Feb. 14, 1928. 1,659,266

L. HOMMEL

MACHINE FOR MAKING METAL FASTENERS AND THE LIKE

Filed Dec. 31, 1924 5 Sheets-Sheet 1

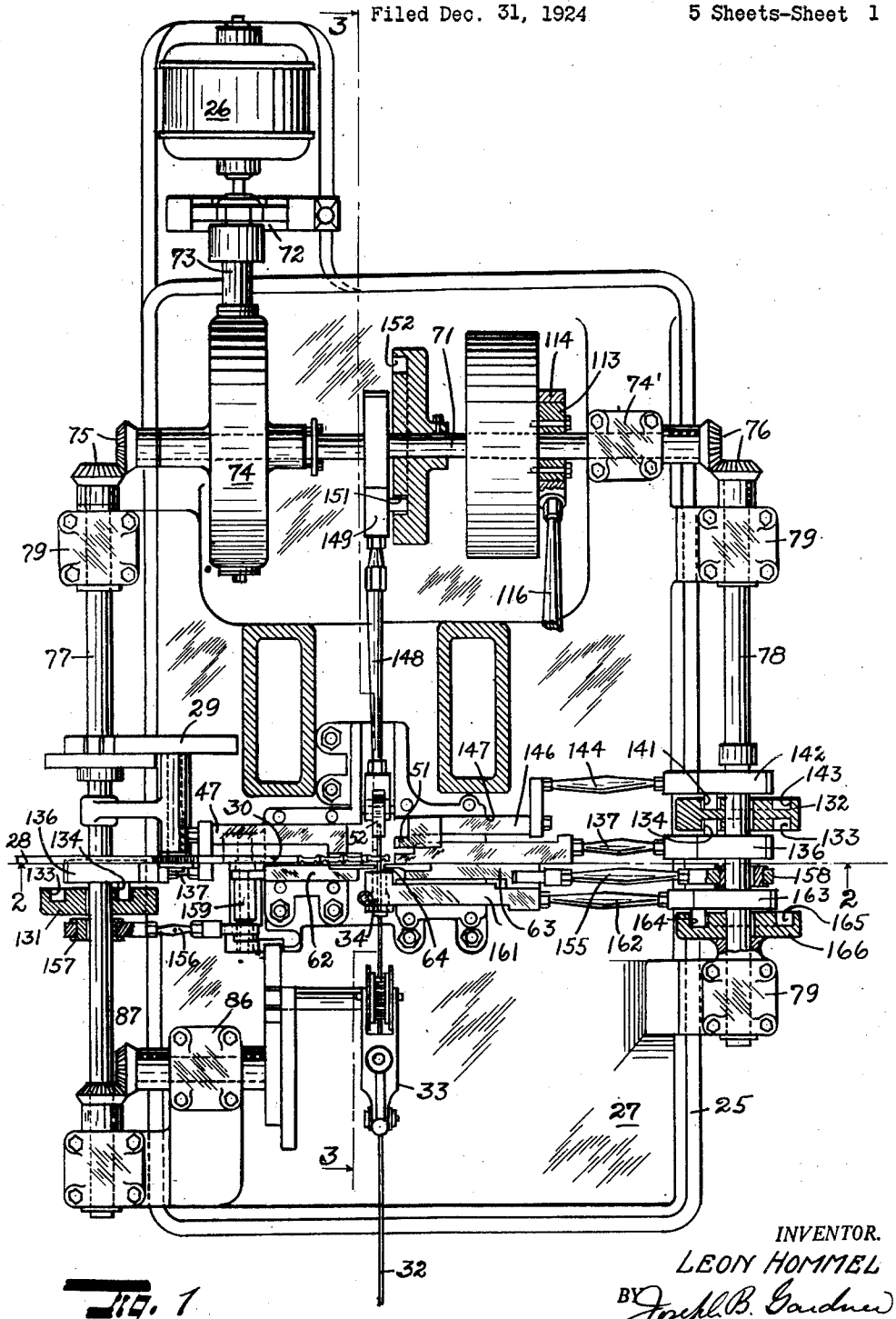


Fig. 1

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Filed Dec. 31, 1924 5 Sheets-Sheet 2

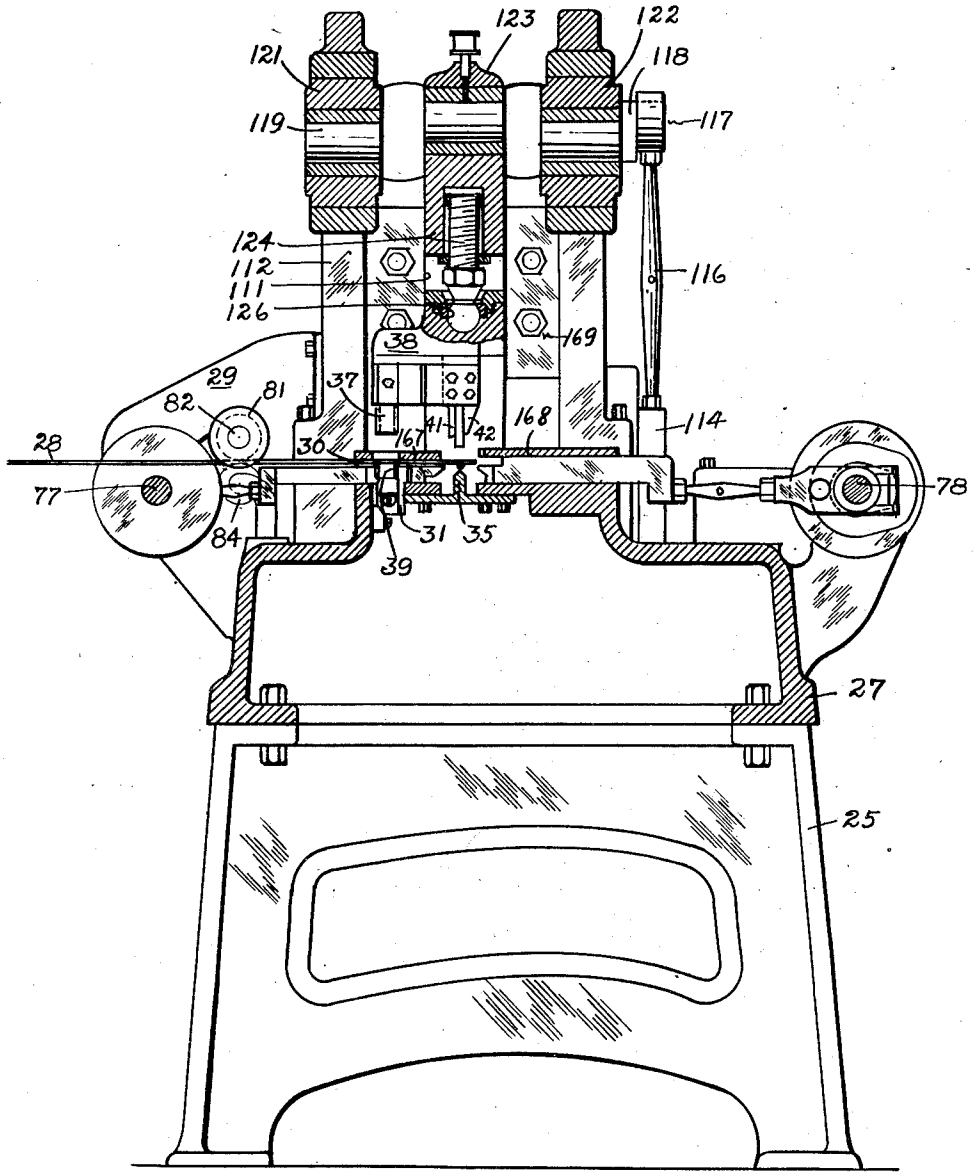


Fig. 2

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Filed Dec. 31, 1924 5 Sheets-Sheet 3

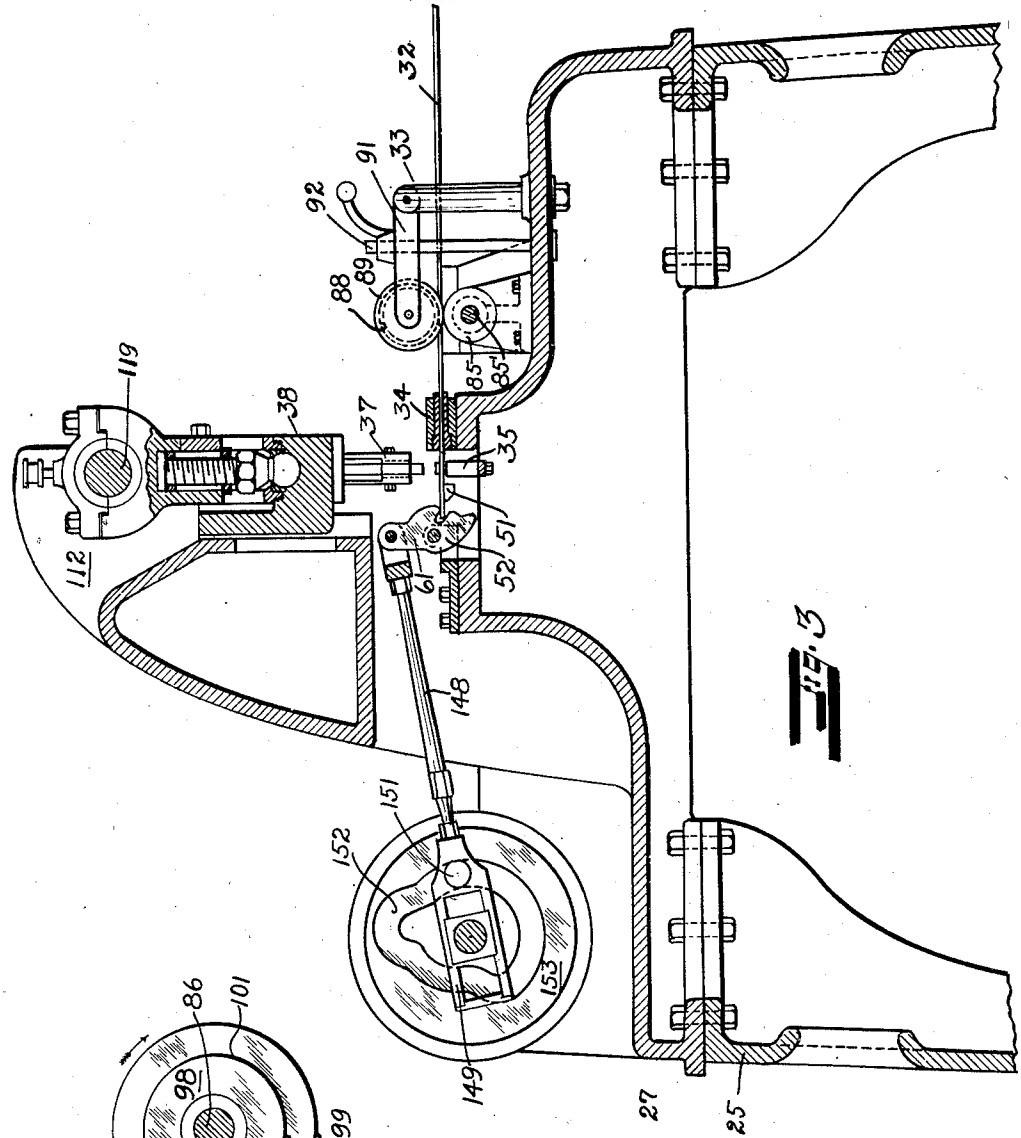


FIG. 3

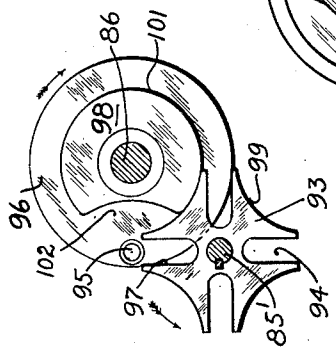


FIG. 4

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Filed Dec. 31, 1924 5 Sheets-Sheet 4

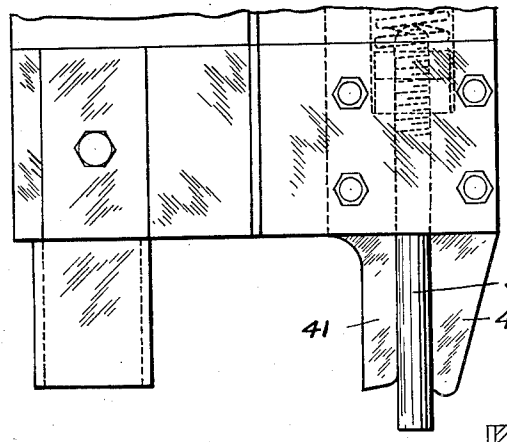
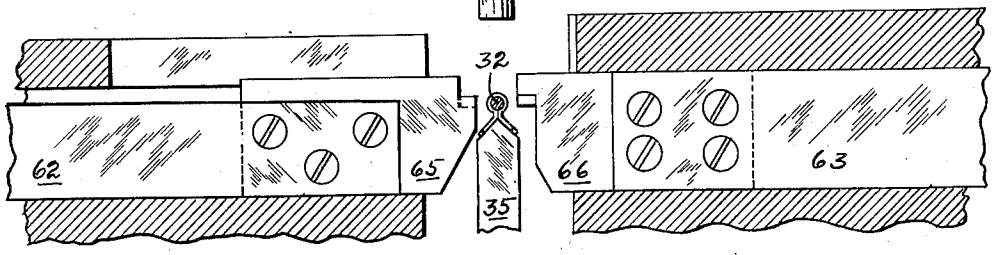


Fig. 5



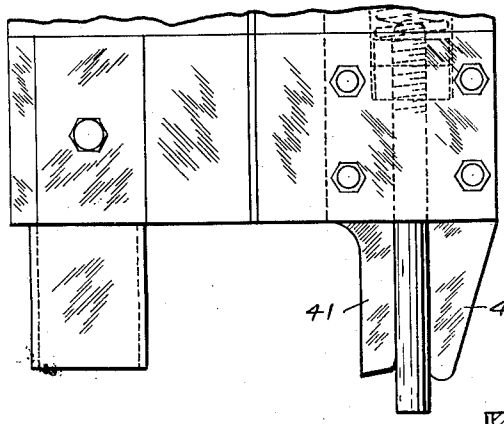
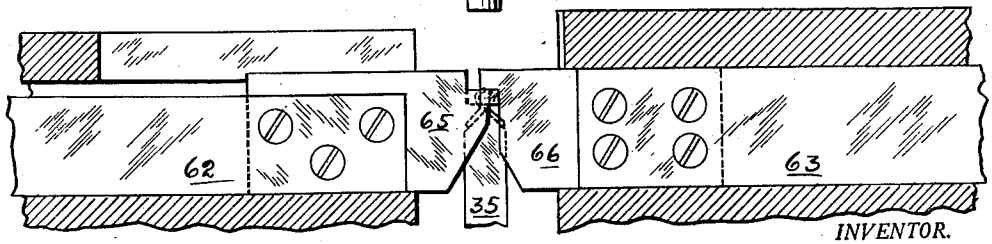


Fig. 6



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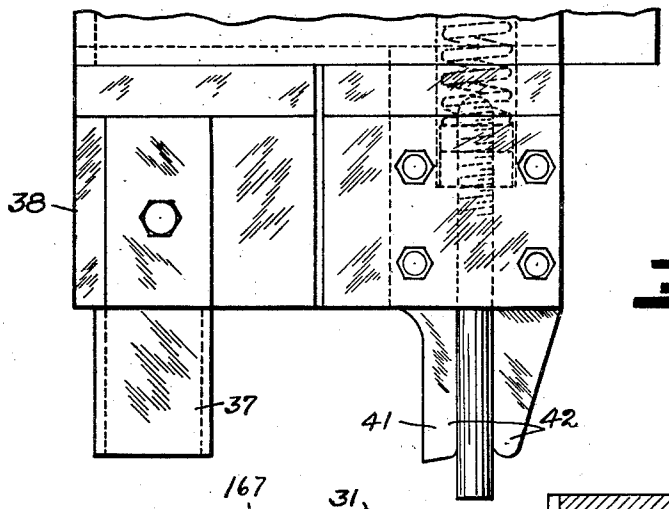
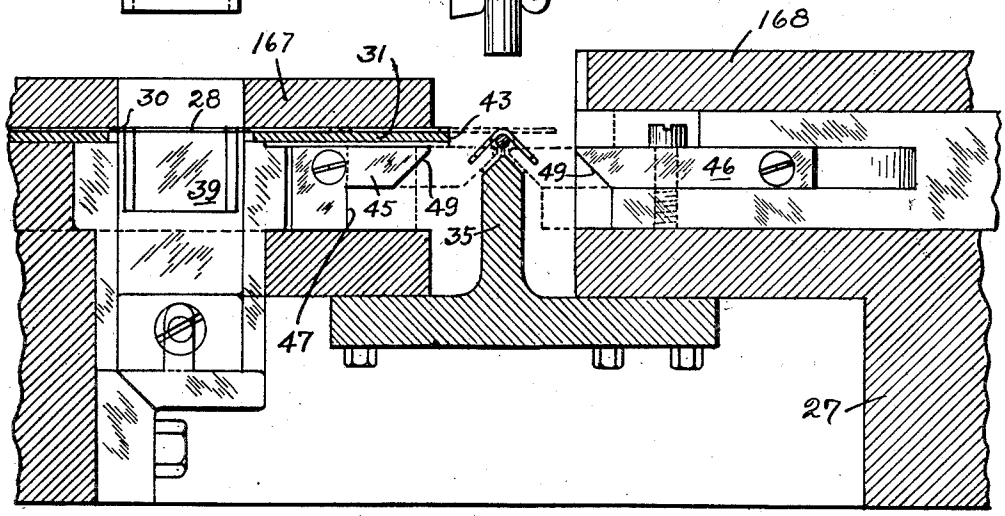


Fig. 7



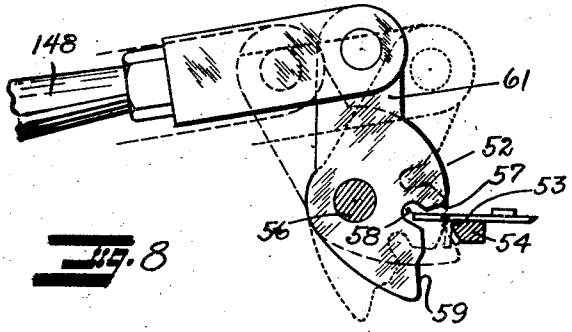


Fig. 8

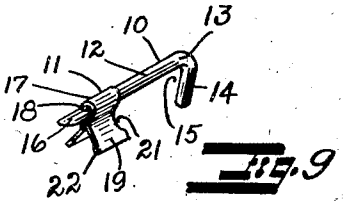


Fig. 9

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Patented Feb. 14, 1928. 1,659,266

UNITED STATES PATENT OFFICE.

LEON HOMMEL, OF OAKLAND, CALIFORNIA.

MACHINE FOR MAKING METAL FASTENERS AND THE LIKE.

Application filed December 31, 1924. Serial No. 759,051.

My invention relates to a machine for making devices such as wire fasteners and the like, and in the present embodiment the machine is particularly adapted for making fasteners having a nail portion and a spacing member frictionally held on the nail portion.

An object of the invention is to provide a machine which will form a separate nail and spacing member and position the latter in frictional and slidable engagement on the shank of the former.

Another object of the invention is to provide a machine of the character described which affords a maximum output of fasteners without undue strain and wear of the machine parts.

My invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood that I do not limit myself to the showing made by the said drawings and description, as we may adopt variations of the preferred form within the scope of our invention as set forth in the claims.

Referring to said drawings:—

Figure 1 is a plan view, partly in section, of the machine of our invention.

Figure 2 is an end sectional view taken on the line 2—2 in Figure 1.

Figure 3 is a side sectional view taken on the line 3—3 in Figure 1.

Figure 4 is an enlarged side view of an intermittent gearing used in the device.

Figures 5 to 7 inclusive are enlarged fragmentary views taken substantially on the line 2—2 in Figure 1 showing the relations of certain of the fastener forming parts at different times in the fastener forming cycle.

Figure 8 is an enlarged side view of a bending cam used in my invention operatively disposed with respect to a wire end which is to be bent to desired form.

Figure 9 is a perspective view of a fastener which the present embodiment of the machine of my invention is particularly arranged to form.

A detailed description follows:

Briefly expressed, the present embodiment of my invention comprises a machine for forming a fastener having nail and spacing member portions, such as the fastener particularly illustrated in Figure 9. The materials of which the fastener is formed comprise wire of suitable size and a metal ribbon of suitable width and thickness, both materials being adapted to be continuously and automatically fed into the machine by means provided thereon. The head portion of the nail is arranged to be shaped by the operation of a cam to bend the wire end around a suitable form. During the formation of the nail head, the spacing member, which has been previously stamped from the ribbon by means of a die, is formed about the nail shank to frictionally grip the same by the successive operation of pairs of vertically and horizontally acting forming members cooperating with an anvil. The completed fastener is then arranged to be released from the machine by means which simultaneously point the nail and cut the same from the wire stock. The machine is adapted to be power driven, the parts previously referred to being suitably actuated to perform the necessary operations in proper sequence, as more particularly described hereinafter.

The nail 10 and associated spacing member 11 of the fastener which the present embodiment of my invention is particularly adapted to form are as shown in Figure 9. The nail portion 10 comprises a shank 12 having a relatively sharp pointed bend 13 formed at one end thereof and serving as a head for the nail, the bent over portion 14 forming an arcuated crotch 15 between itself and the shank. The other end of the shank 12 is preferably sharpened to provide a driving point 16. The spacing member 11 is preferably formed of a blank of metallic ribbon by bending it at an intermediate portion 17 thereof to form a recess 18 in which the shank 12 is adapted to tightly but slidably fit. As here shown, the ends 19 of the spacing member are angularly disposed and are provided with arcuate notches 21 at one side and points 22 at the other.

To form a nail and spacing member, such as described above, I provide a machine having a base 25 on which is mounted a drive motor 26 and a frame 27 which carries the nail forming means of my invention. The ribbon 28 from which the spacing members 11 are formed is arranged to be fed into the machine by means of the feeding mechanism 29 and is then passed through

a longitudinal guideway 30 provided in the upper surface of a horizontally positioned fixed die-plate 31 to project therefrom. The wire 32 from which the nail portions of the fastener are formed is arranged to be fed into the machine through the feeding mechanism 33 and thence through and beyond a guide block 34 which is mounted on the frame for horizontal reciprocative movement transversely of the wire. At the beginning of a fastener forming cycle the projecting portion of the wire is disposed transversely of the projecting portion of the ribbon in a line parallel to and closely underlying the plane of the ribbon and extends beyond the ribbon. Immediately beneath the portion of the extended wire adjacent the guide block 34 is an anvil 35 in the form of an inverted V fixedly positioned on the frame 27 and having an upper edge extending parallel to, and adapted to serve as a seat for the wire.

The notches 21 and points 22 of the spacing member 11 are arranged to be formed in the ribbon by means of male cutting dies 37 mounted on opposite sides of a vertically moving plunger 38 and cooperating with female dies 39 mounted on the die-plate 31, the pieces removed falling through the die-plate apertures into the space defined by the base 25. Also mounted on the plunger 38 for movement therewith is a shearing blade 41 which also serves as one member of a two-point bending die 42, the former being adapted to cooperate with the forward edge 43 of the die plate 31 to sever the spacing member blank from the ribbon, and the latter functioning, after pressing the severed blank and underlying wire upon the anvil 35, to bend the blank about its center to straddle the anvil. Since the wire was pressed slightly downward to contact with the anvil, the raising of the plunger 38 after completion of the bend forming stroke allows the wire to spring slightly upward, raising the blank with it to a position slightly clear of the anvil, as shown in detail in Figure 7. With the bent blank in raised position, oppositely disposed forming members 45 and 46 are advanced horizontally to simultaneously cooperate in the formation of the recess 18 of the spacing member 11 by acting in a plane slightly below that of the axis of the wire to press the sides of the blank together to firmly embrace the wire, the members 45 and 46 being here shown extending from oppositely positioned reciprocable blocks 47 and 48 mounted on the frame. It will be noted that the side faces of the anvil 35 cooperate with the lower faces 49 of the members 45 and 46 to determine the desired angular relation of the ends 19 of the now completed member 11, as shown in Figure 7. The bending die 42 is preferably provided with a spring pressed plunger 50 which is adapted to maintain a resilient pressure on the blank during the forming of the spacing member 11 thereof and thereby hold it properly positioned across the wire.

While the member 11 is thus being formed, a movable anvil 51 mounted for horizontal movement in the frame of the machine and having an end section similar to the desired shape of the nail crotch is moved to a position beneath the inner part of the protruding wire end so that a portion thereof will overhang the anvil. A cam 52 suitably mounted for rotation about a horizontal axis and in a plane including the wire, is then actuated to first bend the wire end which overhangs the anvil downwardly over the edge 53 of the anvil and then bend the end inwardly to lie against the face 54 of the anvil, which is here shown angularly disposed from the vertical plane, it being now noted that the crotch 15 and head 13 of the nail portion 12 of the fastener have thus been simultaneously formed. As particularly shown, in Figure 8, the cam 52 is mounted on a pivot 56 and is provided with a point 57 which is so positioned with respect to the anvil that when brought downwardly from above on a wire end extending therefrom, the wire end will be bent downwardly around the edge 53 of the anvil, the cam being formed with a transverse recess 58 extending inwardly of and below the point 57 and arranged to receive the wire end prior to the bending operation. The lower surface 59 of the recess 58 is preferably formed to conform with the shape of the face 54 of the anvil, so that when brought against the wire end which has been bent downwardly over the anvil, it will bend the same inwardly against the anvil to complete the crotch 15. It will now be noted that in order to perform the before mentioned functions, the cam 52 must be reciprocatively rotated through a small arc during part of a fastener forming cycle, and, accordingly, in the present embodiment of the invention, the cam 52 is provided with an integral lever arm 61 by which such motion may be imparted to the cam in a suitable manner. By referring to Figure 8, it will be noted that the cam 52 is shown therein in full lines in wire receiving position, in dotted lines as positioned at the conclusion of the downward bending operation, and in dash lines as positioned at the conclusion of the inward bending operation.

Mounted on reciprocable blocks 62 and 63 and positioned between the forming members 43 and 44 and the end surface 64 of the guide-block 34, are cooperating cutters 65 and 66 which are arranged to be brought transversely together to cut the wire to form a notch therein, said notch having a transverse side parallel to the surface 64 and a bevelled side sloping away from such transverse side. The relation of the cutters 55

and 56 before and during the cutting operation is shown in detail in Figures 5 and 6.

With the nail and spacing members thus formed and assembled in proper relation, and the wire notched and firmly held between the cutters at the point of the nail, a transverse horizontal movement of the block 34 is arranged to be effected so as to sever the fastener from the remaining wire. The anvil 49 is arranged to be then withdrawn and the members 45 and 46 separated, so that the fastener may fall clear of the forming mechanism and the machine be enabled to start the next cycle of operations.

Driving of the machine is here shown arranged to be effected from a main driveshaft 71 which is positioned transversely of the frame adjacent one end thereof and is operatively connected to the motor 26 through a clutch 72, a shaft 73, and suitable gearing arranged in the housing 74. The shaft 71 is mounted in the bearings provided in the housing 74, and in a bearing 74'. Operatively connected to the opposite ends of the shaft 71 by means of pairs of bevel gears 75 and 76 are secondary shafts 77 and 78 respectively, mounted in sets of bearings 79. In the present embodiment, the shafts 71, 77 and 78 are arranged to rotate at the same rate, one revolution thereof serving to complete one fastener making cycle.

Feeding of the ribbon 28 through the feeding mechanism 29 is here shown arranged to be effected by driving an upper roll 81 thereof carried on a shaft 82 by means of a suitable intermittently acting mechanism operatively connected between the shafts 77 and 82. The driven roll 81 is preferably corrugated and is adapted to firmly hold the ribbon against a cooperating roll 84 so that the ribbon may be advanced when the driven roll is turned.

The wire 32 is arranged to be fed through the feeding mechanism 33 by means of a lower roll 85 of the latter, which is mounted on a shaft 85' and is arranged to be rotated by means of a suitable intermittently acting mechanism operatively connected to the shaft 77 by a shaft 86 and bevel gearing 87. An upper roll 89 which is adapted to cooperate with the roll 85, is provided having a circumferential groove 88 in which the wire is adapted to be positioned, the surface of said groove being preferably transversely corrugated so as to form corresponding impressions on the wire. The circumferential surface of the roll 84 is also corrugated, but has no groove formed therein. Pressure between the rolls sufficient to flatten opposite sides of and form the corrugations in the wire as it passes therebetween, is arranged to be adjustably secured by mounting the upper roll 89 on one end of a lever 91 pivotally secured at its other end to the frame, the lever being arranged to be actuated by turning the nut on a bolt 92 secured to the frame and extending through an aperture midway of the lever 91. Adjustment between the rolls is thus made possible either for different depths of corrugation or different sizes of wire. It is to be noted that by corrugating the wire, a nail shank is provided which will not readily turn in the spacing member 11 or in the material into which it may be driven.

As here shown, the mechanisms by which the feeding rolls 81 and 84 are arranged to be intermittently driven comprise a type of intermittent gear movement, the gearing used for converting the uniform rotation of the shaft 86 into an intermittent rotation of the shaft 85', which is parallel thereto and carries the roller 85, being shown in detail in Figure 4. Fixed to the shaft 85' is a driven member 93 provided with symmetrically disposed radially extending slots 94 of uniform width while a planetary roller 95, suitably mounted on a member 96 for rotation with and around the shaft 86 in coplanar relation with the member 93 is arranged to engage successive slots 94 and thereby serve as a driving means for the member 93. The shafts 85' and 86 are so spaced apart that when the axis of one slot 94 is tangent to the arc of movement of the roller 94, the axis of an adjacent slot will also be tangent to the same arc of movement of the roller but on the opposite side of the line of centers of the shafts. In this manner, with a slot in tangential relation to the arc of movement of the roller, the rotation of the shaft 86 will cause the roller to enter the slot and bear against the forward side 97 thereof to cause the rotation of the member 93 until such a time as it again assumes a position tangent to the arc of movement of the roller, at which time the roller will leave the slot. It will now be noted that the rotative movement thus imparted to the member 93 and its shaft 85' will be one wherein the rate of rotative movement produced will accelerate gradually to a maximum and then as gradually decrease, thus avoiding any sudden movements or impacts of the feeding mechanism which would result in increased wear and a noisy operation of the parts. To insure the proper positioning of the member 93 at all times relative to the roller 95, a circular disc 98 is provided which is coaxially mounted on the member 96 in coplanar relation with the member 93, and each portion of the periphery of the member 93 is provided between the slot portions with concave surfaces 99 having substantially the same radius of curvature as the edge surface 101 of the disc and arranged to slidably engage the latter during the time that rotation of the member 93 is not being effected by the roller. Since rotation of the member 93 would cause a portion of a surface 99 to bear against the disc surface 101; it will be evident that rotation

of the member 93 will thus be prevented. To allow rotation of the member 93 by the roller, a recess 102 is provided in proper position in the disc edge, such recess being here shown by arcuate form, the center of curvature thereof being colinear with the axes of rotation of the roller 95 and shaft 86 and the radius thereof very slightly exceeding the extreme radius of the member 93. In this manner, it will now be noted that an intermittent gear structure has been provided which is at all times positive in its action and one which, at the same time is smooth and quiet in operation.

The plunger 38, which carries the cutting dies 37, shear blade 41, and bending die 42, is arranged for reciprocation in a guideway 111 provided on an upper portion 112 of the frame by means of operative connection to the drive shaft 71. Mounted on the shaft 71 is an eccentric disc 113, about which an eccentric strap 114 carried on a connecting rod 116 is mounted. The rod 116 is connected at its other end to a crank pin 117, the latter being carried by a crank arm 118 provided at the end of a crank shaft 119, it being noted that the shaft 119 is suitably journaled in a pair of bearings 121 and 122 with its axis horizontal. A second crank 123 is provided on the shaft 119, preferably between the bearings thereof, and is operatively connected to the plunger 38 by means of a connecting rod 124 of adjustable length, the rod being here shown pivotally connected to the crank 123 in a usual manner and to the plunger 38 by means of a universal ball and socket joint 126, the ball portion of the latter being here shown carried on the connecting rod 124. The arc of motion of the crank pin 117 is preferably arranged to have a greater radius than is the radius of the arc of eccentricity of the eccentric disc 84, so that the crank pin will be oscillated through an arc of slightly less than 90 degrees as the connecting rod 86 is reciprocated. This arrangement for oscillating the crank shaft 119 is particularly designed to prevent difficulties with dead centers which might occur if the pin 117 were allowed to travel through a complete arc.

Simultaneous cooperative movement of the blocks 47 and 48 which carry the forming members 45 and 46 respectively is here shown arranged to be effected by means of heart or disc cams 131 and 132 mounted respectively on the shafts 77 and 78. Each of the cams 131 and 132 is provided with a roller groove 133 formed in a side face thereof in which a roller 134 carried on a fork 136 which spans the shaft and is carried on a connecting rod 137, is arranged to engage. The other ends of the rods 137 are adjustably attached to the blocks 47 and 48. In this manner, reciprocative movements of the blocks are produced in accordance with the shape of the roller groove, it being obvious that the roller grooves 133 of the cams 131 and 132 are necessarily complementary in form and action.

The movable anvil 51, which is utilized in forming the crotch of the nail, is here shown operated from the shaft 78 by means of a roller 141 carried on a fork 142 and engaging in a roller groove 143 formed in the opposite side of the cam disc 132 from the fork 136 associated therewith. An adjustable rod 144 connects the fork 142 to a block 146 which carries the anvil 51, the block being slidably mounted in a suitable guideway 147 provided in the frame.

The bending cam 52 is arranged to be oscillated upon rotation of the shaft 71 by means of a cam operated connecting rod 148 pivotally secured at one end to the lever arm 61 of the cam and carrying a fork 149 at the other end. Mounted on the fork is a cam roller 151 which is arranged to engage in a groove 152 provided in one face of a cam disc 153 mounted on the shaft 71, the rotation of the disc being thus arranged to impart the desired reciprocative movement to the rod 148 and thus to the bending cam 52.

Simultaneous cooperative movement of the blocks 62 and 63 which carry the cutters 65 and 66 is here shown arranged to be accomplished by means of connecting rods 155 and 156 respectively which are arranged to be reciprocated by means of eccentrics 157 and 158 operatively associated therewith and respectively carried on the shaft 77 and 78. As here shown, the eccentric 157 is out of alignment with the blocks 62 and 63 and the eccentric 158, and the motion of the rod 155 is accordingly communicated to the block 62 by means of a rocker arm 159 of such width that attachment of the rod and block to opposite sides thereof will serve to position the rod and block in required parallel relation.

The guide block 34, which, as hereinbefore mentioned, is moved to finally sever the completed fastener from the wire, is secured to a slidable member 161 reciprocatively mounted on the base and operatively connected to the shaft 78 by means of a rod 162 terminating in a roller carrying fork 163, the roller 164 thereof cooperating with a groove 165 formed in a heart-cam disc 166 mounted on the shaft to thereby produce the desired motion of the block 34.

By referring to the drawings, it will be seen that the blocks 47 and 62 are held positioned in their guideways by means of a removable plate 167. The blocks 46, 48, 63 and 34, all of which are actuated from the shaft 78 and are mounted in adjacent and parallel bearing grooves formed in the frame, are held in position by means of the removable plate 168. Removable plates 169

also serve to hold the plunger 38 in the guideway 82.

It will be evident from the foregoing that the order and extent of the movements of the fastener forming cycle in relation to the movement of the plunger 38 is entirely controlled by means of the form and relative positioning of the roller grooves in the various cam plates and the eccentricities of the eccentrics employed, the succession of desired operations being thus readily controllable, and since any or all of the dies, cutters and various fastener forming tools may be adjusted or replaced, the proper performance of the various forming operations may be readily maintained. Furthermore, it will be obvious that on account of the removability and independent operation of the various forming mechanisms, the machine is readily adaptable for forming other articles of manufacture than the fastener herein specifically described.

I claim:—

1. A machine for forming spacing members about the shank of a nail, comprising means for forming and positioning a blank for said member, a fixed anvil in the shape of an inverted V on which said nail shank is adapted to be seated and across which said blank is adapted to be positioned, a vertically acting means for bending said blank to the shape of said anvil, and independent cooperating means for bending a portion of said blank to encircle said shank.

2. A machine for making a fastener having a nail element and a spacing element formed about the shank thereof comprising feeding devices for intermittently and simultaneously positioning the requisite amount of material for forming said spacing element about the shank of said nail element, means for stamping and severing a spacing element blank, a fixed anvil on which said spacing element is adapted to be shaped, means for shaping said spacing element on said anvil and about said shank, a movable anvil about which an end of said nail element is adapted to be bent to form a head therefor, a cam operable to completely shape said head about said movable anvil, and means operable for severing and releasing said fastener when completed.

3. A machine for making a fastener having nail and spacing portions, comprising feeding mechanisms adapted to supply and position requisite amounts of materials of which to form said portions, a cutting die adapted to sever a blank for said spacing portion, a fixed anvil in the form of an inverted V on the apex of which the shank of said nail portion is adapted to be longitudinally positioned, a downwardly acting die adapted to bend said blank over said shank and anvil, plungers movable horizontally and adapted to complete the bending of said blank to encircle said shank, means for simultaneously forming a head on said nail portion, and means operated independently of said plungers for sharpening and severing a completed fastener.

4. A machine for making in assembled form a fastener having nail and spacing portions, comprising a mechanism adapted to simultaneously feed and position at right angles in substantially the same horizontal plane the requisite amounts of materials of which to form said portions; a fixed anvil in the form of an inverted V having the apex thereof arranged to receive the shank of said nail portion; a movable anvil about which a head for said nail is adapted to be formed by bending an end of the nail portion material; a cam arranged to completely form said head about said movable anvil; a downwardly acting member having members independently mounted thereon arranged to substantially simultaneously form a blank for a spacing portion, sever the protruding blank, and bend the severed blank over said shank; cooperating members movable horizontally and adapted to complete the bending of said blank to encircle said nail shank; independent means adjacent said plungers for simultaneously sharpening and gripping a completed fastener; means for transversely moving said wire adjacent said gripped point to shear said fastener therefrom; and means operative to cause the operations of said various fastener forming means in proper sequence.

5. A machine for making in assembled form a fastener having nail and spacing portions formed of wire and metallic ribbon respectively, comprising a frame; shafts mounted on said frame and operatively connected for simultaneous rotation; an intermittently acting wire feeding mechanism operatively associated with one of said shafts; a movable guide block through which said wire is adapted to be fed; an intermittently acting mechanism for feeding the ribbon transversely of and slightly above the wire and operatively associated with one of said shafts; a fixed die plate over which said ribbon is adapted to pass; an anvil in the form of an inverted V and arranged at the top edge thereof to receive the wire; cooperating mechanisms including a movable anvil and a cam for completely forming a head on said nail portion by bending, each of said mechanisms being operatively connected to one of said shafts by means including a heart cam; a vertically movable head having removably mounted thereon a die adapted to cooperate with said die plate to perforate the ribbon lying thereover, a cutter blade adapted to cooperate with the extremity of said die plate to sheer from the ribbon a spacing member blank, and a bending die adapted to bend said blank over

said wire, said movable head being arranged to be reciprocated by means including an eccentric operatively connected to one of said shafts; cooperating members adjacent the guide block for completing the formation of said spacing member portion about the shank of said nail portion, said members being mounted in reciprocable blocks arranged to be reciprocated by means including independent eccentrics mounted on said shafts; cooperating members for notching and gripping the portion of the wire adapted to form the point of the nail portion of the fastener, said members being mounted on independently reciprocable blocks arranged to be reciprocated by means including heart cams mounted on said shafts; and means including a heart cam for transversely moving said guide block when the wire is held by said gripping means to shear said fastener from the wire adjacent the gripped point.

6. A machine for forming spacing members about the shank of a nail, comprising means for forming and positioning a blank for said member, an anvil on which said nail shank is adapted to be seated and across which said blank is adapted to be positioned, and means cooperating with said anvil to bend said blank to encircle said shank.

In testimony whereof, I have hereunto set my hand at Oakland, California, this 26th day of December, 1924.

LEON HOMMEL.