

1,316,211.

Fig. 1

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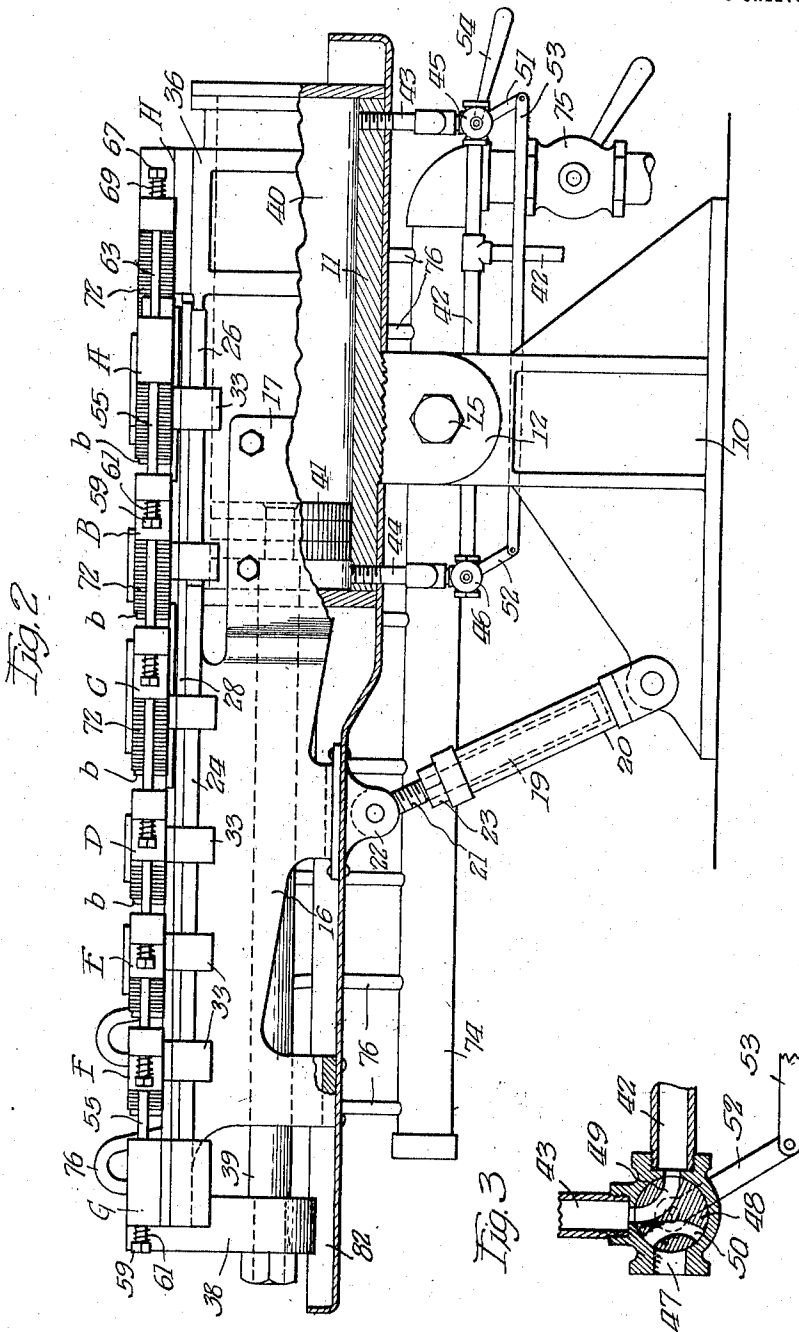
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 SPRING MACHINE.

APPLICATION FILED APR. 18, 1918.

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3 SHEETS—SHEET 2.

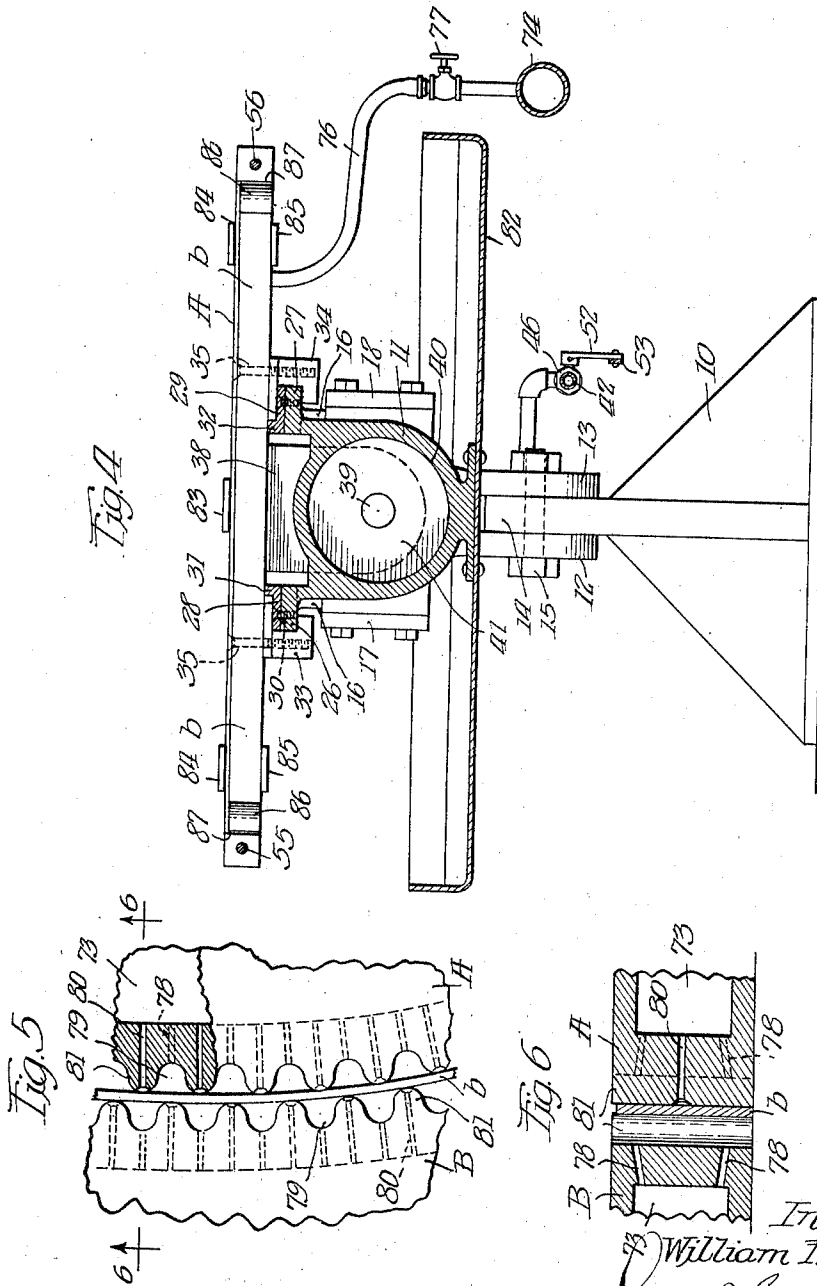


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UNITED STATES PATENT OFFICE.

WILLIAM F. WEGNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE MAREMONT MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION.

SPRING-MACHINE.

1,316,211.

Specification of Letters Patent.

Patented Sept. 16, 1919.

Application filed April 18, 1918. Serial No. 229,280.

To all whom it may concern:

Be it known that I, WILLIAM F. WEGNER, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Spring-Machines, of which the following is a specification.

My invention relates to spring machines, particularly to a machine for making bow springs for vehicles.

The general object of the invention is to form in one operation the various leaves of a bow spring so that these leaves are then ready to be secured together to form the bow spring. More in detail, the machine of my invention is adapted to receive between suitable movable forming dies pieces of steel bars of a length corresponding to the leaves of the spring to be formed, and to bring the dies together to bend the bars and to give them the proper leaf curvature, all in one operation. Another feature of the invention resides in improved means for cooling and tempering the leaves after they have been bent by the dies while in heated condition.

The above essential features and other features of construction and arrangement are fully disclosed on the accompanying drawings in which

Figure 1 is a plan view,

Fig. 2 is a side elevational view, partly in vertical diametral section,

Fig. 3 is an enlarged sectional view of an air controlling valve structure,

Fig. 4 is a sectional view on plane 4—4, Fig. 1,

Fig. 5 is an enlarged plan view of opposed die members, partly in section, and

Fig. 6 is a sectional view on plane 6—6, Fig. 5.

In general, the machine involves a series of bow shaped die blocks or forms between which steel blanks are supported, and powerful means for shifting and bringing the die blocks together so that the blanks are bent into leaf shape between the opposed curved faces of the respective die blocks, together with means for introducing cooling and tempering fluid into the die blocks which are hollow and provided with apertures for conducting the fluid against the sides of the hot formed leaves.

Referring to the drawings, the operative parts of the machine are supported on a base 10. 11 represents a cylinder structure having parallel supporting lugs 12 and 13 extending downwardly therefrom to receive between them the flat upper end 14 of the base 10, a pivot screw 15 extending through this end and the lugs. Extending in axial direction from the cylinder structure 11 is a bracket frame 16 of U-shape cross-section and rigidly secured to the cylinder structure by wings 17 and 18. An adjustable strut or brace link 19 has its barrel 20 pivoted at its lower end to the base 10 and its screw member 21 pivoted to the lugs 22 and extending downwardly from the frame 16, this link member enabling tilting of the frame structure 11 and 16 by adjustment of the nut 23.

At the upper ends of the side members of the frame 16 the guide flanges 24 and 25 extend laterally and are in longitudinal alignment with the flanges 26 and 27 extending from the sides of the cylinder structure 11. Top plates 28 and 29 are secured by screws 30 against the tops of the registering flanges 24, 26 and 25, 27, respectively, and form unbroken longitudinal slide surfaces. At their inner ends the plates 28 and 29 have upstanding abutment flanges 31 and 32 respectively.

The plates 28 and 29 and the registering flanges to which they are secured form slide-ways for a series of die blocks or forms A, B, C, D, E, F, and G, of which there may be any number, depending upon the number of leaves for the springs to be manufactured. These bow shaped die blocks extend transversely of the machine over the slide-ways and, as best shown in Fig. 4, each has the guide block structures 33 and 34 secured thereto by screws 35, these structures engaging against the outer sides and under sides of the guide flanges 24, 26 and 25, 27 respectively, and engage at their tops against the plates 28 and 29 and against the abutment flanges 31 and 32 of such plates. At the top of the cylinder structure 11 near its outer end a shelf 36 is provided to which is secured the stationary die block H by means of the screws 37. The shiftable die block G at the other end of the machine has a depending lug 38 to which is secured the outer

end of the piston rod 39 which extends into the cylinder chamber 40 of the cylinder structure and is there secured to the piston 41. This piston can be shifted by introduction of some fluid under pressure, as for example, steam or air. As shown, this fluid enters through the piping 42 communicating with the cylinder ends by branch pipes 43 and 44, two-way controlling valves 45 and 46 being inserted in these branches. One of these valves is shown in Fig. 3. The valve chamber communicates at one end with the piping 42 and at its other end with the exhaust outlet 47 and has the lateral outlet 15 communicating with the respective branch pipes to the cylinder. The valve plug 48 has the two arcuate ports 49 and 50 for connecting the cylinder branch pipe with either the fluid inlet piping or the exhaust outlet. As shown in Fig. 3, the port 49 connects the fluid piping with the cylinder pipe and the exhaust outlet 47 is closed. Upon turning of the valve plug in clockwise direction the port 49 will be closed and the port 50 will bring the exhaust outlet 47 into connection with the cylinder pipe. Levers 51 and 52 extend from the respective valve plugs and are connected by a bar 53. One of the valve plugs has the operating handle 54 which when turned will, by means of the levers 51 and 52 and the bar 53, simultaneously shift the valve blocks for suitable control of the cylinder. In the position shown on the drawings the branch pipe 44 is connected with the fluid supply pipe and the branch pipe 53 is connected with the exhaust outlet of the valve 45 so that fluid under pressure will be admitted into the cylinder to shift the piston 41 from the inner to the outer end of the cylinder chamber. When the lever 54 is swung in the opposite direction the outer end of the cylinder chamber will be connected with the fluid supply and its inner end will be connected with atmosphere. Extending laterally from the ends of each of the die blocks A, B, C, D, E, and F are tie rods 55 and 56. The tie rods on each die block extend through guide ways 57 and 58 at the end of the next die block and the ends of the bars have heads 59 and 60 between which and the respective die block cushioning springs 61 and 62 are inserted. Secured to the ends of the die block A are the guide rods 63 and 64 which extend through the openings 65 and 66 at the ends of the stationary die block H, the outer ends of these guide rods having the heads 67 and 68 between which and the die block the springs 69 and 70 are inserted. These guide rods keep the die blocks properly spaced and also serve to return the blocks to their normal positions when the piston is returned after a forming operation. Normally the piston is at the inner end of the cylinder, as indicated on the drawings, and the die blocks

are properly spaced apart for the reception between them of the blanks *b* which are to be bent to form the spring leaves. These blanks extend transversely of the machine between the die blocks and rest edgewise on the tops of the flanges 31 and 32. When the piston is shifted to its outer position the die block G will first move and upon engagement of this block with the adjacent blank *b*, this blank will be shifted against the next die block F, and so on, the die blocks being serially started and the heavy pressure against the piston causing the straight blanks to be bent intimately against the curved surfaces of the die blocks. During such bending operation the die blocks move along the respective guide rods. After the forming operation the piston is shifted toward the inner end of the cylinder and the die blocks will be serially returned to their normal positions, each block being carried with the adjacent block by the guide rods, the compression springs 61 and 62 cushioning the engagement and preventing sudden shifting of the blocks.

The die blocks are bow shaped, each having a concave face 71 and a convex face 72, the stationary block H having only the convex face 72, the convex face of one block being opposed to the concave face of the other and such opposed faces being preferably parallel, that is, they have the same center of curvature. However, the radius of curvature decreases progressively from the right end to the left end of the machine, that is, from the long die blocks to the shortest one, this being for the purpose of compensating for back spring and to sufficiently bend the blanks *b* so that the formed leaves will intimately engage with each other throughout their length when they are secured together at their center to form the bow spring.

When the blocks are heated before being bent they must be cooled after the bending operation and the temper restored. For this purpose the die blocks are hollow to provide the fluid chambers 73. At the side of the machine a water pipe 74 is secured to be connected through a valve 75 with a source of fluid, such as water or oil. Flexible leads 76 extend from the pipe to the chambers 73 of the various die blocks, each lead being preferably controllable by a valve 77. Through the front and rear walls of the blocks suitable outlet ports are provided for the fluid to be applied to the blanks after the blocks have been brought together. In order to cause efficient distribution of the fluid on the leaves the faces of the blocks are corrugated or transversely notched, the fluid outlet ports 78 terminating at the notches 79 and other ports 80 terminating at the ridges 81. When the die blocks are brought together and the blanks have been

bent, the valve 75 is opened and the cooling or tempering fluid will be forced through the various ports and against the leaves to cool them at the proper time so that the formed leaves will have the required temper. To receive the discharged cooling fluid a pan 82 is supported from the structures 11 and 16 below the die blocks and this pan being of extensive area the fluid is rapidly cooled. The pan is particularly desirable where oil is used as a cooling fluid as the oil after cooling in the pan can be used over again. By means of the link strut 19 the machine can be tilted sufficiently to enable the oil to be readily drained from the pan at the lower end thereof.

In order to keep the blanks horizontally aligned in the machine during the bending operation and also to prevent vertical displacement thereof, plates 83 are secured to the tops of the die blocks at the centers thereof to overlie the blanks, and at the outer ends of the die blocks upper and lower plates 84 and 85 are secured, the lower plates forming shelves on which the blanks rest at their outer ends, and the upper plates 84 overhang the blanks as soon as bending begins. Accurate bending can thus be accomplished. The longest blank which will form the inner leaf of the spring can be turned over at its ends to form bolt eyes 86, before the blank is inserted in the machine, and in order to center this blank in the machine the ends of the second die block A are provided with pockets 87 for engaging with the blank ends 86.

I thus provide a simple yet very efficient machine which will in one operation form all the leaves of a bow spring and which after the bending operation restores the temper to the metal of the leaves, all that is necessary after forming and tempering being to bind the leaves together to form the spring.

I do not of course desire to be limited to the exact construction, arrangement and operation shown and described as changes and modifications can no doubt be made which would still come within the scope of the invention.

I claim as follows:

1. In a spring machine, the combination of a row of bow-shaped die blocks, means for supporting lengths of metal bar between said blocks, and means for shifting said blocks to bend said lengths to form leaf springs.

2. In a spring machine, the combination of a supporting frame, guide-ways on said frame, a row of die blocks mounted on said frame and connected with said guide-ways, said guide-ways serving to support blanks between said blocks, and means for shifting said blocks together to bend the blanks into the form of spring leaves.

3. In a spring machine of the class described, the combination of a supporting frame, a plurality of die blocks shiftable on said frame and having opposed die faces, and means controlled by fluid under pressure for bringing the opposed faces of said die blocks together to bend and form blanks placed between the faces.

4. In a spring machine, the combination of a supporting frame, a stationary die block at one end of said frame, a row of shiftable guide blocks on said frame, said die blocks having opposed forming faces, means for supporting blanks between said faces, a cylinder mounted on said frame, a piston within said cylinder, a piston rod extending from said piston and connected with the outer shiftable die block, and means for controlling the flow of fluid under pressure through said cylinder to shift said piston to cause said blocks to be brought together to bend blanks between them.

5. In a spring machine of the class described, the combination of a supporting frame, die blocks extending transversely on said frame and longitudinally shiftable thereon, said blocks having opposed die faces for receiving between them blanks to be bent, means connecting together the outer ends of said blocks for limited relative shifting movement on said frame, and means for bringing said die blocks together whereby blanks placed between them will be bent and formed.

6. In a spring machine of the class described, the combination of a supporting frame, a cylinder structure mounted on said frame below the top thereof, guide-ways along the top of said frame, a die block rigidly mounted at one end of said guide-ways toward and away from said stationary die block, a piston within said cylinder, a rod extending from said piston and connecting with the outermost shiftable die block, means for controlling said cylinder and piston mechanism to shift said die blocks together on said guide-ways and to bend blanks placed between said blocks.

7. In a spring machine of the class described, the combination of a supporting frame, a cylinder structure mounted on said frame below the top thereof, guide-ways along the top of said frame, a die block rigidly mounted at one end of said guide-ways, a row of die blocks shiftable on said guide-ways toward and away from said stationary die block, a piston within said cylinder, a rod extending from said piston and connecting with the outermost shiftable die block, means for controlling said cylinder and piston mechanism to shift said die blocks together on said guide-ways and to bend blanks placed between said blocks, and tie rods connecting together the adjacent

outer ends of said die blocks for limiting the relative shifting movement thereof.

8. In a spring machine, the combination of a row of bow-shaped die blocks, means for supporting lengths of metal bar between said blocks, and means for shifting said blocks to bend said lengths to form leaves for a leaf spring, the radius of curvature of

said blocks varying progressively from one to the other sufficiently to cause slight over-bending of the bars to compensate for back spring of the bars. 10

In witness whereof, I hereunto subscribe my name this 3rd day of April, A. D., 1918.

WILLIAM F. WEGNER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."