate E is secured so as to be detachable a cap-die, F′, and which acts in conjunction with a horn-die, F, and which is secured at the upper section and the outer surface of the die-box B. The form and arrangement of these dies F F′ are clearly shown in Fig. 2. About the form of their cavities, and the impression which they will print on the link, there is nothing peculiar, as they simply reduce the obovate form which has been given to the welded section of the link through the action of the dies C C′, and which is shown in Fig. 3, to a form that corresponds with the main section of the link or blank, the projecting jaws or sides *f f* of the die F′ preventing the parallel sides of the link from spreading during the process of said reduction. The cam-wheel G is firmly keyed on a vertical driving-shaft, G^1, and which is secured and works in suitable bearings *g g* attached to the upper cross-piece D^2 and the bed A^3 of the frame A. At the lower section of this shaft G^1 is a beveled gear-wheel, G^2, and which gears with the pinion-wheel H^1, attached to the driving-shaft H, and which shaft is journaled in suitable bearings H^2 H^2 on the bed-piece A^3. The revolution of this shaft H revolves the shaft G^1, and with it the cam-wheel G, and which, through the bearing E′, alternately elevates and releases the plunger D, and thus imparts the desired motion to both of the movable dies C′ F′. K is a horizontal sliding stop-bar, and in form and function is in all respects precisely similar to the sliding stop-bar in my patent before referred to. This bar works in slotted bearings *a a*, cut through the uprights A^4 A^4 of the frame A. This stop-bar K is provided with a shoulder, *k*, which is designed to engage with a bearing-pin or stump, k^1, on the rear surface of the plunger D, as clearly shown in Fig. 2. K′ is a flat plate or other spring, secured to the outer surface of one of the uprights A^4 of the frame A, and has its free end resting or bearing against the projecting end of the stop-arm K. The tension of this spring K′ is constantly employed in so pressing the stop-bar K as to cause its shoulder *k* to engage with the bearing-pin k^1 of the plunger, and thus hold its bearing E′ free from all contact with the cam-wheel G, and which arrests the movement of the plunger. L is a vertical lever, which works through a slotted bearing, *a′*, in the intermediate cross-plate A^1 of the frame A. At its lower section this lever L is pivoted to a short lever, M, and which is pivoted in a bearing, M′, seated on the base or bed piece A^3 of the frame. To the opposite end of this pivoted oscillating lever M is attached, by pivot-joint connection N′, the traveling tongue N, and which tongue is in all respects similar to the traveling tongue of my former patent, and works through a center opening, *c*, of the die C, precisely as that tongue does. This tongue, after the link is placed in the die C to be welded, is forced up, so as to provide an interior bearing for the same, and serves to retain it in proper position for the action of the traveling die C′. At its upper section the lever L is bent, as shown at L^1, and which provides an inclined bearing, and which is designed to act against the bearing-pin k^2, secured at the front face of the stop-arm K. Thus it will be seen, when the

lever L is so drawn down as to overcome the tension of the spring K′, its bearing-shoulder L^1 will so press against the bearing-pin k^2 on the stop-arm K, as to press that arm so out as to free its shoulder *k* from the bearing k^1 of the plunger, and cause the latter to fall to such a position as will permit the cam-wheel G to engage with its bearing E′, and thus operate the plunger, and of course the dies C′ F′.

O is a treadle-arm, and is pivoted at its upper section to the lever L, and at its lower section to a horizontal lever, O^1, and which is secured to a swinging treadle, O^2, and which is pivoted in suitable bearings, *o o*, secured to the bed-plate of the frame. This arm O terminates at its rear section in a bent or shoe bearing, P, and which is designed to act in connection with the cam P′ on the main driving-shaft H, and which cam is relatively so arranged on said shaft that just before the plunger D reaches its highest elevation through the action of the cam-wheel G, the toe *p* of the cam-wheel P′ shall, through the bearing P, draw down the lever L, and cause said lever to draw with greater tension on the bed R, and to which the torsion-spring R^1 is attached, and thus the entire force and power of this spring is acting on the upper surface of the plunger, to add weight to its downward blow, the instant it is released from the cam-wheel G. This cam P′ also, in connection with the shoe-bearing of the arm P, performs another most important function, as will be clearly understood by reference to Fig. 2. After the toe *p* strikes the bearing, the cam continues to so press on the arm P, as to relieve the operator from exerting any considerable pressure on the treadle during the movements of the plunger. This spring bed-plate R is secured in suitable bearings R^2 on the upper surface of the bearing-plate D^2 of the frame. At the forward section of this bed-plate R is secured an open socket-bearing, R^3, the parallel bearings of which pass and work through mortises cut in the cross-plate D^2. To the lower section of this bearing is secured, by means of the screw-thread L^3 and jam-nuts *l l*, the lever L, and which permits of the degree of pressure which the lever L shall exert on the bed-plate R, and consequently upon the spring R^1, being regulated and adjusted. This torsion-spring R^1 is so arranged on the bed-plate R that the outer sections of its lateral lever-arms *r r* rest immediately above the upper section of the plunger D, as clearly shown in Fig. 1. S and S′ are two plate-springs, and are secured, respectively, to the bed-piece A^3, and the upper cross-plate D^2 of the frame. These springs act against the treadle-lever O and the under surface of the bed-plate R, and serve to assist in returning the different features of the mechanism which act in conjunction with the lever L to their normal condition the instant the treadle O^2 is freed from pressure.

From the foregoing full and detailed description, the operation of the machine will readily be understood. The different features of the mechanism are all in the position shown in Fig. 2, the shoulder *k* of the stop-arm K being under the bearing-pin k^1 of the plunger D. The dies C′ F′ are silent, and will so remain until, through the action of the lever L, the stop-arm K is so acted on as to release the plunger. Through a crank, Y, engine, or any other desired motor, power is now applied to the driving-shaft, and which, through the bevel-pinion H^1 and gear G^2, communicates motion to the shaft G^1 and cam-wheel G; but the dies C′ F′ yet remain silent.

The link, having been heated, is now placed on the die C, its lapping scarfed ends, or the section to be welded, being properly adjusted or arranged in the cavity of said die. This being done, the operator depresses the treadle O^2, and which, through the lever O^1 and arm O, draws down the lever L, when instantly all the different features of the mechanism are brought into active and effective operation—that is, the drawing down of this lever L causes its inclined bearing L^1 so to press against the bearing-pin k^2 of the stop-arm K as to push the same to a position that frees its shoulder *k* from contact with the bearing-pin or stump k^1 of the plunger, and which causes the plunger to fall with its bearing E′ in position to be acted on by the cam-wheel G. The same movement of the lever so draws down the bed-plate of the spring R^1 as to leave the lateral lever-arms of the spring in position to act on the plunger, and in being drawn down the lever L has so acted on the oscillating lever M as to cause it to drive the traveling tongue N up through the opening *c* in the die C, and thus cause it to afford an interior bearing for the link, serving to steady the same, and retain it in proper position for the action of the traveling die C′.

The pressure on the treadle O^2 is continued until the desired welding of the link is effected through the hammering and plunging pressure of the die C′, and which, through its action, gives the obovate form shown at *u*, Fig. 3, to the welded section of the link, and which has allowed of the proper distribution of the excess of metal which the scarfed ends of the link provide, and secures, in connection with the finishing-dies, the working up of the scarf.

The cam P′ on the driving-shaft H, by engaging with the bent bearing P on the arm O, so draws on the lever L as to cause the spring R^1 suddenly to develop its utmost tension or power on the plunger at the instant the latter begins its fall. So soon as the link is welded the pressure is released from the treadle O^2.

The springs R′ S S′ return all the features of the mechanism to the position shown in Fig. 1, and the plunger D is again held in a stationary position, and the tongue N having been withdrawn from its bearing within the link, the ready removal of the latter is provided for.

The first stage of the welding having been thus effected, the link is now placed on the die F for the action of the traveling die F′, and which, through its hammering action, reduces the welded section of the link to the desired form.

While this process is being carried on, it will readily be seen that a fresh link can be placed in the die C, and thus the separate stages of the welding process can be carried on, on separate links, at one and the same time.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The dies C C′, having cavities of such outline as will give to the welded section of the link an obovate form in cross-section, the thicker portion being at the inside of the link, said cavities being of semi-obovate form at the center of their curved portions, and gradually approaching the original form of the blank, until, at the junction of their curved and their straight portion, they are of said original form, as and for the purpose specified.

2. In combination with dies C C′, having cavities of a semi-obovate contour, the finishish-dies F F′, the same being connected, respectively, with the sleeve B and traveling plunger D, to operate substantially as described, as and for the purpose specified.

3. The sliding stop-bar K and plunger D, having bearings k k^1, lever L, having an inclined bearing, L^1, arranged in connection with a bearing-pin, k^2, on the stop-bar, as shown, spring K′, and treadle M, the latter secured to the lever L through a suitable connection, the whole being combined and arranged to operate substantially as described.

4. In combination with the stop-arm K, pin k, and the plunger D, having bearings, as shown, the lever L, having inclined bearing L^1, pivoted lever M, and traveling tongue N, the whole being combined and arranged as shown, to operate substantially as described.

5. The bed-plate R, spring R^1, lever L, rod O, having an outer hook-bearing, P, cam P′, and lever O^1, the whole being combined and arranged to operate substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

B. HERSHEY.

Witnesses:
JOS. T. K. PLANT,
EDWIN JAMES.