March 22, 1927. 1,622,169

A. ZIDOVEC

FORGING MACHINE

Filed Jan. 3, 1922 4 Sheets-Sheet 1

FIG. 1

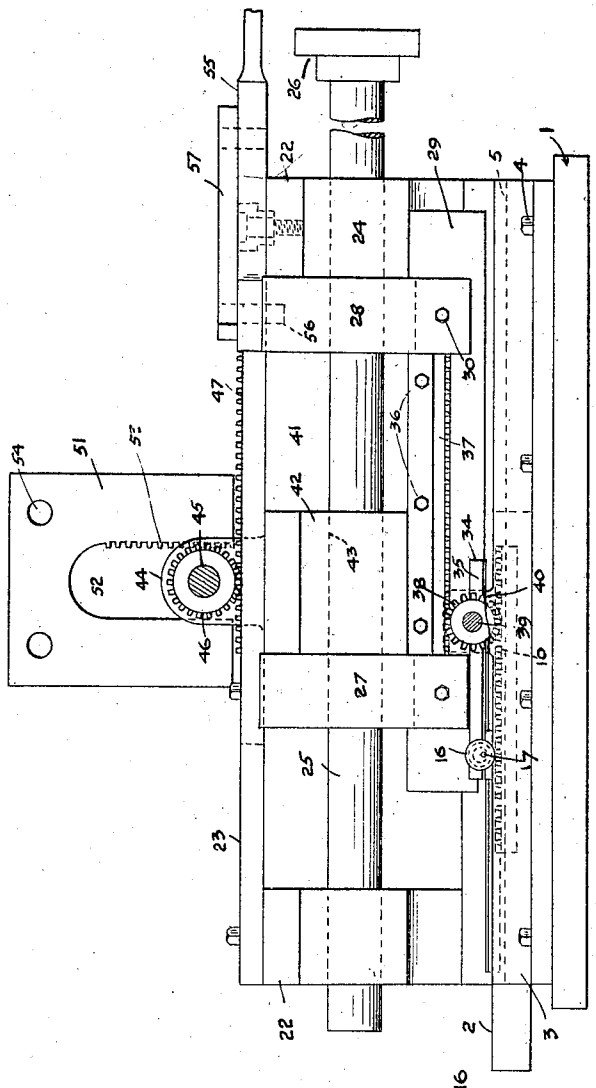
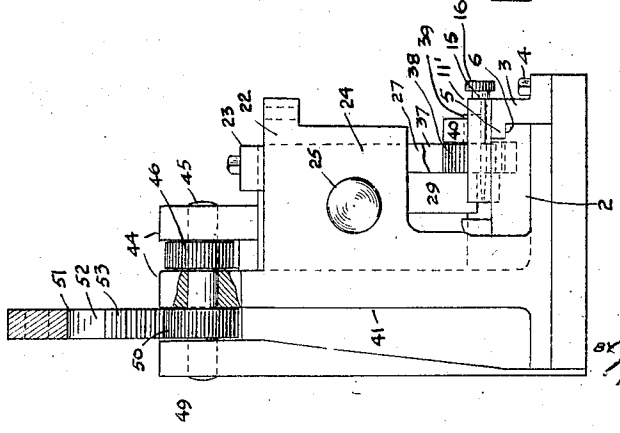


FIG. 2B



FIG. 2



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A. ZIDOVEC

FORGING MACHINE

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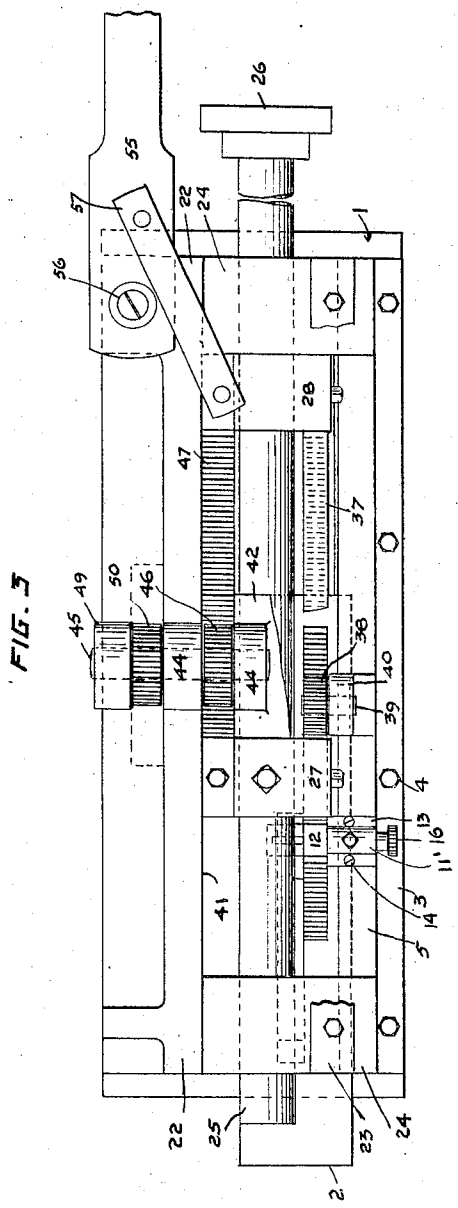


FIG. 3

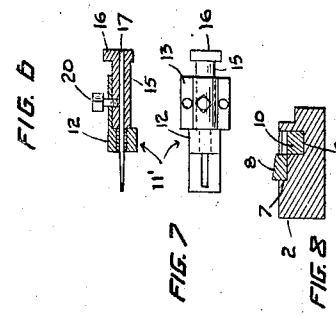


FIG. 6

FIG. 7

FIG. 8

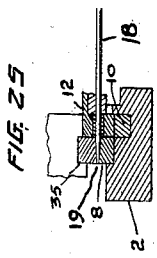


FIG. 25

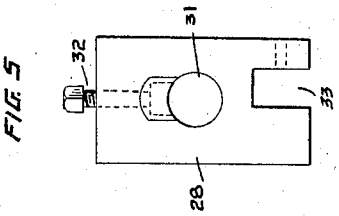


FIG. 5

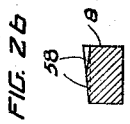


FIG. 26

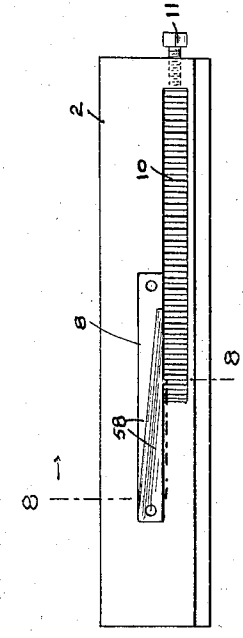


FIG. 4

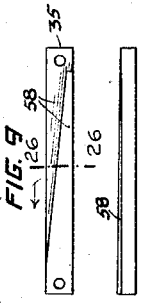


FIG. 9

FIG. 10

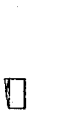


FIG. 11



FIG. 12

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FORGING MACHINE

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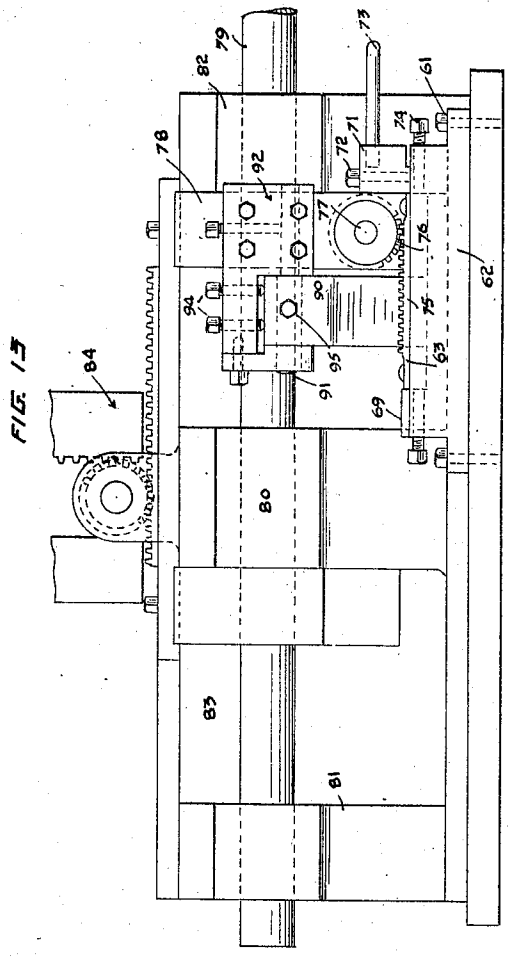


FIG. 13

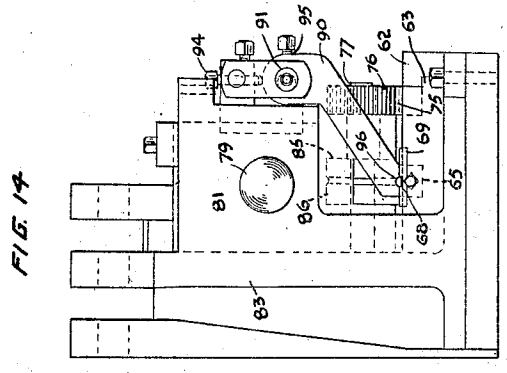


FIG. 14

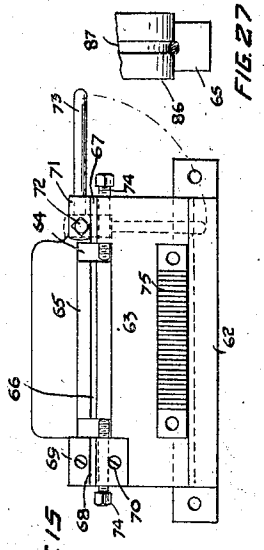


FIG. 27

FIG. 15

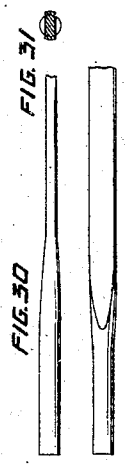


FIG. 31

FIG. 30

FIG. 17

FIG. 29

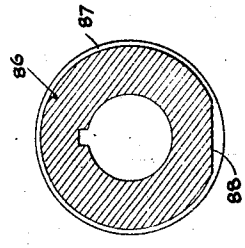


FIG. 16

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FORGING MACHINE

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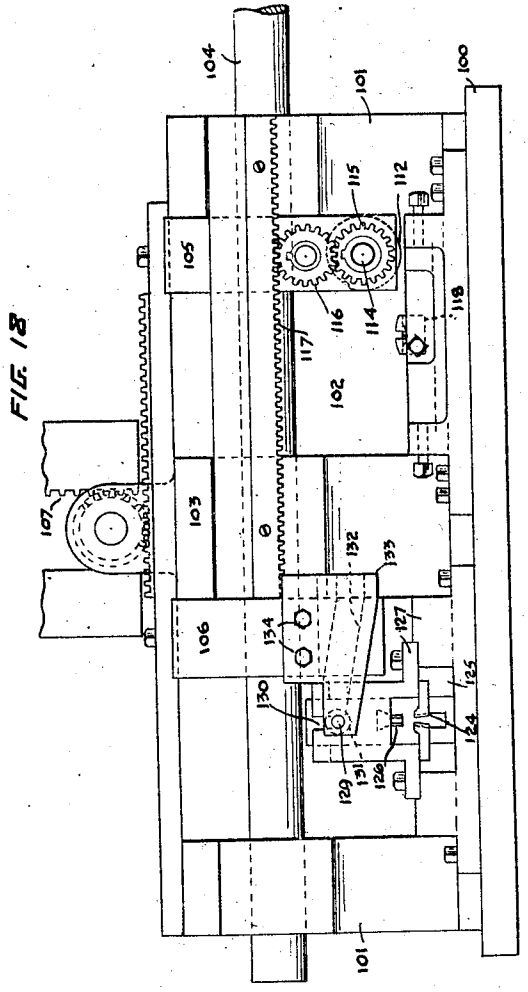


FIG. 18

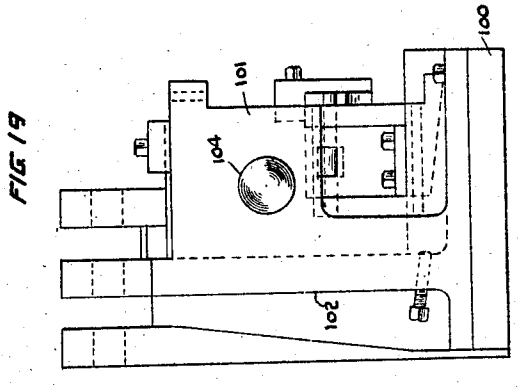


FIG. 19

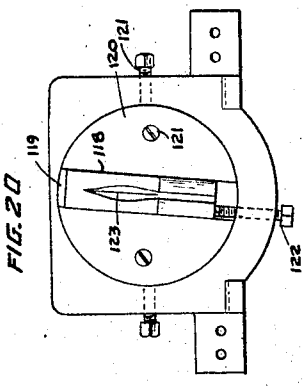


FIG. 20

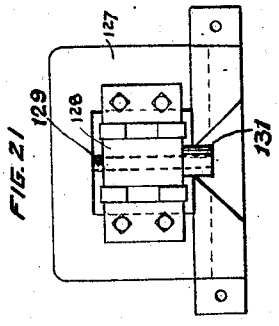


FIG. 21



FIG. 33

FIG. 34

FIG32

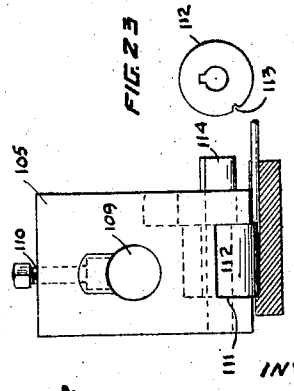


FIG. 23

FIG. 24

FIG. 22

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Patented Mar. 22, 1927. 1,622,169

UNITED STATES PATENT OFFICE.

AUGUST ZIDOVEC, OF SAN RAFAEL, CALIFORNIA.

FORGING MACHINE.

Application filed January 3, 1922. Serial No. 526,642.

The present invention relates to improvements in forging machines and the primary object is to provide a machine of this character which will eliminate the necessity of drop forging and hand forging and provide for better forging of various articles in a more expeditious and reliable manner than is possible under drop and hand forging methods, the articles forged with the machine of the invention being of a more uniform finish.

Another object of the invention is to provide a forging machine of the character described which will be compact, smaller than drop or hand forging machines and prove particularly useful in forging small articles, such as needles, in pointing the ends, tines of various instruments, pointing darts, tapering pins for machines and the flattening and spreading of small articles of various kinds, it being possible to effect a greater number of forgings with the machine of the invention than with hand or drop forging machines as heretofore used.

The invention possesses other advantages and features some of which, with the foregoing will be set forth at length in the following description where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming a part of the present specification. In said drawings I have shown one form of the construction of my invention, but it is to be understood that I do not limit myself to such form since the invention as expressed in the claims may be embodied in a plurality of forms.

Referring to the drawings:

Fig. 1 represents a front elevation of the forging machine, parts being shown in section.

Fig. 2 reperesents an end view of the machine showing part thereof broken away and in section.

Fig. 3 represents a top plan view of the machine.

Fig. 4 represents a top plan view of one of the parts of the machine on which a die is supported.

Fig. 5 represents an end view of a reciprocal die carrier.

Fig. 6 represents a sectional view of a work holder.

Fig. 7 represents a top plan view of said holder.

Fig. 8 is a sectional view taken on the plane 8—8 of Fig. 4.

Fig. 9 is a bottom plan view of one of the dies.

Fig. 10 is a side elevation of one of the dies.

Figs. 11 and 12 represent opposite end views of the dies.

Fig. 13 represents a front elevation of a modified form of the machine.

Fig. 14 represents an end elevation of a modified form.

Fig. 15 represents a top plan view of work holder and die carrier for one of the dies.

Fig. 16 represents a sectional view thru the other of the dies.

Fig. 17 is a sectional view at right angles to the one at 16 of said last named die.

Fig. 18 is a front elevation of another modified form of machine.

Fig. 19 is an end elevation of a form shown in Fig. 18.

Fig. 20 represents a top plan view of the bottom die and work holder.

Fig. 21 represents a top plan view of one of the trimming dies.

Fig. 22 is a side elevation of the carrier for the moving die.

Fig. 23 is an end view of the moving die.

Fig. 24 is a top plan view of said moving die.

Fig. 25 is a vertical sectional view showing the dies as they would appear when cooperating to form a point upon a needle or like device.

Fig. 26 is a sectional view taken on line 26—26 of Fig. 9.

Fig. 27 is an end view of the dies employed in the machine shown in Fig. 13, showing the work in position between the dies and in cross section.

Fig. 28 is a fragmentary plan view of a member or article after having been pointed in the machine shown in Figs. 1 and 2.

Figs. 29 and 30 represent fragmentary elevations taken at right angles to one another and showing the articles as when flattened in the machines shown in Figs. 13 and 14.

Fig. 31 is a cross sectional view of one of the flattened articles shown in Figs. 29 and 30.

Figs. 32, 33 and 34 are plan and end views respectively of a finished article after having

been forged in the machine shown in Figs. 18 and 19.

Referring to the embodiment of the invention illustrated in Figs. 1 to 12 inclusive, the machine is adapted for drawing points on various objects and comprises a base 1, upon which a die carrier 2 is reciprocally mounted. A guide strip 3 is bolted as at 4 to the base 1 and has a flange 5 which engages in a recess 6 in the carrier so as to slidably retain the carrier upon the base. The carrier 2 is provided with a die receiving recess 7 in which an elongated point drawing die 8 is received. Extending along the side of the recess 7 is a recess 9 in which a rack bar 10 is counter-sunk, said rack bar being held in place by a set screw 11 and having its working face disposed below the upper side of the die.

A work holder 11′ is supported upon the guide 3 and comprises a sleeve-like body 12 having flanges 13 secured by fastenings 14 to the guide 3. Rotatably mounted within the body 12 is a work holding member 15 having an enlarged annular head 16 and provided with a wrok receiving bore 17 extending therethru. The bore 17 is off center or eccentrically arranged and is adapted to receive a pin, needle or strip of wire as shown at 18, which needle, pin or wire is adapted to be pointed as at 19, (Fig. 25). A set screw 20 in the body 12 provides for holding the eccentric member 15 in position with the work or pin either arranged to engage or be free of the dies. By turning the member 15 the end of the work to be pointed is moved towards or away from the dies as will be later more fully described.

Extending upwardly from the base 1 are a plurality of standards or bearing members 22 which are joined at their upper ends by a horizontal piece 23 and are provided with enlarged bearing portions 24. A reciprocal shaft 25 is mounted in the bearing portions 24 and is provided with means 26 capable of attachment to either end thereof which means will permit of the coupling or connection of said shaft with a "bull-dozing" machine, not shown, whereby the shaft may be reciprocated. Fixed to and depending from the shaft 25 are supporting members 27 and 28 for the upper die carrier 29, said members at their lower ends being secured by fastenings 30 to end portions of said die carrier. The supporting members 27 and 28 are provided with central openings 31 thru which the shaft 25 extends and are held in place upon said shaft by set screws 32. The lower ends of the supporting members are recessed as at 33 for reception of the carrier 29. The carrier 29 is provided with a die receiving recess 34 in which a die 35 is held in any suitable manner, but so that it will cooperate with the lower die 8. Attached by fastenings 36 to one side of the carrier 29 is a rack bar 37 adapted to cooperate with the rack bar 10 thru a pinion 38 supported upon a pin 39 mounted in a bearing 40 carried upon the guide strip 3. Thus it will be seen that when the upper carrier is reciprocated the lower carrier 2 is reciprocated in the opposite direction by means of the rack bars 8 and 37 and pinion 38.

Extending forwardly from a vertical wall 41 which joins the members 22 and extends along the back of the machine, is a bearing member 42 having an opening 43 therein thru which the shaft 25 reciprocates. The upper side of the member 42 and upper edge of the wall 41 support bearings 44 for pin 45 upon which latter a pinion 46 is fixed. The pinion is adapted to mesh with the teeth of a rack bar 47 secured at its ends to the upper side of the bearing 42 between the upright bearings 44. The pin 45 extends rearwardly from the bearing 44 and has its rear end journaled in a bearing 49 extending upwardly from the base 1. A pinion 50 is rotatably mounted upon said extended portion of the pin. A vertically reciprocal member 51 in the form of a plate, having a vertical slot 52 extending from one end thereof, receives in its slot said pinion 50. Said pinion meshes with teeth 53 forming a rack bar on one edge of the slot. The upper end of the member 51 has openings 54 therein to provide for connection of said member with the punching head of a forging press, not shown, whereby the reciprocal motion of the press may be imparted to said member and the pinion 50 will rotate so that such rotary movement will be imparted thru the shaft 45 to the pinion 46, which latter operates the rack bar 47. Thus it will be seen, that if desired, the machine, instead of being operated by connecting one end of the shaft 25 with the "bull-dozing" machine, may have the punching head of a forging press connected with the member 51 and thru the means above described, reciprocate the carriers for the dies.

To provide for manipulating or reciprocating the carriers in order that the fitting, removing or adjusting of the dies and other parts of the machine also the insertion of the work in proper position for cooperation of the dies may be effected, there is provided a hand operated means consisting of a lever 55 pivoted at one end as at 56 to one of the members 22. A link 57 is pivoted at its ends to the lever 55 and the upper end of the supporting member 28. Thus upon rocking of the lever 56 the die carriers may be moved back and forth to the desired extent for the purposes above mentioned.

In the operation of the machine it will be apparent that the die carriers 2 and 29 will be reciprocated in opposite directions regardless of whether the "bull-dozing" ma-

chine or the punching head of the forging press is employed as the prime mover. This employment of one of the two prime movers is optional and depends upon the circumstances under which the machine is used. The pin, wire, or other member, which will be hereinafter referred to as the work, is inserted in the bore 17 of the member 15 so that one end of the work will project between the dies 8 and 35. By turning the member 15 the end of the work may be moved eccentrically with relation to the dies and in this manner disposed in proper position to be forged. The dies are provided with oppositely inclined faces 58 which cooperate to provide a V or wedge shaped opening between the dies, which opening extends for approximately the full length of the dies. The faces 58 are also inclined from the horizontal, Fig. 10, so that they converge towards certain ends of the dies and as the dies are reciprocated in opposite directions it will be apparent that the end of the work lying between them will be quickly forged or drawn to a conical point. It will be apparent from the foregoing description and accompanying illustration, I may quickly and reliably forge points upon various articles by inserting them in the work holder and adjusting the holder to properly present the end of the work for forging. With the mechanism of this invention it is possible to draw finished and uniform points upon a greater number of various small articles than can be done by hand or drop forging, thus effecting a saving of material, time and labor and obtaining at the same time better and more uniform work.

Referring to the modified form of the machine as shown in Figs. 13 to 17 inclusive, the machine is of the same construction as the one previously described with the exception of the die holders and dies, which latter are arranged and constructed so as to provide for flattening or drawing flat sides upon cylindrical or other shaped articles, the operation being a lengthwise flattening. In this modified form of the invention a lower die carrier clamp 62 holds the lower die carrier 63 upon the base 60. A recess or groove 64 formed in the upper side of the carrier receives the lower die 65, said die being in the form of a flat strip of die material provided with a longitudinal straight groove 66 extending from end to end thereof. The groove or recess 64 terminates short of opposite ends of the carrier and those portions of the carrier defining the ends of the grooves are provided with upwardly opening work holding grooves 67 and 68, which latter are in the same plane as and in line with the groove 66. The work, not shown, is adapted to be laid in the grooves 67 and 68 so that it will lie in the die groove 66. The groove 68 is covered by plate 69 secured upon the upper side of the carrier by fastenings 70 so that the work will be held against accidental removal from said groove. To hold the work in the groove 67 there is provided a holder block 71 pivoted as at 72 upon one side of the groove 67. The block is provided with a handle 73 extendnig outwardly from one side of said groove 67 and when in the former position will hold the work firmly in place, the under face of the block clamping or wedging upon the work when the block is in said former position. To hold the die in the groove 64, there are provided set screws 74 supported by the carrier and disposed at the ends of the slot 64 so as to engage opposite ends of the die.

To provide for operation of the upper die the carrier 63 has rigidly fixed thereto, a rack bar 75, which rack bar meshes with a pinion 76 keyed upon the pin or shaft 77 within the upper die carrier 78. The carrier 78 is fixed to a reciprocating shaft 79, which latter is journaled in bearing members 80, 81 and 82 carried upon the frame 83 supported by the base 1. The shaft may be coupled at either end thereof with a bulldozing machine, not shown, by means 79′ whereby said shaft may be reciprocated. The shaft may also be reciprocated by means of the pinion and rack bar arrangement generally designated 84, which arrangement corresponds to that of the form of invention first described and is adapted for connection with the punching head of a forging press, not shown.

The carrier 78 is provided with a slot 85 receiving a roller die 86, which latter is keyed to the shaft 77. The roller die 86 is formed with a peripherial die groove 87 adapted to aline and cooperate with the die groove 66. The groove 87 is substantially semicircular in cross section and at one point is deepened or enlarged as at 88. The enlarged, deepened portion 88 provides for the insertion of a wire or other material to be forged, in proper position between the dies.

A guide member 90 is pivotally supported upon an eccentric pin 91 carried in a bracket 92 rigidly secured to the member 78. The eccentric pin provides for vertical adjustment of the guide. Set screws 94 are carried by the bracket and are adapted to engage the upper end of the guide to hold the guide in adjusted position. An additional set screw 95 is carried by the guide and adapted to bear upon the pin 91. The guide extends downwardly vertically from the bracket and then angularly and inwardly so that its lower end is disposed over the die 65, said lower end having a recess 96 therein of approximately the same size as the die groove 66 and adapted to lie over the die groove. The groove 96 receives the wire or material to be flattened at a point to one side

of the die roller and serves to hold the work straight and within the die groove 66.

In the operation of this form of the invention, when the shaft 79 is reciprocated thru the means 84 or the means not shown, for connection with a "bull dozing" machine, the member 78 will be carried back and forth with the shaft and cause the pinion 76 to rotate, due to its engagement with the rack bar 75. This rotation of the pinion 76 and the shaft 77 upon which it is keyed, causes the die roller 86 to rotate over the lower die 65 holding the wire or work. As the die roller rotates over the die roller 65, the grooves 87 and 66 in said dies will aline and receive the wire or other material to be forged, in such manner that the wire or other material will be flattened, as shown in Figs. 29 to 31 inclusive. As the die roller moves back and forth the flattening of the wire or other material will be readily effected, the width of the grooves 66 and 87 limiting the flattening operation. The guide 90 moving with the upper die to one side thereof and receiving the wire or other material in its groove 96, will prevent the wire from buckling and being lifted out of the groove 66 and die 65 and thereby prevent the bending or distorting of the wire during forging operation.

Referring to the modified form of the invention shown in Figs. 18 to 24 inclusive, the mechanism is for the most part the same as in the other forms of the as in the other forms of the invention save that the dies and cooperating parts are constructed and arranged to provide for spreading the various articles and material and for trimming the articles thus spread.

The machine comprises a base 100 having upstanding bearing members 101 at the end, a back wall 102, a central bearing member 103 extending forwardly from the back wall, a shaft reciprocally mounted in said bearings and two carriers 105 and 106 rigidly mounted upon and depending from the shaft 104. The shaft is adapted to be connected at either end thru the means employed in the other form of the invention and not here shown, with a "bull dozing" machine, also not shown. The shaft may also be reciprocated thru means 107 for connecting the device with the punching head of a forging press, not shown. In addition to these elements the machine has the hand operating means generally designated 108 to provide for movement of the carriers as desired, for adjusting and setting the dies and work.

The member 105 is provided with a central opening 109 thru which the shaft extends and said member is held rigidly upon the shaft by means of a set screw 110. The lower end of the member 105 is recessed as at 111 to receive the upper spreading die 112, which die is in the form of a roller and is provided in its periphery with a groove or recess 113 of the shape of the spread work. The die is keyed upon the shaft 114 supported in the member 105 and rotated by the pinion 115 keyed thereto. The roller die 112 has a bearing engagement against the wall of a socket formed in the lower end of the member 105 so as to provide strength and rigidity. The pinion 115 meshes with pinion 116 journaled upon the side of the member 105 and meshing with a rack bar 117. The rack bar 117 is fixed to the stationary bearings 101 and 103.

The lower spreading die 118 is supported in a recess 119 formed in a revolvable die holder 120, said holder being rotatable on the base 100 and adapted to be held in adjusted position by set screws 121. The die is held in place by a set screw 122 and is in the form of a rectangular metal plate having a forming groove or recess 123 in its upper face, which groove or recess is in the shape of the finished work, in this particular instance, that of a sack needle. The dies are arranged so that when disposed one above the other they may be adjusted so that the grooves 113 and 123 will aline with one another. The work, that is the article to be forged, may be maintained in the groove 123 due to the greater depth of the groove, in the narrow part thereof. The widened part of the groove 123 is a good deal smaller than the shank or narrow part of the groove so that when the widened part of the groove 123 alines with the groove 113, the cavity formed by the two grooves is of less diameter vertically than the diameter of the wire or other material to be forged.

Assuming that the sack needle is to be finished in this modified form of the machine, the needle after having been pointed in the first described form of the machine and flattened lengthwise at the point in the second described form of the machine, is placed with the pointed and lengthwise flattened end in the groove 123 of the die 118. The machine is then connected thru the means 107 or with the punching head of the forging press, or thru the shaft directly with the "bull dozing" machine so that in either case the shaft 104 will be reciprocated. As the shaft 104 reciprocates, the member 105 thereon carrying a roller die 112 is moved back and forth over the die 118 so that said roller die 112 in so moving will forge or flatten and spread the portion of the needle within the groove 123. As the member 105 reciprocates the pinion 116 is rotated thru this arrangement with the rack bar 16 and this rotary movement is imparted to the die 112 thru the pinion 115 and shaft 114 thereby directly rotating the roller die. The article being treated is forged in accordance with the shape of the groove 123. When the roller die 112 moves to a position immediately over the finishing die 118, the

grooves 123 and 113 will register or aline with one another and a spreading operation will be effected only at such time when such alinement of the grooves takes place. As the member 105 advances over the die 118 one side will lie over the groove 123 so as to prevent the wire or other material in said groove from being bent or disrupted while in the groove.

In the form of the machine herein described I provide a trimming or finishing device which consists of a lower die 124 mounted upon a support 125 fixed to the base 100. The die 124 is the exact shape and size that the finished article is to have. The upper die 126 is vertically reciprocally supported in a frame 127, upon the lower end of the carrier 128. The dies 124 and 126 are so arranged that when moved into cooperating position will trim the work forged between the dies 118 and 112 to bring the work to the exact shape and size desired. The die carrier 128 has a pin 129 extended transversely therethru so that the pin projects from opposite sides thereof thru slots 130 formed in the frame 127. The pin 129 is provided upon one end with a roller 131 engaging in an inclined groove 132 formed in a bracket 133 rigidly secured as at 134 to the member 106. As the member 106 is moved back and forth upon reciprocation of the shaft 104, the bracket 132 is likewise moved so that the roller travelling in the inclined groove will cause the carrier to reciprocate vertically. This will cause the die 126 to move into and out of cooperating relation to the die 124 and trimming of the finished work may be thus effected with this mechanism. Thus it will be seen that the machine shown in Figs. 18 and 19 is a double acting one, wherein the one machine serves as a forging and trimming device.

I claim:

1. A forging machine comprising a frame, a shaft reciprocally mounted within the frame, a die carrier mounted upon the frame, a die supported by said carrier, another die carrier arranged to reciprocate with said shaft, a die in the scond named carrier arranged to cooperate with said first named die, a shaft revolvable upon the frame, a pinion fixed to the shaft, a rack member cooperating with a pinion and adapted for connection with the punching head of a forging press, another pinion fixed to the second named shaft and a rack bar with which the second pinion meshes, which bar is fixedly connected with said reciprocal shaft.

2. A forging machine comprising a frame, a shaft reciprocally mounted within the frame, a die carrier mounted upon the frame, a die supported by said carrier, another die carrier arranged to reciprocate with said shaft, a die in the second named carrier arranged to cooperate with said first named die, a shaft revolvable upon the frame, a pinion fixed to the shaft, a rack member cooperating with a pinion and adapted for connection with the punching head of a forging press, another pinion fixed to the second named shaft, a rack bar with which the second pinion meshes, which bar is fixedly connected with said reciprocal shaft and means providing for connection of an end of the reciprocal shaft with a prime mover.

3. A forging machine comprising a frame, an eccentrically mounted work holder adapted to receive work to be pointed mounted on said frame, a shaft reciprocally mounted within the frame, a die carrier supported by the shaft, another die carrier mounted on the frame, dies supported in said respective carriers in position whereby work supported in the work holder may be disposed to engage the dies, said dies having oppositely inclined faces which form a V-shaped opening between the dies, said inclined faces also being inclined from the horizontal so that they converge towards certain ends of the dies for the purpose of drawing the end of the work to a point.

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