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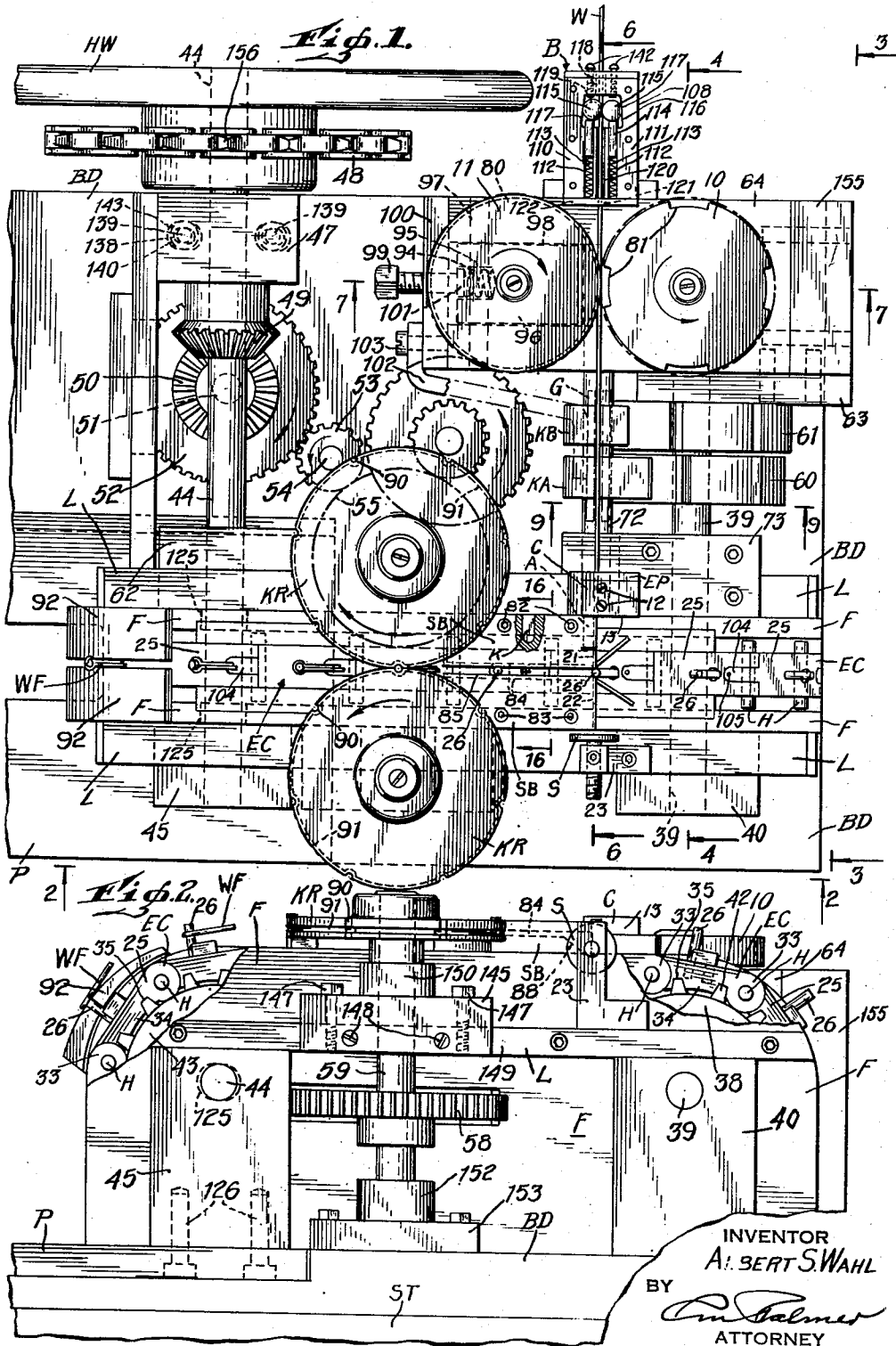
A. S. WAHL

2,486,450

WIRE FORMING MACHINE

Filed Aug. 22, 1944

7 Sheets-Sheet 1



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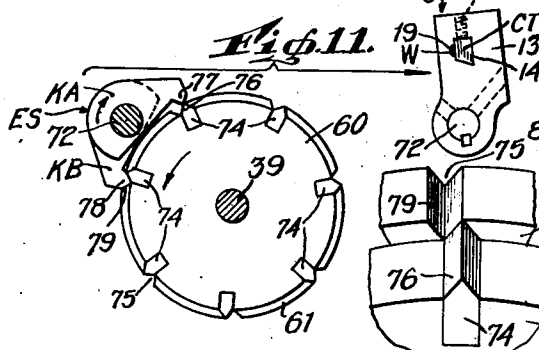
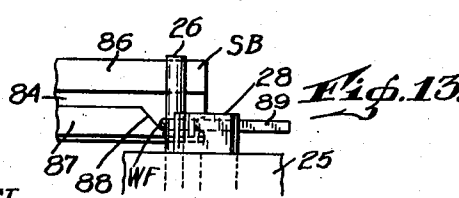
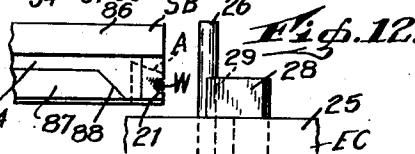
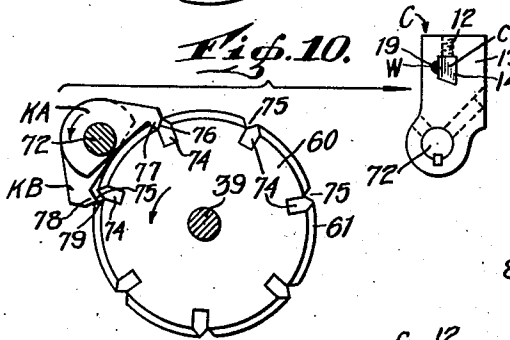
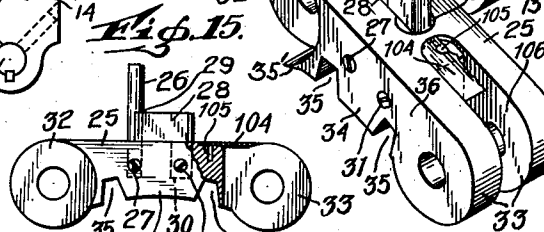
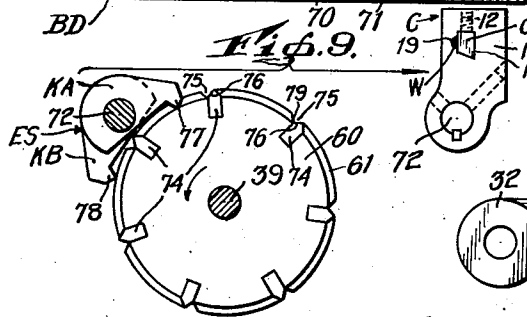
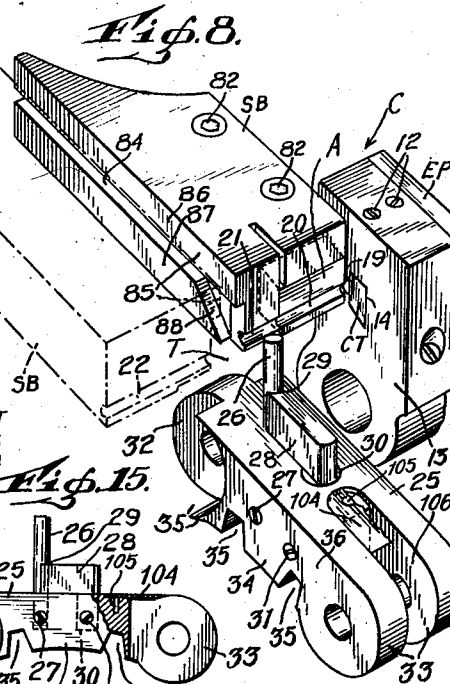
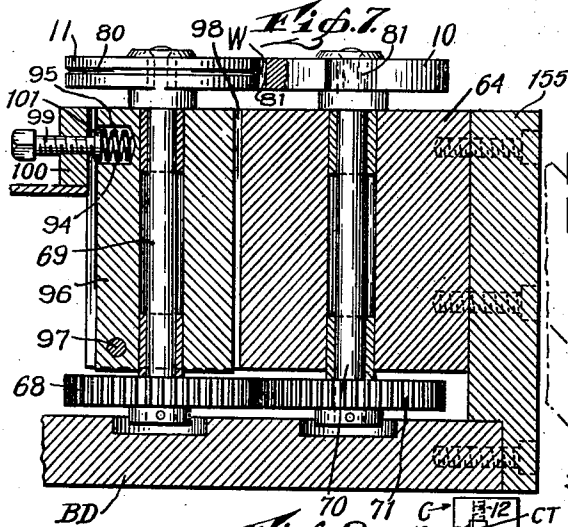
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WIRE FORMING MACHINE

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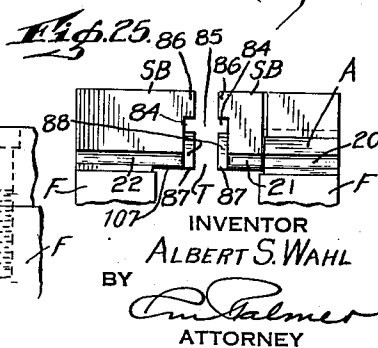
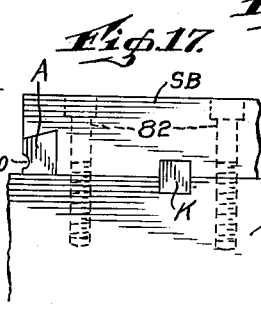
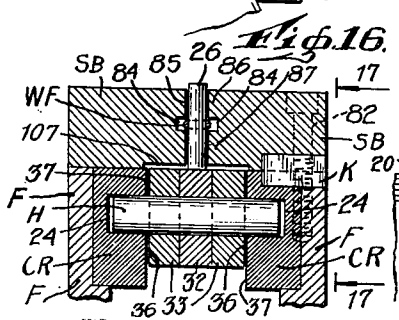
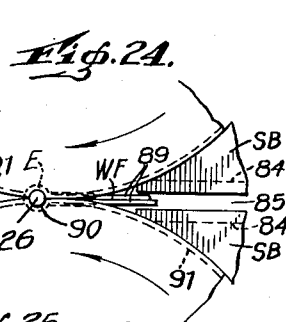
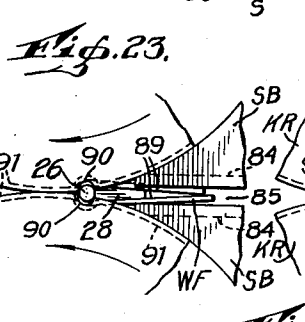
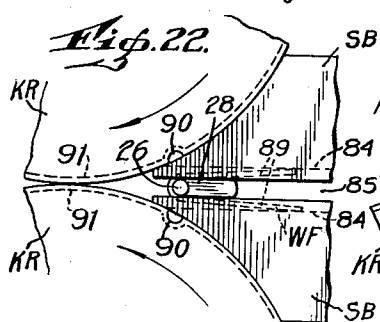
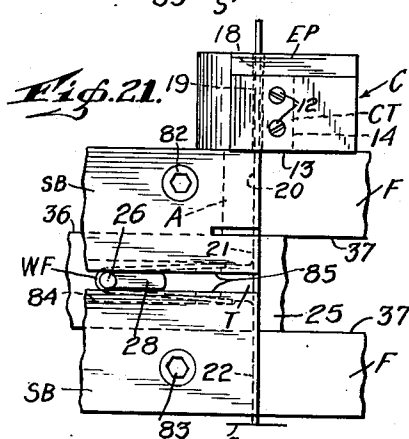
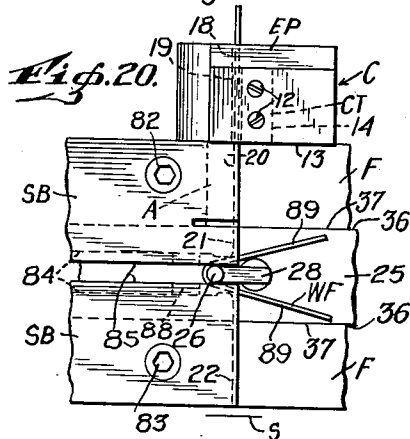
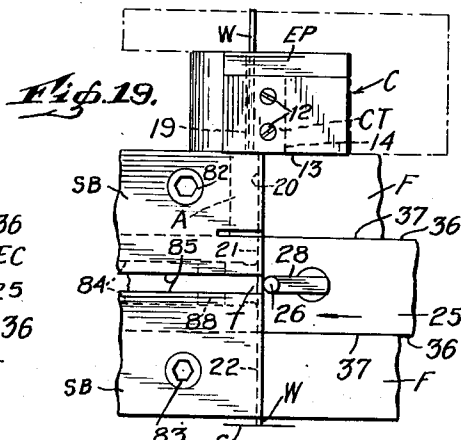
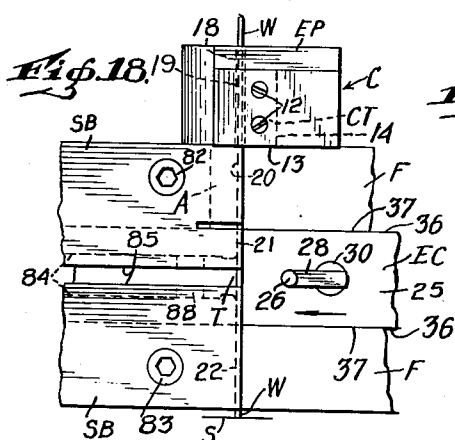
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7 Sheets-Sheet 5



INVENTOR
ALBERT S. WAHL
BY
[Signature]
ATTORNEY

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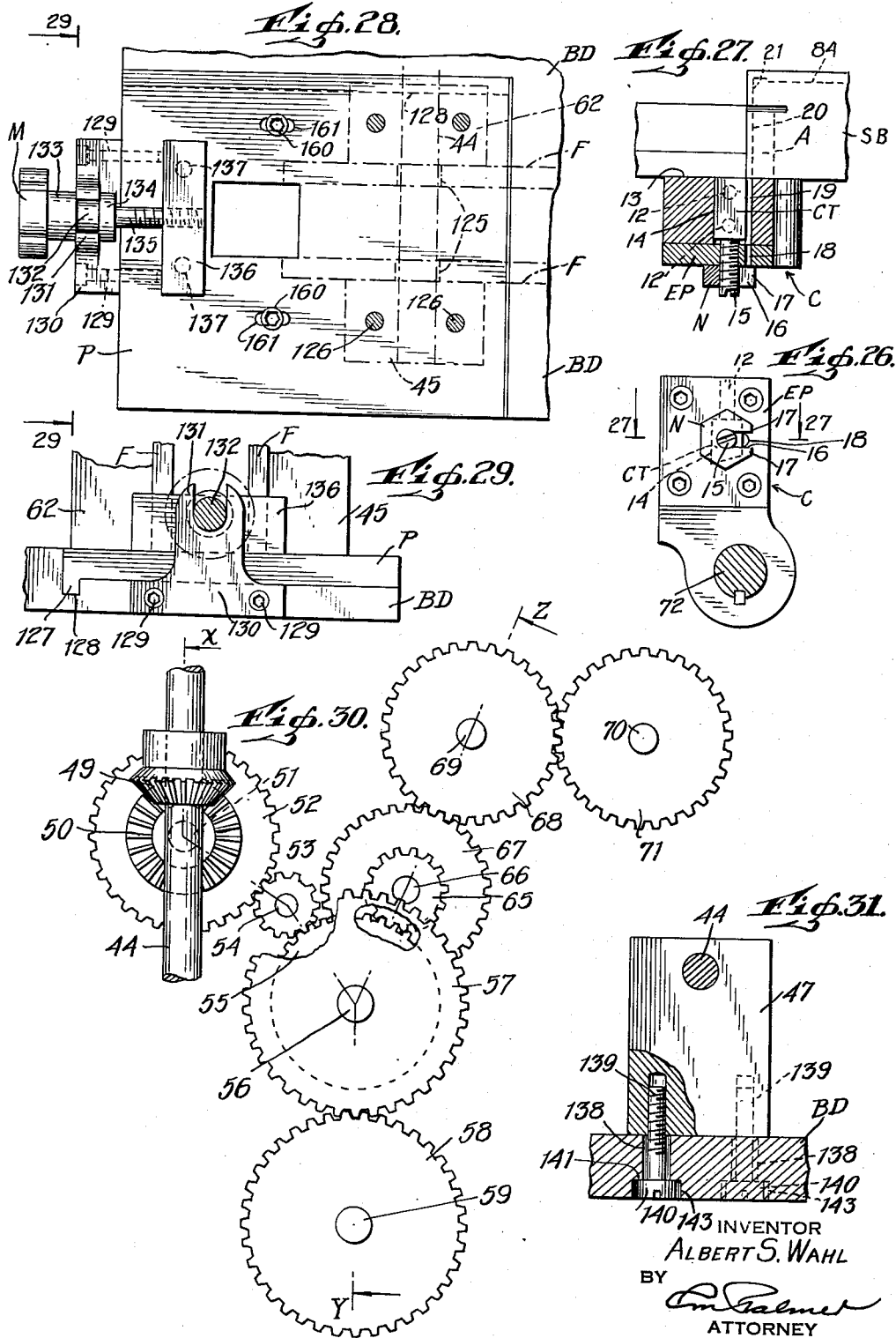
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WIRE FORMING MACHINE

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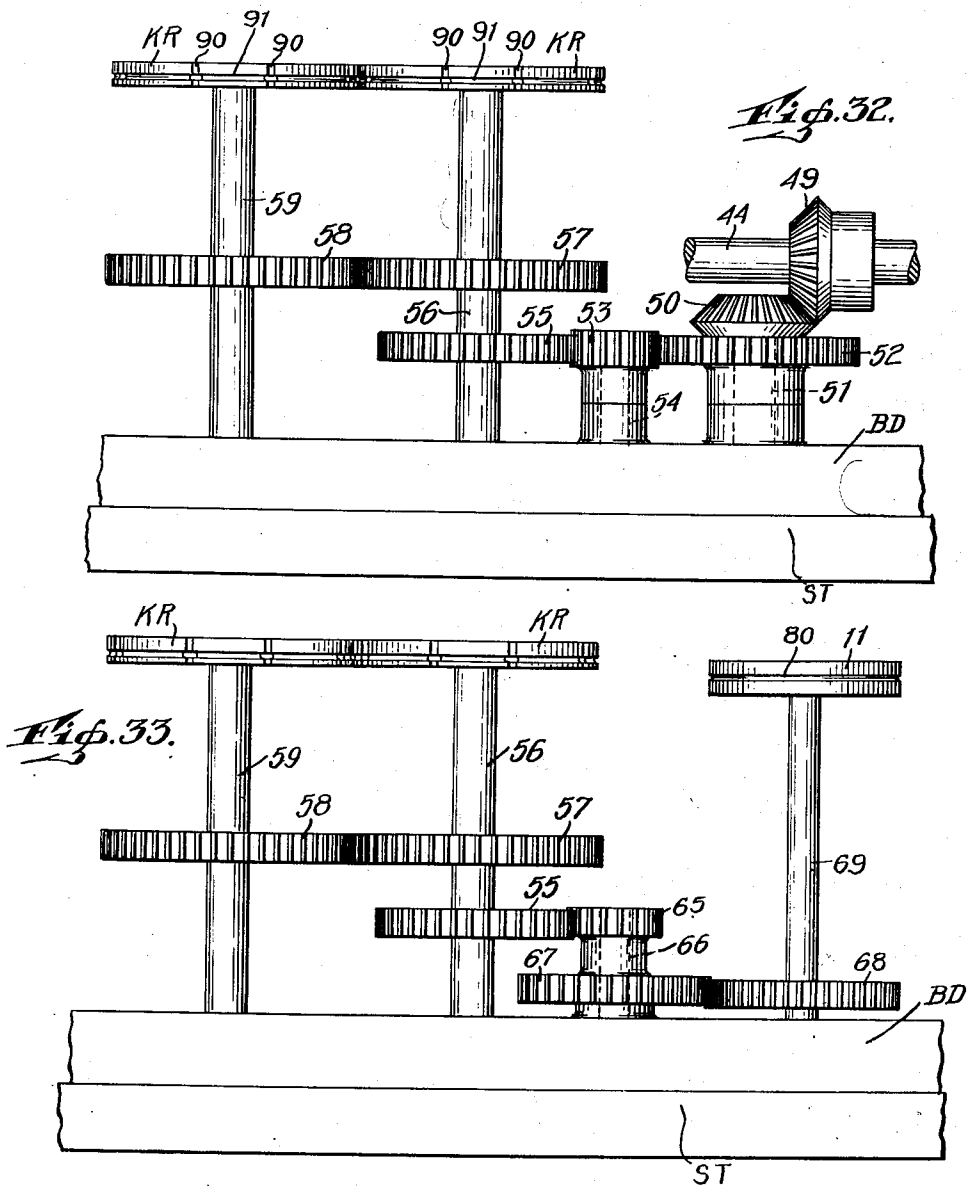
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7 Sheets-Sheet 7



INVENTOR
ALBERT S. WAHL
BY 
ATTORNEY

UNITED STATES PATENT OFFICE

2,486,450

WIRE FORMING MACHINE

Albert S. Wahl, Jersey City, N. J., assignor to
Solo Products Corporation, New York, N. Y., a
corporation of New York

Application August 22, 1944, Serial No. 550,530

31 Claims. (Cl. 140—71)

1

This invention is broadly concerned with a functionally and structurally improved wire forming machine and specifically is directed to a completely automatic machine for enhancing the production of articles of manufacture of wire. Hitherto automatic machines were utilized in making articles of manufacture of wire. In actual practice such types of automatic machines were designated as the "single slide" or "multiple slide." Where the "slide type" of automatic machine is employed there is an appreciable amount of lost motion resulting in slower production. For example in the slide type of automatic wire forming machines, the wire feeding and wire bending means each is reciprocable. In the case of the reciprocable wire feeding means, the wire is gripped and pulled across the throat of the shaping means. Thereafter the reciprocating feeding means releases and retracts idly, preparatory to pulling another length of wire across the throat of the wire shaping means. Thus one half of the cycle of the reciprocable wire feeding means is wasted and this motion may be considered as definitely slowing production. In a similar manner the reciprocable bending means is only effective on one half of its cycle, namely, at a time, it is directed towards and against the work, and thereafter on this cycle it is idly operating. Thus further lost motion or loss of time is encountered. The present invention has for its dominant object to provide an automatic wire forming machine having an appreciably faster rate of production than the so-called "slide type" of automatic machine. The invention has as a further object the provision of a serviceable wire forming machine wherein the wire which may be fully round, partly round, or polygonal in cross section and where desired may be of flat or ribbon metal stock is intermittently fed across the throat of the wire shaping means by continuously rotating and companion rollers. Another important object of the invention is realized in successively deforming predetermined lengths of wire by a plurality of stabilized and reinforced spatially arranged bending means on an endless chain unidirectionally driven through the throat of the wire shaping means and completely through the latter, thus resulting in faster production than is possible in the case of the "slide type" of wire forming automatic machines. A further and important object of the invention is realized in the provision of improved and serviceable means for enhancing the production in continuously but interruptedly feeding successive predetermined lengths of wire or relatively flat metal strip across wire or metal

2

strip shaping means during the time that similar and previously cut predetermined lengths of wire or metal strip are successively driven unidirectionally through novel wire shaping means. As a further object the invention provides means when desired for automatically clinching the deformed wire as it leaves the wire shaping means. Further objects, advantages and functional and structural aspects of the invention are: the provision of continuously rotating means for periodically actuating escapement means to oscillate novel wire cutting means through which the wire is fed unidirectionally and intermittently; the provision of thrust take up means to prevent dislodgement of the wire shaping means; the provision of novel means for automatically stripping the completed wire form from the machine; the provision of adjustable means for taking up the slack of the endless belt carrying the plurality of stabilized wire bending means; the provision of means to permit one of the rotatable wire feeding rollers to float to compensate for the variations in thicknesses of the wire fed between the companion wire feeding rollers; the provision of adjustable means for regulating one of the clinching rollers for accommodating wire having uncontrollable variations in thicknesses; the provision of automatic means for elevating the wire form on passing through the throat of the wire shaping means. Another feature of the invention comprehends a novel method of automatically bending unidirectionally and intermittently fed wire across the throat of wire shaping means, driving the bent wire through the shaping means with the aid of the bending means traveling in a unidirectionally guided path, and stripping the shaped wire automatically on leaving the shaping means. Other salient objects, features and advantages will also appear from the following detailed specification considered in the light of the accompanying drawings wherein:

Fig. 1 is a plan view of the wire forming machine according to my invention.

Fig. 2 is a side elevational view on the line 2—2 of Fig. 1, however, partly broken away to illustrate the interior construction.

Fig. 3 is a front elevational view on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view on the line 4—4 of Fig. 1.

Fig. 5 is a view similar to Fig. 2, illustrating the adjustable chain slack take up means.

Fig. 6 is a transverse sectional view on the line 6—6 of Fig. 1.

Fig. 6A is a horizontal view partly in section

on the line 6A—6A of Fig. 5, illustrating the laterally adjustable shaft for one of the crimping rollers.

Fig. 7 is a longitudinal sectional view on the line 7—7 of Fig. 1 etc., illustrating the hinged and floating bearing for one of the wire feeding rollers.

Fig. 8 is an enlarged perspective and exploded view of a fragmentary portion of the machine, illustrating the spaced wire shaping blocks, a link of the continuously driven endless chain for driving a predetermined length of wire into the shaping blocks, and the oscillatory cutter for severing a predetermined length of wire prior to its reception in the shaping blocks.

Fig. 9 is a sectional view on the line 9—9 of Fig. 1 however also illustrating the cutter to indicate the neutral position of the latter at a time when the escapement is idling at which time the wire is feeding through the cutter.

Fig. 10 is a view similar to Fig. 9 but showing the control means in a position for actuating the escapement to drive the wire cutter in a direction towards the stopped wire to sever the latter.

Fig. 11 is a view similar to Fig. 9 but illustrating the control means and cutter at the completion of the severing of the wire by the cutter and the control means in position to actuate the escapement for returning the cutter to a neutral position.

Fig. 11A is a fragmentary perspective view of the control means or cams for periodically oscillating the escapement.

Fig. 12 is a fragmentary view illustrating a stabilized wire bending post of the continuously driven endless chain about to bend and drive a predetermined length of wire into the throat of the wire shaping means.

Fig. 13 illustrates the wire bending post of Fig. 12 driving the now bent wire form onto the inclined or cam faces for automatically driving the wireform into the shaping channels of the shaping blocks.

Fig. 14 illustrates the wire bending post of Fig. 13 driving the wireform in the shaping channels of the shaping blocks.

Fig. 15 is a side view partly in section of one of the toothed links of the wire driving sprocket chain.

Fig. 16 is an enlarged transverse sectional view on the line 16—16 of Fig. 1 depicting one of the stabilized posts driving a wire form through the shaping blocks.

Fig. 17 is a side elevational view on the line 17—17 of Fig. 16 showing the key for absorbing the thrust applied to the anvil on severing of the wire by the cutter during each complete cycle of the latter.

Fig. 18 is a fragmentary plan view illustrating one of the wire driving posts of a link of the wire driving chain just prior to severing of the unidirectional fed wire and at a time when the wire has been fed a predetermined length and interrupted momentarily.

Fig. 19 is a view similar to Fig. 18 and illustrates the wire cut to a predetermined length by the cutter at which time the driving post of a link of the wire driving chain is ready to deform the wire intermediately thereof and feed the same into the wire forming channels of the shaping blocks.

Fig. 20 illustrates the deformed wire passing through the throat of the spaced wire forming blocks at which time the cutter is retracted and through which wire is again driven.

Fig. 21 shows the wireform further deformed as it is driven in the forming blocks.

Fig. 22 illustrates the wireform about to leave the shaping blocks to be received between the wire clinching or processing collars.

Fig. 23 shows the wire processing or clinching rollers about to crimp corresponding portions of the wireform as it leaves the wire shaping blocks.

Fig. 24 illustrates the deformed or clinched wireform about to leave the forming and fixed guide or shaping blocks although still further deformed by the processing rollers.

Fig. 25 is a front view of the spaced wire shaping blocks.

Fig. 26 is a side view of the cutter keyed to its oscillatory shaft and illustrating the check nut and end plate of the cutter having aligned apertures or openings through which the wire is intermittently fed, and illustrating regulating means on the end plate for adjusting the cutting tool.

Fig. 27 is a horizontal sectional view taken on the line 27—27 of Fig. 26 showing the regulating means for adjusting the wire cutting tool.

Fig. 28 is a fragmentary plan view of the machine showing the regulating means for adjusting the main drive shaft and consequently the wire driving endless chain.

Fig. 29 is a rear elevational view of the line 29—29 of Fig. 28.

Fig. 30 is a plan view, partly broken away, of the transmission gearing.

Fig. 31 is an elevational view partly in section of one of the end bearings for the main drive shaft, shown attached to the bed of the machine and adjustable lengthwise of the bed.

Fig. 32 is an elevational view of the transmission taken on the bent plane X—Y of Fig. 30 particularly illustrating that portion thereof for continuously driving the crimping rollers, and

Fig. 33 is a portion of the transmission taken along the bent plane Y—Z of Fig. 30.

Broadly speaking the wire W (Fig. 1) is fed through a braking device B, through rotary feed rollers 10 and 11 for intermittently feeding the wire W which travels through an oscillatory cutter generally denoted C, across a fixed anvil A, across the throat T (Fig. 8) of the spaced wire shaping blocks SB, and against the adjustable stop S.

The oscillatory cutter

Upon striking the stop S, the wire is periodically severed by the cutting tool CT non-rotatably but adjustably mounted in the cutter or arm C which comprises set screws 12 (Figs. 8, 26 and 27) for fixedly holding the cutting tool in place and flush with the transverse face 13 of the cutter.

The non-circular opening 14 in the body of the cutter rectilinearly and slidably guides the cutting tool CT which can be shifted towards face 13 by the set screw 15 threadably mounted on the end plate EP removably fastened to the cutter, and a check nut N adjustably mounted on set screw 15 holds the latter against accidental rotation.

It should be observed, however, that the check nut N is provided with a slot or recess 16 defined by the spaced portions 17, through which is threaded the wire W as it is intermittently fed by the wire feeding rollers 10 and 11.

Of importance also is the aperture or opening 18 in the body of removable end plate EP and this aperture is in registration or alinement with

5

the wire feeding opening or aperture 18 in the body of the cutter and the slot 16 of the removable check nut N.

Unidirectional path of travel

The wire W is intermittently fed towards and across the throat T of the spaced wire shaping blocks SB through the guard G which prevents buckling, through slot 16 in the check nut N, threadably through the guide aperture 18 in the end plate EP, threadably through aperture 19 of the body of the cutter onto wire positioning groove 20 of the anvil A and in the aligned wire positioning groove 21 in one of the wire shaping blocks SB, across the gap or throat T and onto the wire positioning groove 22 of the other but companion wire shaping block SB and to and against the adjustable stop S.

Endless chain guide frame

Supporting the threaded stop S is a bracket 23 attached to a ledge or flange L appropriately fastened to one of the plates F of the endless chain guide frame, which in fact is characterized by a pair of spaced plates F disposed lengthwise of and appropriately fastened on the sturdy and durable metal foundation or bed plate BD suitably fixed on a metal block or supporting table St.

Specifically the spaced frame plates F are fixedly arranged to be normal to the direction of travel of the wire W as it is intermittently fed unidirectionally across the throat T. These spaced frame plates F have appropriately and fixedly anchored thereto the upper and lower cooperating spaced pairs of channeled shaped races CR (Figs. 3 and 4) having aligned channels or grooves 24 defining track means for movably and continuously guiding the hinged pins H of the several pivoted links 25 of the endless chain EC.

The endless continuously driven chain and stabilized wire driving posts

Each of the links 25 is provided with a fixedly anchored wire bending post 26 (Figs. 8 and 15) held in place by set screw 27. Backing up and reinforcing each upstanding binding post 26 is a shock absorbing block 28 provided with a groove 29 for receiving the shank of its adjacent post 26. Each block 28 includes a depending stud 30 held anchored by the set screw 31 to its respective link 25. Therefore each post 26 is stabilized by its backing or reinforcing shock absorbing block.

The several links 25 of chain EC are also pivotally secured to one another by reason of the hinge or fulcrum pins H (Figs. 3, 6 and 16) and each link includes at one end a perforated ear 32 (Figs. 8 and 16) and at another end a pair of spaced perforated ears 33 while the bottom portion of each link embodies a tooth 34 straddled by teeth receiving notches 35. Each link also includes a curved and forwardly and downwardly projecting scoop or tail portion 35' for carrying off undesirable steel particles to prevent clogging.

When the pivoted links 25 are assembled and driven through the frame defined by the spaced plates F, the outer side faces 36 of the links are close to but parallel to the inner faces 37 of the upper and lower fixedly anchored races CR. By this arrangement the chain EC is stabilized and lateral play of the links 25 is precluded during their travel in the frame.

The endless chain EC continuously driven and guided in the frame between the plates F is also

6

actuated by and meshes with the gear 38 (Figs. 2, 4 and 5) appropriately fixed on shaft 39 sustained by and journaled in bearing blocks 40 and 41 (Fig. 4) appropriately fastened to the bed plate BD. More particularly teeth 42 of the gear 38 coact with the walls of the teeth receiving notches 35 of the links 25 to facilitate driving the endless chain EC through the guide frame defined by plates F.

But the chain EC is directly driven by gear 43 (Fig. 2) at the rear of the frame. This gear is fastened to the main drive shaft 44 sustained by the spaced bearing blocks 45, 62 and 47 (Fig. 1). It should be observed however that the main drive shaft 44 receives its power through gear means 156 and a sprocket chain 48 connected to a suitable motor not shown.

The transmission for driving the wire crimping rollers, the endless chain, and the wire feed rollers

Coupled to the main drive shaft 44 (Fig. 32) is the beveled gear 49 for driving the companion beveled gear 50 attached to the vertical stub shaft 51 to which is keyed gear 52 for driving gear 53 keyed to stub shaft 54. Associated with and driven by pinion 53 is the gear 55, keyed to vertical shaft 56 to which gear 57 and one of the wire clinching rollers KR are keyed. However, gear 57 drives a companion gear 58 on shaft 59 carrying the other companion wire crimping roller KR. By this arrangement the pair of wire crimping wheels or rollers KR are continuously rotating during rotation of the main drive shaft 44.

When the main drive shaft 44 is rotating, the endless chain EC is actuated by the driven gear 43 (Fig. 2) appropriately keyed to shaft 44. Consequently front gear 38 is set in motion by the endless chain EC, hence causing the rotation of the drive shaft 39 on which the cam or control means 60 and 61 are fastened. Therefore shaft 39 is always rotating during rotation of the main drive shaft 44. Shaft 39 is sustained by or journaled in the bearing block 40 and by bearing block 41 attached to the bed BD by suitable bolts 46 and by the auxiliary bearing 63 appropriately fastened to the bearing block 64 (Figs. 3 and 4).

As previously stated, rotation of the main drive shaft 44 ultimately causes the pair of wire crimping rollers KR to rotate through the intermediary of the gears 52, 53, 55, 57 and 58. However at this time the floating wire feeding wheel or roller 11 is also rotated by the driven and revolving gear 55 (Fig. 33) which drives gear 65 keyed to stub shaft 66 on which is mounted gear 67 operating gear 68 attached to shaft 69 carrying the wire feeding roller 11. The companion wire feeding roller 10 is fastened on shaft 70 (Fig. 30) in the bearing block 64 (Fig. 4) and rotated by gear 71 on shaft 70 driven by gear 68. It is thus apparent that the companion wire feeding rollers 10 and 11 also continuously rotate during the operation of the main drive shaft 44.

Briefly recapitulating once the main drive shaft 44 has started to rotate, the endless chain EC is driven; the companion crimping rollers KR are caused to rotate in the directions indicated in Fig. 1; the feed rollers are likewise caused to rotate to feed the wire W as indicated in Fig. 1 from the brake B into the guard G; and the shaft 39 is continuously rotated, causing the rotation of the cam wheels 60 and 61.

Escapement for periodically oscillating the cutter

The cutter C is fixedly anchored on the oscilla-

tory shaft 72 (Figs. 4 and 6) suitably journaled in the bearing blocks 73 and 64 and is adapted to be rocked or partially rotated by an escapement generally denoted ES (Fig. 9) comprising the cutter advancing pawl or dog KA and the cutter retracting pawl KB each anchored to the rocking shaft 72.

The cutter advancing pawl KA is periodically operated by the cam or toothed wheel 60 which has a plurality of spaced teeth 74 in opposition to the V-shaped notches or grooves 75 of the cam 61.

Corresponding faces as 76 of the teeth 74 of toothed wheel 60 successively coact with the depending tooth 77 of the cutter advancing pawl KA, causing the latter to be periodically raised hence rotating the oscillating shaft 72 in a counter clockwise direction (Fig. 10) or towards the wire W. Since the cutter C is also fastened to the rocking shaft 72 and inasmuch as the latter has been rocked or partially rotated, the cutter is bodily swung in a direction towards the wire W. By this action the cutting tool CT is brought transversely across the wire W retained in groove 20 on the anvil A, and the wire is thus severed however, thereafter pausing slightly and awaiting to be driven into the throat T of the spaced shaping blocks SB.

Shortly pursuant to such cutting operation during rotation of the cam or escapement actuating wheels 60 and 61 which in fact rotate together at all times, tooth 78 of the retracting pawl KR falls into a notch 75 of cam wheel 61 and a wall 79 of the latter causes the retracting pawl KB of the escapement to tilt in a clockwise direction, thus partially rotating the oscillatory shaft 72 in a similar direction, consequently bodily retracting the cutter C. It therefore follows that the cutter is again awaiting to go through a complete operating cycle, that is, swung to cut, and thereafter swung to retract. This complete stroke or cycle takes place many times during one revolution of the driven shaft 39 or in other words, during one revolution of the cam wheel 60 and 61. As illustrated, seven complete cycles per one revolution of shaft 39 is possible and if desired and as is well understood the number of cycles may be increased or decreased depending upon the number of teeth as 74 and grooves as 75 are employed on the cam wheels 60 and 61. It is thus seen that wire W even though threaded and passing through the cutter is periodically severed or cut at a time however when the feed of the wire is stopped for an instant as will be hereinafter more particularly pointed out.

Continuously rotating rollers for intermittently feeding the wire stock to and through the oscillatory cutter

As previously emphasized the wire W is fed into the cutter C and across the throat of spaced shaping blocks SB by the rotary feed rollers 10 and 11. Although these rollers are continuously rotating during the operation of the machine nevertheless they feed the wire intermittently. In this connection it will be observed that roller 11 fastened on floating shaft 69 is provided with an annular and uninterrupted groove or race 80 while the companion roller 10 fastened on shaft 70 has its circumference interrupted by a plurality of vertical gaps 81. Normally the vertical rim surface of roller 10 in cooperation with the wall of race 80 of the companion feed roller 11 drive the wire fed from brake B through the guard G and cutter to the stop S. Where how-

ever the rim surface of the roller 10 is interrupted by the gaps 81, feeding of the wire is interrupted. By this action the wire is thus intermittently fed. However during such interruption the cutter is operated to sever the wire.

Moreover inasmuch as the effective feeding portions of the roller 10 are between the gaps 81 and since these feeding portions have substantially equivalent effective operating areas, predetermined lengths of wire are fed across the throat T of the spaced shaping blocks SB, the arrangement being such, that when feeding of the wire has ceased or interrupted the cutter C instantly swings into position to sever the wire. For example, in Fig. 18 a predetermined length of wire W is between the stop S and the cutter C and across the throat T. The wire at this time is interrupted and at the next instant the cutter C has been swung bodily towards the wire, causing the cutting tool CT to sever the wire (Fig. 19). Thereafter the cutter C retracts, and the feeding of the wire is continued through the check nut N, through the end plate EP, and through the body of the cutter and in Fig. 21 a predetermined length of wire is again in position for severing by the cutter. Or in other words, predetermined lengths of wire fed are successively positioned before the throat T.

Even though the wire is fed intermittently it is sustained in position across the throat T and is ready to be bent by a bending post 26 of a link 25 of the endless chain EP. Thus in Fig. 19, a predetermined length of wire has been cut, a bending post 26 is already in position to bend the central portion of the wire inwardly into the throat T (Fig. 20) of the channeled shaped end spaced wire shaping blocks SB fixedly but removably attached to frame plates F by bolts 82 and 83 or the like (Figs. 1, 16, 17 and 18).

The thrust absorbing key to sustain proper alinement of the wire shaping blocks

Attention is directed to the thrust absorbing key K arranged in one of the frame plates F (Figs. 1, 16 and 17) and this key also positions the anvil carrying shaping block SB on this frame plate. It also has an additional function, to take the strain off adjacent bolts 82. This strain is created on each severing of the wire by the cutter and the thrust imparted is absorbed by the key K instead of the adjacent bolts 82, hence preventing the latter from shearing. In other words, the key absorbs the stress produced on severing of the wire and thus relieves strain on the adjacent bolts. Because of the action the wire shaping blocks are maintained in proper alinement, that is, the opposed and alined wire shaping channels 84 in communication with the guide slot 85 for the reception of the reinforced or stabilized driving and bending pins or posts 26 of the endless chain EP are kept true, the guide slot 85 being defined by the overhanging guide lips 86 (Fig. 25), and the bosses 87 extending from the shaping blocks SB although just slightly to the rear of the throat T each has an inclined cam face 88 for elevating the bent wire now designated a wireform WF (Fig. 20) onto the bosses or shoulders 87 to be received closely but movably in the longitudinally arranged opposing wire shaping recesses or channels 84 wherein the shanks 89 of the wireform WF are urged towards each other in view of their close confinement in the opposed shaping channels 84 extending the entire length of the spacing blocks SB.

The continuously rotating wire clinching rollers

The opposed clinching rollers KR toward the end of the travel of the wireform WF in the spaced shaping blocks SB coact with the successive driving posts 26 to clinch the loop portion of the wireform and to close the shanks 89 thereof, that is, these rollers form the eye E (Fig. 24) and arrange the shanks 89 of the wireform in close juxtaposition. To this end it will be observed that the clinching rollers KR are provided with a plurality of notches 90 interrupting their annular races 91.

The loop of the wireform WF first leaves the shaping blocks SB (Fig. 22) and ultimately is received between a pair of aligned clinching notches or grooves 90 (Fig. 23) in the opposing clinching wheels or rollers KR. The walls of these clinching notches bend the loop closely around the driving post 26 and as the latter is driven between the crimping or clinching rollers KR the races or grooves 91 cause the shanks 89 to be arranged closely against each other (Fig. 24).

Automatic stripper or kick-off for completed wireform

The clinching rollers also cause the eye E of the wireform WF to cling firmly to its driving post which continues in its path of travel because of the orbital displacement of the driving endless chain EC. Eventually the clinched wireform or article of manufacture is driven, that is, the eye thereof onto the spaced but fixed cams or strippers 92 (Figs. 1 and 2) which function to remove the completed wireform from its driving and carrying post 26 and falls into a suitable chute 93 (Fig. 5) and into a collecting receptacle not shown.

It should be understood of course that the operation of the machine is continuous and as each of successive driving posts of the chain EC reach the throat T, a predetermined length of wire is awaiting to be bent and fed into the spaced shaping blocks SB for shaping, thereafter between the crimping or clinching rollers KR for further deforming, and thereafter fed to the inclined stripper means or spaced cams 92 for automatic removal from the machine.

Automatic and compensatory means for involuntary variations in thicknesses of wire fed between the wire feed rollers

To compensate for irregularities in the thicknesses of the wire W fed between the rotary feed rollers 10 and 11, roller 11 is yieldably disposed and may be considered as floating although it is normally urged towards its companion roller 10 by the spring 94 (Figs. 1 and 7) disposed in recess 95 of the swingably guided bearing block 96 hinged on the fulcrum pin 97 fixedly anchored in the fixed bearing block 64. More particularly floating shaft 69 rotates in the hinged bearing or bearing block 96 swingably guided in recess 98 of the fixed bearing block 64 in which shaft 70 of the companion feed roller 10 is rotatably driven and guided.

Cooperating with the spring 94 is the adjustable threaded bolt 99 mounted on the closure plate 100 removably and fixedly fastened to the fixed bearing 64 in any well known manner. By adjusting bolt 99, flange 101 thereof compresses or relaxes spring 94. If relaxed, greater hinged displacement of the feed roller 11 is possible. If compressed less displacement takes place.

Hence feed roller 11 swings slightly to compensate for variations in thicknesses of the wire fed between rollers 10 and 11 although it is always yieldingly urged towards the feed roller 10 by the helicoidal spring 94.

Buckling of wire in its travel towards the oscillatory cutter is precluded

Referring now back to the wire guard or track G, the latter is appropriately secured to the offset arm 102 (Figs. 1 and 6) which in turn is sustained by a suitable bolt 103 attached to the closure plate 100 fastened to the fixed bearing block 64. By this arrangement the wire between the feed rollers 10 and 11, and the cutter C is desirably held against buckling or vibration and is unidirectionally guided until it reaches the adjustable stop S at which time it is severed.

During operation of the machine, fine particles at times chip off the wire and these are precluded from entering between the hingedly connected links 25 of the endless chain EC in the provision a closure 104 removably held by pins 105 across gap 106 between ears or knuckles 33 between which is closely guided a companion link. Thus the chain is caused to operate smoothly and without being needlessly scratched or interfered with, particularly so in that vertical sides 36 of each link 25 is closely and movably guided by the vertical inside faces 37 of the fixed races CR (Fig. 4) of the frame plates F, although it should be noted that each of the shaping blocks SB is provided with a relief channel 107 (Fig. 16) providing an outlet for powdered particles that may fall off the wireform. These relief channels are in alinement as shown and the powdered articles fall on top of the chain EC and thereafter carried off by the latter and cleared in any well known manner.

The brake mechanism to prevent feeding of wire across the shaping blocks less in length than required predetermined lengths

Previous mention was made of the brakes B (Figs. 1 and 6) which consists of a housing 108 removably fastened by screws 109 to the fixed bearing 64. This housing has its spaced legs 110 and 111 provided with the bores 112 in which the helicoidal springs 113 are confined. These springs coact to urge the slidably guided tumblers 114 towards a pair of floating discs 115 closely but rotatably confined in a tapered recess or bearing 116 having the outwardly converging walls 117.

Specifically the wire W is fed through a guide aperture 118 at the outer end of the housing 108 and between the race or groove 119 of one of the rotatable discs 115 and against the uninterrupted rim of the companion disc 115 and through the medially arranged bore 120 in the housing and into a guiding aperture 121 in the end plate 122 fastened to the housing 108. Thereafter the wire W is fed directly between the feed rollers 10 and 11. A cover plate 123 is suitably removably held on the housing to prevent the moving parts within the brake housing from being taken out and to prevent steel dust to enter.

When the wire W is properly and continuously feeding towards and between the feed rollers 10 and 11, the companion discs 115 are idly rotating against the slidable and yieldably disposed tumblers 114.

The rotatable discs 115 of the brake clamp the wire W and prevent it from slipping backwards during its instantaneous pauses, that is,

11

periodically during each revolution of the feed roller 10 and at the time when one of its gaps 81 is effective to prevent feeding of the wire. By clamping the wire for just a relatively short instant, feeding of the wire in lengths less than the required predetermined lengths is avoided.

Adjustable set screws 142 cooperate with the discs 115 to regulate their retraction and control the time interval for clamping the wire to arrest its feeding.

If for any reason the wire has a tendency to feed or slip in an opposite direction such action instantly is resisted in that the discs 115 immediately and automatically are urged towards the contracted portion of recess 116 by springs 112, thus instantly clamping the wire, thereby arresting its movement. Once however the wire is again fed towards the feed rollers 10 and 11, the discs 115 unclamp the wire, permitting its travel as desired.

Endless chain take up mechanism

Should the links 25 of the endless chain EC wear during operation of the machine, such wear is compensated for. To this end it will be observed that the main drive shaft 44 may be bodily shifted in a direction towards or away from the wire feeding and crimping rollers. Specifically the frame plates F include the aligned and slightly elongated slots 125 (Figs. 1, 2 and 28) thus permitting the main drive shaft 44 to be displaced when its bearings 45 and 62 secured by bolts as 126 to the slidable plate P (Figs. 2 and 28 are bodily shifted on the adjustment of plate P).

This metal plate P is provided with a depending rib 127 (Fig. 29) slidably guided lengthwise of the machine in the recess or track 128 in the metal block or bed plate BD which is fastened by bolts 129 to the bracket 130 having the bearing 131 wherein the stub shaft 132 of a rotatable manipulator generally denoted M is journaled. Collars 133 and 134 of the manipulator M rotatably straddle the bifurcated bearing 131 and extending from collar 134 is the threaded stem 135 threadably received by a block 136 fastened by rivets 137 to the slidably guided plate P. By this arrangement rotation of the manipulator M causes the slidable block 136 to be moved towards or away from the fixed bracket 130. It follows that slidable plate P may be bodily displaced relative to the stationary bed plate BD upon rotation of the manipulator. And of course, if plate P is slidably displaced, the fixed bearings 45 and 62 thereon are correspondingly displaced. Consequently the end of the drive shaft 44 journaled in bearings 45 and 62 is likewise correspondingly displaced relative to the spaced and aligned elongated slots 125 (Fig. 28) in the spaced guide frame plate F which carry the upper and lower races CR to prevent the endless chain EC from chattering, in a direction widthwise of the shaping blocks SB, hence stabilizing this chain.

The other end of the main drive shaft 44 is journaled as previously stated in the rear bearing 47 (Figs. 1 and 31). This bearing may be adjustably fixed relative to the bed plate BD. For this purpose the bed plate is provided with the elongated openings 138, permitting the adjustable bolts 139 to be displaced relative to these elongated openings 138 when this rear bearing is shifted but this must be done at a time when the heads 140 of the bolts are unclamped from the shoulders 141. It follows that by unloosening bolts 139, the rear bearing and consequently the

12

rear end of shaft 44 may be shifted relative to the bed plate. After such adjustment, the bolts 139 are clamped, and the rear bearing 47 is held in a fixed position.

By the arrangement just set out, adjacent of the supporting bearings 45, 62 and 47 for the main drive shaft is possible and thereafter when the manipulator M is actuated, shaft 44 is displaced and consequently drive gear 43 (Fig. 2) carried by shaft 44 is displaced. Following the displacement of the drive gear 43 the endless chain EC is correspondingly adjusted, that is, extended as desired to compensate for irregularities due to wear or due to any other causes. Pursuant to such adjustment the clamping bolts 139 for the rear bearing 47 are fastened to prevent dislodgement of these bearings. However it should be noted that the heads 140 of the bolts 139 are also displaceable relative to the elongated openings 143 in the bed BD. If therefore these bolts are loosened the threaded shanks are adjustable in elongated openings 138 and the heads 140 of these bolts are displaceable in the openings 143.

Lateral adjustment of one of the crimping rollers

Due to uncontrollable variations in the thickness of the wire, at times it is necessary to laterally adjust one of the wire crimping rollers KR relative to the other. This is accomplished in adjustably mounting an intervening bearing 145 (Figs. 2, 5, 6 and 6A) on a fixed ledge L. Specifically this intervening bearing 145 has spaced elongated openings or slots 146 surrounding the spaced bolts 147 threadably secured to the companion ledge L. By unloosening set screws 148 when bolts 147 are unclamped the bearing may be shifted widthwise relative to its ledge L (Fig. 6). Thereafter clamping bolts 147 are tightened to clamp bearing 145 against top face of the ledge L and the set screws 148 are fastened against a side face 149 of ledge L.

Integral with the intermediate bearing 145 is the hub 150 in which shaft 59 is also journaled. If therefore, bearing 145 is adjusted shaft 59 is correspondingly displaced. Consequently the crimping roller K fastened to this shaft is likewise correspondingly displaced widthwise of the machine or towards or away from its companion clinching roller. However the lower end of shaft 59 (Fig. 6) is also journaled in a slightly tapered bore 151 of the hub 152 of the bearing block 153 fastened to the bed plate BD. By reason of the tapered bore, shaft 59 may be slightly tilted as desired to compensate for the adjustment thereof on shifting of the bearing block 145 relative to its supporting ledge L.

As illustrated the rollers 10 and 11 are adapted to feed half round wire in that the rim of roller 11 is provided with the race or groove 80 while the rim of the roller is uninterrupted except for the non-feeding wire gaps 81. Obviously full round, flat, and other shaped wire and many types of cross sectional shaped strip material may be also fed through the machine. Where full round wire is used each of the feed rollers would have a race as 80 and in the case of feeding flat wire, roller 10 would remain as is while the roller 11 would have the rim of roller 10 however without non-feeding wire gaps. Where full round, flat or other shaped material or metal stock is employed the wire feed guiding apertures and grooves would be correspondingly changed as is well understood.

The feed wire clinching rollers are removably secured to their respective shafts in any well known manner and thus may be quickly replaced

for purposes of inspection or for repair. The machines may be readily dismantled since most of the bearing blocks or bearings are removably secured. And access may be readily had to the cutter and the cutting tool by removing the end plate EP. The fixedly held but removable anvil A is an alloy, known in the trade as Stellite. The bolts employed are generally known as hollow head cap screws and thus may be readily adjusted or clamped. Of course while at times it is desirable to clinch the wireform, there are times when this may not be needed. Hence at such times the clinching rollers may be removed.

Where even faster production is required per revolution of the wire feed rollers, feed roller 10 may be replaced by another roller having more than four non-feeding gaps, and of course the control means or cam means 60 and 61 would be modified accordingly. Then again stop S may be rotated for adjustment to take care of increasing or decreasing desired predetermined lengths of wire as the case may be. The links 25 of the wire deforming driving chain EC are hingedly connected to one another but fit closely into one another to preclude admission therebetween of steel particles. The end block 155 (Figs. 1 and 2) is removably fastened to the bed plate BD and to the feed roller bearing 64 while the auxiliary bearing 63 sustaining one end of the stub shaft 39 is suitably attached to the bearing block 64 and to the end block 155 which imparts a certain rigidity to the bearing 64, thus desirably stabilizing the latter. Also a hand wheel HW is mounted on the main drive shaft 44 to overcome the initial inertia in starting of the motor (not shown) for driving sprocket chain 48, thus rotating pinion 156, keyed to shaft 44, and consequently the latter.

By the present invention, because of each succeeding step in the method herein pointed out follows almost immediately pursuant to the completion of its preceding step, no appreciable lost motion is encountered. Thus by utilizing the rotary wire feeding means, and driving the predetermined lengths of wire almost instantly into the wire shaping means SB, the action is rapid and in prompt succession, thus appreciably stepping up production many times that is possible in the case of the slide type of wireforming machines particularly so in that while successive predetermined lengths of wire are continuously but nevertheless interruptedly fed by the rotary feed rollers across the shaping means defined by the shaping blocks, predetermined lengths of such wire previously fed by these feed rollers are being driven through the shaping means in a unidirectional path. Thus the shaping operations on previously cut wire take place simultaneously with the feeding of the next consecutively fed wire portions to the shaping means. As a further commentary, it should be observed that prior to the adjustment of the slidable plate P, bolts 160 (Figs. 5 and 28) are unclamped therefrom, thus permitting slots 161 to be displaced relative to these bolts when plate P is shifted. After the adjustment of plate P, bolts 160 are again tightened thereagainst to retain the set position.

Various changes may be made in the details of construction and arrangement of parts without departing from the spirit of the invention or sacrificing any of the advantages therein.

I claim:

1. In combination, shaping means for deforming metal stock, a cutter for severing said stock, 75

escapement means for periodically oscillating said cutter to sever predetermined lengths of said stock, rotary means for continuously but intermittently feeding said predetermined lengths of said stock to said shaping means, and means for successively driving previously fed predetermined lengths of said stock by said rotary means unidirectionally through said shaping means to successively deform said lengths during feeding of subsequent predetermined lengths of said stock to said shaping means by said rotary means.

2. In combination, shaping means for deforming metal stock, rotary means for feeding a predetermined length of said stock to said shaping means, a cutter for severing said predetermined length, escapement means for oscillating said cutter, an endless chain having bending means for driving said predetermined length through said shaping means, means for driving said endless chain, means for actuating said escapement means, and means for driving said rotary means.

3. In combination, shaping means for deforming metal stock, rotary means for successively and intermittently feeding predetermined lengths of said stock to said shaping means, cutting means for periodically and successively severing said predetermined lengths, escapement means for oscillating said cutting means spatially arranged stock bending means for successively driving said predetermined lengths unidirectionally through said shaping means, means for driving said bending means, means for actuating said escapement means, and means for driving said rotary means.

4. In combination, spaced shaping means for deforming a wire or strip metal material, a cutter, escapement means for actuating said cutter for successively severing predetermined lengths of said wire or material, rotary means having means for intermittently and successively feeding said predetermined lengths of said wire or material to said shaping means, an endless chain having a plurality of pivotally interconnected links each having bending means for successively driving said predetermined lengths unidirectionally and completely through said shaping means, means for driving said endless chain, rotary means for oscillating said escapement means, means for driving said rotary means, and means for stabilizing said chain during its travel through said shaping means.

5. In a machine for making a wireform from wire, shaping means having a throat and having spaced walls defining a gap and having spaced and opposing wire shaping channels, cam means below said channels, means for feeding said wire across said shaping means, pin means movably guided in said gap for bending said wire against said shaping means to define said wireform and for elevating said wireform along said cam means and into said channels and for subsequently driving said wireform through said channels to shape said wireform, and means for driving said pin means.

6. In a machine for making a wireform from wire, spaced blocks defining a gap and having spaced and opposing wire shaping channels, inclined means extending from said blocks below said channels, means for feeding said wire across said blocks, pin means movably guided in said gap for bending said wire against said blocks to define said wireform for elevating said wireform onto and along said inclined means and into said channels and for driving said wireform through

15

said channels to shape said wireform, means for driving said pin means, and rotary clinching means for crimping said wireform against said pin means pursuant to its travel through said channels.

7. In a machine for successively making wireforms from wire, spaced blocks defining a gap and having spaced opposing wire shaping channels, rotary means for successively and interruptedly feeding said wire across said blocks, hingedly interconnected links defining an endless chain, post means carried by said links and movably guided in said gap, means for driving said chain to arrange said post means of successive links of said chain against successive portions of said wire to bend the latter and successively drive said portions into said channels to shape said bent portions, a frame, means sustaining said blocks on said frame, key means interposed between said frame and blocks for relieving the shock imparted to said blocks on bending of said wire by said posts, and rotary means for driving said chain.

8. In a machine for successively making wireforms from wire, spaced blocks defining a gap and having spaced and opposing wire shaping channels, companion rotary means comprising oppositely rotating rollers one of which embodies an interrupted rim for successively and interruptedly feeding said wire across said blocks, hingedly interconnected links defining an endless chain, post means carried by said links and movably guided in said gap, means for driving said chain to arrange said post means of successive links of said chain against successive portions of said wire to bend the latter and successively drive said portions into said channels to shape said bent portions, rotary driving means for actuating said chain, a cutter, rotatable control means, and escapement means effective upon rotation of said control means for oscillating said cutter to successively sever predetermined lengths of said wire across said blocks.

9. In a machine for successively making wireforms from wire, spaced blocks defining a gap and having spaced and opposing wire shaping channels, rotary means for successively and interruptedly feeding said wire across said blocks, hingedly interconnected links defining an endless chain, post means carried by said links, means for driving said chain to arrange said post means of successive links of said chain against successive portions of said wire to bend the latter and successively drive said portions into said channels to shape said bent portions, rotary means for driving said chain, means for stabilizing said chain, and means for adjusting said chain to compensate for any wear thereof.

10. In a machine for successively making wireforms from wire, shaping means having spaced walls defining a gap and having spaced and opposing wire shaping channels, rotary means for continuously and successively but interruptedly feeding said wire across said shaping means comprising a pair of companion rollers one of which embodies a rim provided with one or more gaps, hingedly interconnected links defining an endless chain, post means carried by each of said links, means for driving said chain to arrange said post means of successive links of said chain against successive portions of said wire to bend the latter and successively drive said portions into said channels to shape said portions, rotary means for driving said chain, a bearing sustaining one of said rollers, and resiliently controlled adjustable means pivotally connected to said

16

bearing for yieldably sustaining the other roller of said pair.

11. A machine for forming wire comprising shaping means for sustaining said wire, a frame for supporting said shaping means, fastening means for removably holding said shaping means on said frame, key means for positioning said shaping means on said frame, a cutter threadably receiving said wire, means for oscillating said cutter to successively sever said wire pursuant to its travel from said cutter onto said shaping means, and said key means adapted to absorb the impact of said cutter on severing of said wire to prevent shearing of said fastening means.

12. In combination, wire shaping means, driving means, an endless chain actuated by said driving means and having spaced posts, frame means having races for guiding said chain and for stabilizing the latter, a shaft, means driven by said chain for rotating said shaft, control means mounted on said shaft, a supplementary shaft, a rockable cutter carried by said supplementary shaft, and escapement means actuated by said control means for oscillating said supplementary shaft and correspondingly rock said cutter in a direction towards or away from said shaping means.

13. In combination, wire shaping means, driving means, an endless chain actuated by said driving means and comprising pivotally interconnected links each having reinforced wire bending means, frame means having races for guiding said links and for stabilizing said chain, a shaft, means driven by said chain for rotating said shaft, control means mounted on said shaft, a supplementary shaft, a rockable cutter carried by said supplementary shaft, escapement means actuated by said control means for oscillating said supplementary shaft and correspondingly rock said cutter in a direction towards or away from said shaping means, and means for adjusting said driving means in a direction substantially normal to said shaping means for taking up slack of said chain.

14. In combination, wire shaping means, driving means, an endless chain actuated by said driving means comprising a plurality of interlocking links each having wire bending means, fulcrum means pivotally interconnecting adjacent links of said plurality, frame means having races for guiding said fulcrum means and for stabilizing said chain, a shaft, means driven by said chain for rotating said shaft, control means mounted on said shaft, a supplementary shaft, a rockable cutter carried by said supplementary shaft, escapement means actuated by said control means for oscillating said supplementary shaft and correspondingly rock said cutter in a direction towards or away from said shaping means, an adjustable cutting tool carried by said cutter, a pair of rotary wire feeding rollers, means driven by said driving means for rotating said rollers, one of said rollers having an indented rim providing one or more non-wire feeding gaps, and resiliently controlled adjustable means for yieldingly urging one of said feed rollers towards the other feed roller to compensate for uncontrollable variations of the thicknesses of wire fed between said rollers.

15. In combination, wire shaping means having an anvil, driving means, an endless chain actuated by said driving means and comprising a plurality of hingedly interconnected links each having wire bending means, frame means including races for guiding said chain and for stabiliz-

17

ing the latter, a shaft, means driven by said chain for rotating said shaft, control means mounted on said shaft, a supplementary shaft, a pair of rotary companion rollers for intermittently feeding wire towards said shaping means, a rockable cutter carried by said supplementary shaft and threadably receiving said wire, escapement means actuated by said control means for oscillating said supplementary shaft and correspondingly rock said cutter in a direction towards and away from said anvil, said wire bending means driving said wire unidirectionally through said shaping means, one of said rotary wire feeding rollers having non-feeding wire portions for interrupting the travel of said wire, rotary means for clamping said wire during non-feeding intervals thereof, a transmission controlled by said driving means for actuating said wire feeding rollers, a pair of rotary crimping rollers at one end of said shaping means for deforming said wire on leaving of said shaping means, and means for adjusting one of said crimping rollers relative to its companion crimping roller.

16. In a wireforming machine, a frame, spaced races sustained by said frame and having aligned tracks and having spaced walls, an endless chain having a plurality of links closely but movably interposed between said walls, fulcrum means pivotally interconnecting said links and movably guided on said tracks, spaced blocks mounted on said frame and defining a longitudinally disposed gap, post means carried by each of said links and movably guided through said gap, said blocks having aligned and spaced grooves, inclined means extending from said blocks in advance of said grooves, automatic means for interruptedly feeding predetermined lengths of wire across said blocks, and said post means adapted to bend said lengths against said blocks to define wireforms elevated on said inclined means and driven successively by said post means into said spaced grooves of said spaced blocks.

17. In a wire forming machine, a frame, spaced races sustained by said frame and having aligned tracks and having spaced walls, an endless chain having a plurality of links closely but movably interposed between said walls, toothed means extending from each link, fulcrum means pivotally interconnecting said links and movably guided on said tracks, spaced blocks mounted on said frame and defining a longitudinally disposed gap, post means carried by each of said links and movably guided through said gap, said blocks having aligned and spaced grooves, inclined means extending from said blocks in advance of said grooves, automatic means for interruptedly feeding predetermined lengths of wire across said blocks, and driving means in mesh with said toothed means for actuating said chain for successively moving said post means against said lengths to bend said lengths against said blocks to define wire forms elevated on said inclined means and driven by said post means into said spaced grooves of said spaced blocks.

18. In a wire forming machine, a frame, spaced races sustained by said frame and having aligned tracks and having spaced walls, an endless chain having a plurality of links closely but movably interposed between said walls, toothed means extending from each link, fulcrum means pivotally interconnecting said links and movably guided on said tracks, spaced blocks mounted on said frame and defining a longitudinally disposed gap, post means carried by each of said links and movably guided through said gap, said blocks having aligned

18

and spaced grooves, inclined means extending from said blocks in advance of said grooves, automatic means for interruptedly feeding predetermined lengths of wire across said blocks, driving means in mesh with said toothed means for actuating said chain for successively moving said post means against said lengths to bend said lengths against said blocks to form wireforms elevated on said inclined means and driven by said post means into said spaced grooves of said spaced blocks, and key means interposed between said frame and at least one of said blocks for absorbing the thrust on said lengths in forming said wireform.

19. In a wireforming machine, a frame, spaced races sustained by said frame and having aligned tracks and having spaced walls, an endless chain having a plurality of links closely but movably interposed between said walls, toothed means extending from each of said links, fulcrum means pivotally interconnecting said links and movably guided on said tracks, spaced blocks mounted on said frame and defining a longitudinally disposed gap, post means carried by each of said links and movably guided through said gap, said blocks having aligned and spaced grooves, inclined means extending from said blocks in advance of said grooves, automatic means for interruptedly feeding predetermined lengths of wire across said blocks, driving means in mesh with said toothed means for actuating said chain for successively driving said post means against said lengths to bend said lengths against said blocks to define wireforms elevated on said inclined means and driven by said post means into said spaced grooves of said spaced blocks, and each of said links having a shock absorbing block disposed against its respective post means for stabilizing the latter.

20. In a machine for making wireforms from wire, spaced wire shaping means, an endless belt having a plurality of pivotally interconnected links each having upstanding post means for successively driving predetermined lengths of said wire between said shaping means to define wireforms, companion means for clinching said wireforms against said post means, and means for automatically and successively stripping said clinched wireforms from said post means.

21. In a machine for making wireforms from wire, spaced wire shaping means, an endless belt having a plurality of pivotally interconnected links each having upstanding post means for successively driving predetermined lengths of said wire between said shaping means to define wireforms, companion and notched rollers for clinching said wireforms against said post means, and means for automatically and successively stripping said clinched wireforms from said post means.

22. In a machine for making wireforms from wire, spaced wire shaping means, an endless belt having a plurality of pivotally interconnected links each having upstanding post means for driving predetermined lengths of said wire between said shaping means to define wireforms, companion rollers for clinching said wireforms against said post means, means for automatically and successively stripping said clinched wireforms from said post means, and means to provide for adjusting one of said rollers.

23. In a machine for making wireforms from wire, spaced wire shaping means, an endless belt having a plurality of pivotally interconnected links each having upstanding post means for driving predetermined lengths of said wire between said shaping means to define wireforms,

companion and notched rollers for clinching said wireforms against said post means, and fixed inclined means for automatically and successively stripping said clinched wireforms from said post means.

24. In a machine for making wireforms from wire, spaced wire shaping means, an endless belt having a plurality of pivotally interconnected links each having upstanding post means for driving predetermined lengths of said wire between said shaping means to define wireforms, companion and notched rollers for clinching said wireforms against said post means, and spaced and inclined means for automatically and successively stripping said clinched wireforms from said post means.

25. In a machine for making wireforms from wire, spaced wire shaping means, an endless chain having a plurality of pivotally interconnected links each having upstanding post means for driving predetermined lengths of said wire between said shaping means to define wireforms, each of said links having toothed means, gear means adapted to be in mesh with each of said toothed means, a shaft sustaining said gear means, bearing means supporting said shaft, and adjustable means providing for displacement of said bearing means to permit shifting of said gear means to take up the slack of said chain.

26. In a machine for making wireforms from wire, spaced wire shaping means, an endless chain having a plurality of pivotally interconnected links each having upstanding post means for driving predetermined lengths of said wire between said shaping means to define wireforms, each of said links having toothed means, gear means adapted to be in mesh with each of said toothed means, a shaft sustaining said gear means, bearing means supporting said shaft, a slidable plate sustaining said bearing means, a support having means for slidably guiding said plate, and adjustable means connected to said plate and sustained by said support for bodily displacing said shaft and gear means to take up the slack of said chain.

27. In a machine for making wireforms from wire, spaced wire shaping means, an endless chain having a plurality of pivotally interconnected links each having upstanding post means for driving predetermined lengths of said wire between said shaping means to define wireforms, each of said links having toothed means, gear means adapted to be in mesh with each of said toothed means, a shaft sustaining said gear means, a support, a plate mounted on said support, means for movably guiding said plate on said support, bearing means carried by said support for sustaining said shaft, and adjustable means for displacing said plate relative to said support.

28. In a machine for making wireforms from wire, spaced wire shaping means, an endless chain having a plurality of pivotally interconnected links each having upstanding post means for driving predetermined lengths of said wire between said shaping means to define wireforms, each of said links having toothed means, gear means adapted to be in mesh with each of said toothed means, a shaft sustaining said gear means, a support, a plate mounted on said support, means for movably guiding said plate on said support, spaced bearing means carried by said support for sustaining said shaft, a block

secured to said plate, and rotatable means sustained by said support and threadably connected to said block for displacing said bearings relative to said support.

29. In a wire forming machine, a cutter arm having an opening and a wire guiding aperture, a cutting tool non-rotatably but slidably guided in said opening, an end plate mounted on said arm and having a wire guiding opening in registration with said aperture, adjustable means mounted on said end plate for displacing said cutting tool relative to said arm, means mounted on said adjustable means to prevent displacement of the latter relative to said plate and having a wire guiding slot in registration with said wire guiding opening, and means for periodically oscillating said cutter arm.

30. In a wire forming machine, a cutter arm having an opening and a wire guiding aperture, a cutting tool slidably guided in said opening, an end plate mounted on said arm and having a wire guiding opening in registration with said aperture, adjustable threaded means mounted on said end plate for shifting said cutting tool to be substantially flush with one face of said arm, a check nut mounted on said threaded means to prevent displacement of the latter relative to said plate and having a wire guiding slot in registration with said wire guiding opening, and means for periodically oscillating said cutter arm.

31. The herein described method of making wire forms, which includes the steps of concurrently feeding a substantially continuous length of wire, severing said continuous length of wire into short cut lengths feeding said successive cut lengths of wire into the path of a series of spaced elements moving continuously in a predetermined straight line path, shaping the cut lengths of wire on said elements while travelling in said path, moving the elements with the wires shaped thereon between moving forming tools arranged in said straight line path to shape the wire forms to predetermined contour in passage through said tools, and then ejecting the formed wire forms from said elements.

ALBERT S. WAHL.

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