

Feb. 19, 1924.

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M. WITTE

RADIATOR FIN FORMING MACHINE

Filed April 24, 1922

4 Sheets-Sheet 1

Fig. 1

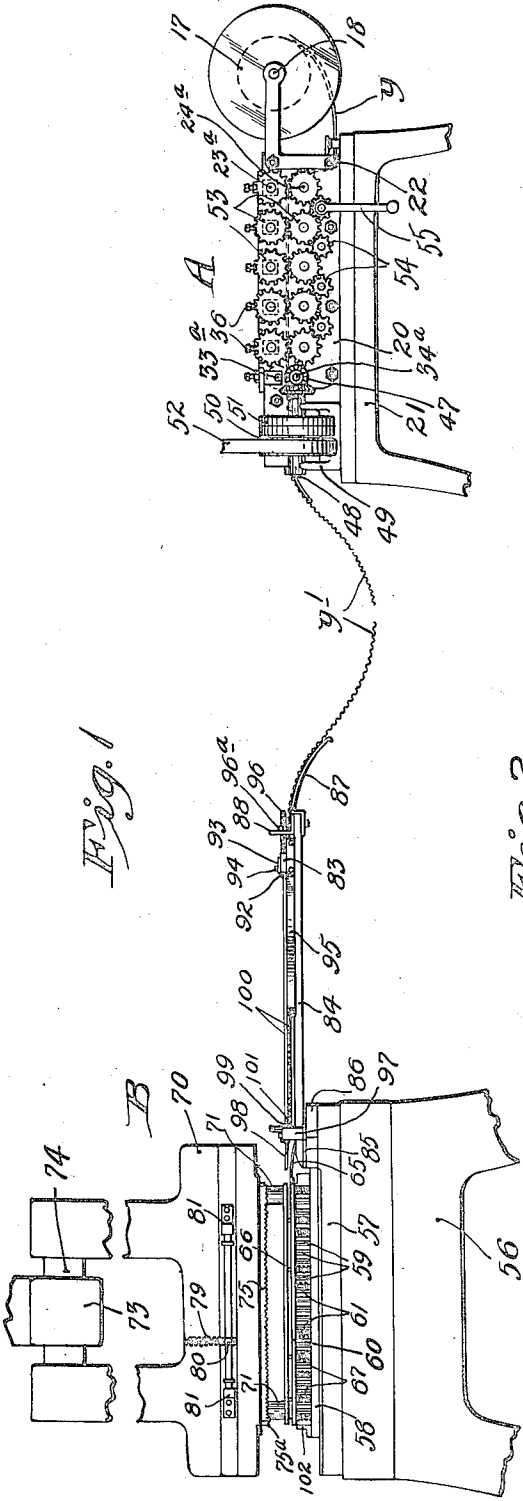
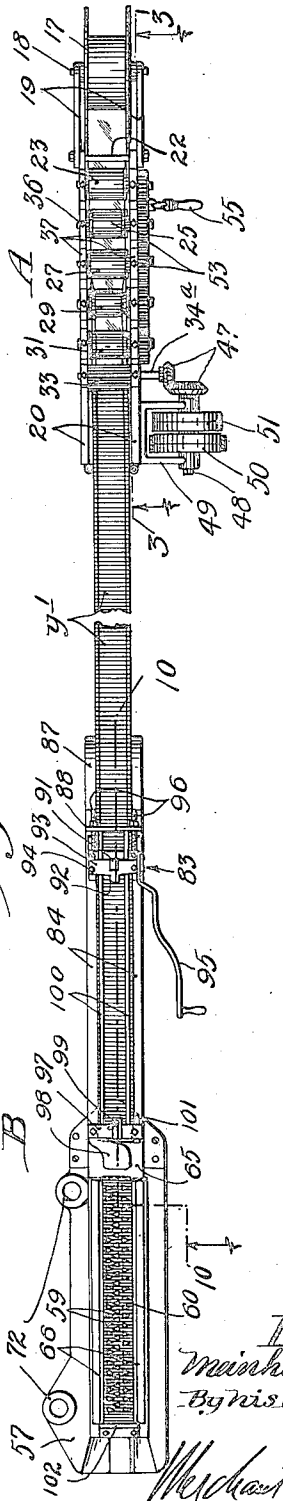


Fig. 2



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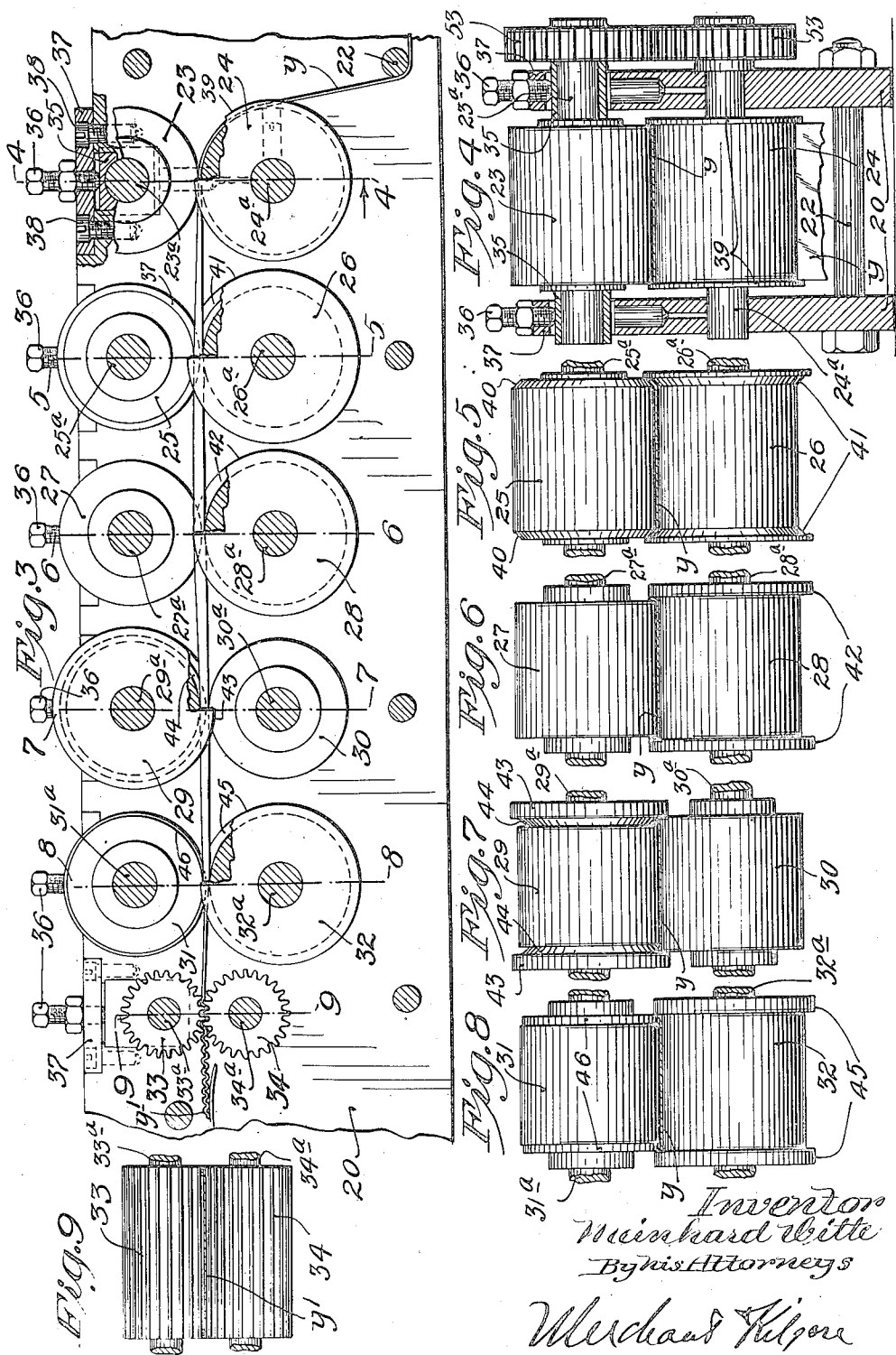
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4 Sheets-Sheet 2



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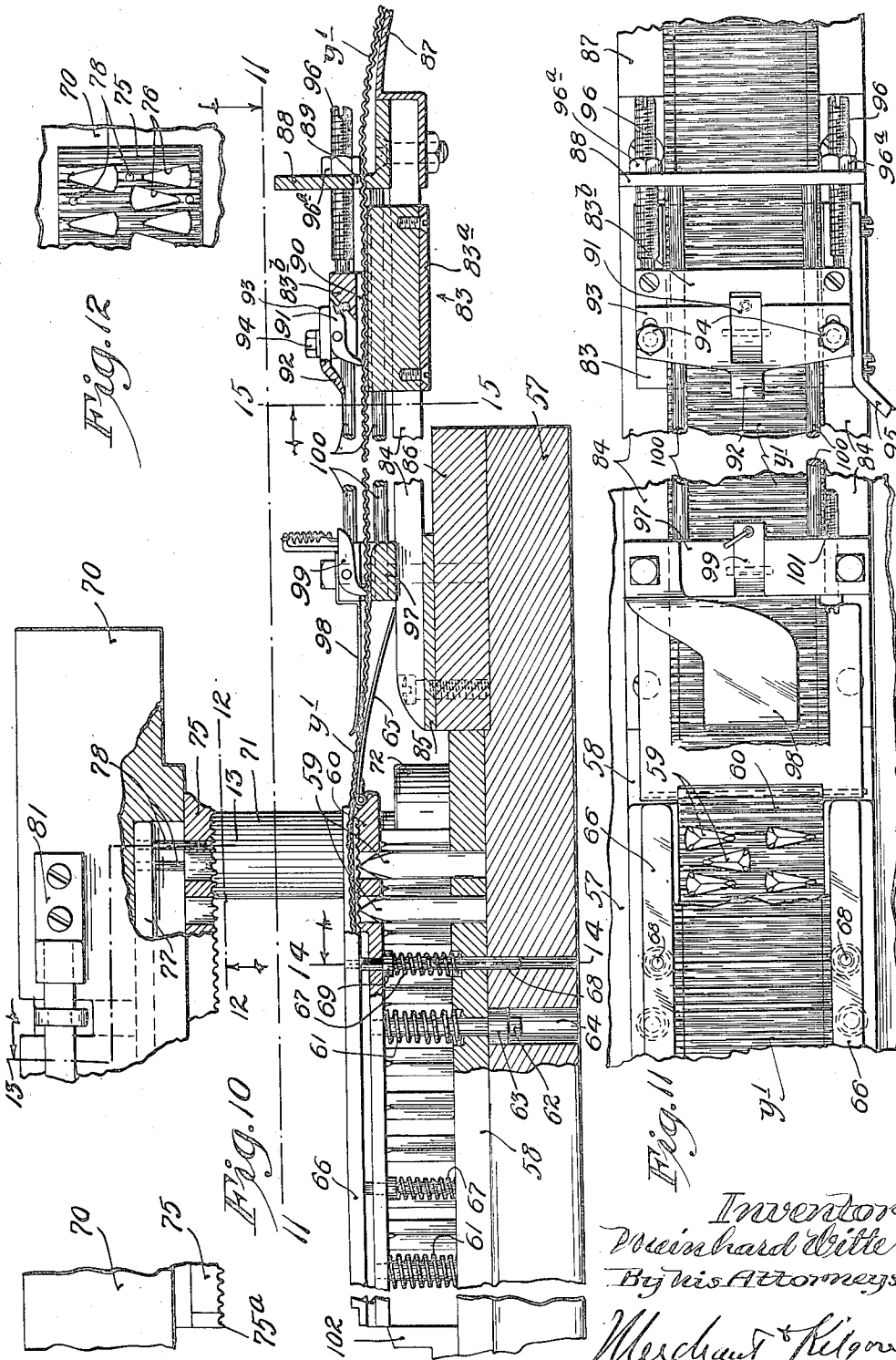
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

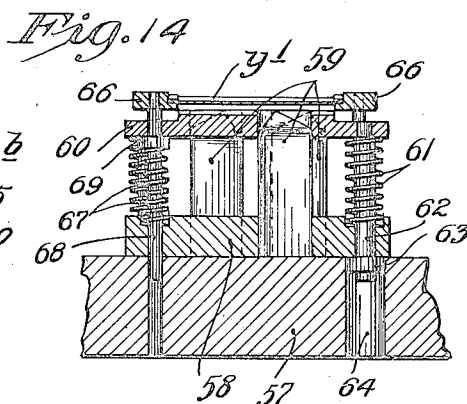
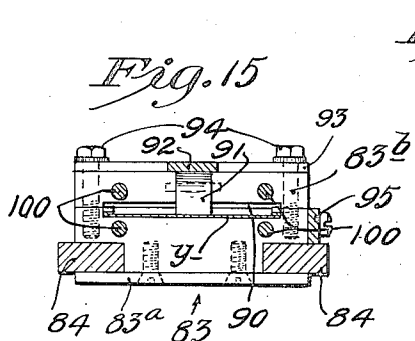
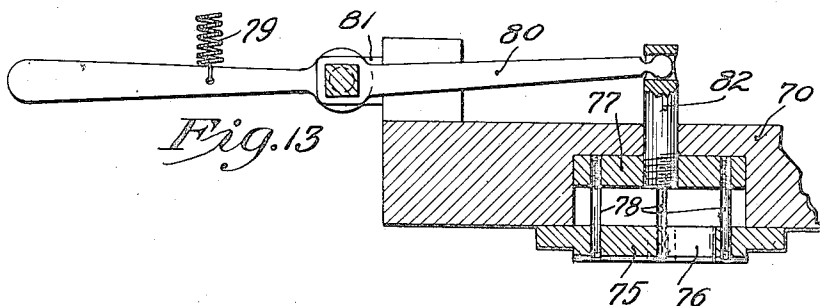
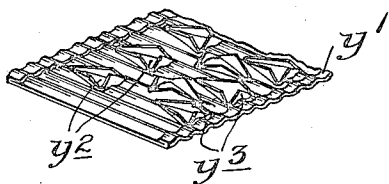


Fig. 16



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UNITED STATES PATENT OFFICE.

MEINHARD WITTE, OF MINNEAPOLIS, MINNESOTA.

RADIATOR-FIN-FORMING MACHINE.

Application filed April 24, 1922. Serial No. 556,284.

To all whom it may concern:

Be it known that I, MEINHARD WITTE, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Radiator-Fin-Forming Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention provides a simple and highly efficient machine for forming radiator core fin out of thin sheet metal, such as sheet brass or copper, and generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

While capable of more general use, the present machine has been especially designed and is particularly adapted for making out of ribbons of thin spring brass, radiator fins of the type disclosed in my pending application Serial Number 416,083, filed October 11, 1920, and entitled "Radiators."

The ribbons or radiating fins employed in the radiator of said prior application require not only to be corrugated but to be punctured for the passage of the tubes therethrough; and inasmuch as the tubes employed in said radiator were triangular, the passages therefor were correspondingly formed, not by the entire removal of the metal from the fin, but by slitting the fin and turning up lips adapted for frictional contact with the tubes. As the metal of the fins or ribbons will be extremely thin, it is advisable to turn over the edges thereof and thereby stiffen the exposed edges so that they will not be distorted by any ordinary contact.

The machine illustrated in the drawings will automatically perform the several functions above indicated, that is, will first turn over the edges of the metal ribbon or fin, second will corrugate the same and third will form the tube passages by partially severing and then turning up the lips for contact with the tubes. Preferably, the machine will also automatically cut off the completed fin in proper lengths for the particular radiator.

In the accompanying drawings, which il-

lustrate the improved machine, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a side elevation of the machine, some parts being broken away;

Fig. 2 is a plan view thereof;

Fig. 3 is an enlarged section taken approximately on the line 3—3 of Fig. 2, some parts being broken away;

Fig. 4 is a vertical section taken approximately on the line 4—4 of Fig. 3;

Figs. 5, 6, 7, 8 and 9 are detail views in rear elevation showing ribbon-forming rollers found in the vicinity of the lines marked, respectively, 5—5, 6—6, 7—7, 8—8 and 9—9 on Fig. 3;

Fig. 10 is a view partly in side elevation and partly in vertical section on the line 10—10 of Fig. 2, showing the parts on an enlarged scale and some parts being broken away;

Fig. 11 is a plan view showing parts found below the line marked 11—11 on Fig. 10;

Fig. 12 is a fragmentary view in bottom plan showing parts located just above the line marked 12—12 on Fig. 10;

Fig. 13 is a transverse vertical section taken approximately on the line 13—13 of Fig. 10;

Fig. 14 is a transverse vertical section taken approximately on the line 14—14 of Fig. 10, some parts being broken away;

Fig. 15 is a transverse vertical section taken approximately on the line 15—15 of Fig. 10; and

Fig. 16 is a perspective showing a fragment of the completed radiator fin.

The complete machine involves an edge-turning and corrugating mechanism designated as an entirety in Figs 1 and 2 by the character A, and a punching and lip-forming mechanism indicated as an entirety by the character B on the same views. The mechanism A will first be described and, hence, attention is particularly directed to Figs. 1 to 9, inclusive.

The thin brass ribbon *y* will be preferably contained on a spool or reel 17, which, by a spindle 18, is detachably pivoted to arms 19 rigidly secured to the rear ends of laterally spaced parallel bearing plates 20 rigidly secured to and supported by a suitable supporting bed or frame 21.

The ribbon γ from the reel passes under a transverse guide shown as in the form of a bolt 22 secured to the bearing plates 20; and from said guide 22, said ribbon passes progressively through spaced pairs of cooperating rollers 23—24, 25—26, 27—28, 29—30, 31—32 and 33—34, which rollers, respectively, are secured to shafts bearing the same numbers with the exponent α attached thereto, and which shafts are journaled in suitable bearings in the bearing plates 20. The lower of said shafts are preferably journaled in fixed bearings in the plates 20, while the upper of said shafts are journaled in bearings 35 that are made vertically adjustable by set screws 36 working through bars 37 rigidly but detachably secured to the bearing plates 20 by machine screws 38, (see particularly Fig. 3). The vertically adjustable bearings 35, of course, make it possible to set the upper rollers in respect to the cooperating lower rollers so as to give just the desired tension on the ribbon in formation of the fin.

After passing under the guide 22, the ribbon γ is first passed forward between the first pair of rollers 23—24. Said roller 23 is a plain roller that works between end flanges 39 on the lower roller 24. These two rollers simply feed or guide the ribbon in flat form.

Next, the ribbon passes between the second pair of forming rollers 25—26. The upper roller 25, at its ends 40, is beveled approximately forty-five degrees, and the lower roller 26 has correspondingly beveled outstanding end flanges 41, which co-operate therewith to turn upward the edges of the ribbon, as shown in Fig. 5.

The ribbon next passes between the third pair of rollers 27—28. The upper roller 27 is a plain roller, which works with slight clearance between outstanding flanges 42 on the lower roller 28 and co-operates therewith to turn up the edges of the ribbon at an angle of ninety degrees, as shown in Fig. 6.

The ribbon next passes between the fourth pair of rollers 29—30. The lower roller 30 is a plain roller that works between outstanding guide flanges 43 on the ends of the upper roller 29. These flanges 43, on their inner sides, have beveled faces 44 that turn the edges of the ribbon over and inward to approximately forty-five degrees to the plane of the ribbon.

The ribbon next passes between the fifth pair of rollers 31—32. The lower roller 32 has outstanding ribbon-guiding flanges 45 between which the turned-over edges of the ribbon are adapted to pass. The upper roller 31, in line with the overturned edges of the ribbon, has end portions 46 that are very slightly reduced in diameter but which co-operate with the lower roller to press the overturned edges of the ribbon tightly down against the body of the ribbon. This

completes the turning of the edges of the ribbon.

Next, the ribbon is passed through the sixth pair of rollers 33—34. These rollers are the corrugating rollers and, hence, are formed with intermeshing corrugations which corrugate the ribbon, as best shown in Fig. 3. The corrugated ribbon with its edges overturned, as just described, is indicated by the character γ^1 .

The corrugating rollers 33—34 must be positively driven and, hence, the shaft 34^a of the lower roller 34 is shown as connected by intermeshing bevel gears 47 to a short shaft 48 journaled in a bracket 49 on one of the bearing plates 20. On the shaft 48 is an idle pulley 50 and a live pulley 51 over which a power-driven belt 52 is adapted to run.

In the automatic operation of the machine, the first, second, third, fourth and fifth pair of rollers will be driven by the pull on the ribbon γ produced by the corrugating rollers 33—34, but for feeding the ribbon between said rollers into initial engagement with the corrugated rollers, said first five pair of rollers are preferably geared together. As shown, this is done by providing the shafts of said rollers with intermeshing pairs of gears 53, the lower of which gears are connected by intermediate gears 54, one of which intermediate gears is provided with a hand crank 55, (see Figs. 1 and 2). The corrugated fin strip or ribbon γ^1 will be delivered from the mechanism A just described to the punching and lip-forming mechanism B, which latter mechanism will now be described.

Rigidly secured on a suitable base frame 56 is a horizontal bed plate 57 on which, as shown, is rigidly secured a punch-supporting plate 58.

For punching the holes in the corrugated fin strip γ^1 , I provide a plurality of upstanding punches 59, which, at their lower ends, are rigidly secured in the plate 58. These punches 59 are positioned to correspond to the desired location of the holes or tube passages that are to be formed in the fin strip. In horizontal cross section, said punches are triangular and, in size, correspond to the exterior of the triangular tubes of the radiator. The upper ends of these punches 59 are beveled on their three sides to form three upwardly converging edges that join in a common point, (see particularly Figs. 10 and 14).

The numeral 60 indicates a so-called clamping plate that is formed with triangular passages through which the punches 59 are arranged to work. The upper surface of this clamping plate 60 is corrugated to fit the corrugations in the under side of the corrugated fin strip γ^1 . Said plate 60 is yieldingly pressed or held normally in a raised position substantially as shown in

Fig. 10, by coiled springs 61, preferably placed around guide pins 62 that are rigidly secured to and depend from the reduced side flanges of the plate 60, work through perforations in the plate 58 and, below the latter, are provided stop collars 63 that work with clearance in passages 64 formed in the bed plate 57.

To guide the corrugated strip y^1 above the clamping plate 60, the latter is shown as provided at its rear end with a pivotally attached oblique guide plate 65.

The corrugated strip y^1 could not be readily moved forward while in contact with the corrugations of the clamping plate 60, and, hence, for normally supporting the corrugated strip slightly above the corrugations of the plate 60, (see particularly Figs. 10, 11 and 14), I provide a pair of laterally spaced parallel guide rails 66, the inner edges of which are rabbeted or reduced to form a sort of a channel in which the edges of the corrugated strip are adapted to slide while properly held in position above the punches.

The rails 66 are depressible and are yieldingly supported by coiled springs 67 compressed between the plates 58 and 60 and placed around guide pins 68 that work through vertically aligned holes in the plates 60, 58 and 57. The pins 68 are provided with stop collars 69 that engage the plates 60 and limit the upward movements of the pins 68 therethrough. The extreme upper ends of the guide pins 68 are reduced and seated in perforations formed in the guide rails 66. The function and operation of the devices just described will be noted later on.

In Figs. 1, 10 and 13, the numeral 70 indicates a vertically movable punch-head located above the punches 59 and plates 60 and rails 66 and adapted to be given vertical movement by any suitable means, such, for example, as found in the commercial punches and presses. As shown, said head 70 is guided for true vertical movements by guide posts 71 secured to and depending from said head and working through guide sleeves 72 on the bed plate 57, (see Figs. 2 and 10). In Fig. 1, the numeral 73 indicates a crank-operated rod of the power press, which is connected to the punch-head 70 by a wrist pin 74.

Rigidly but detachably secured to the under side of the punch-head 70 is a die plate 75 formed with triangular punch passages 76 and formed on its under surface with corrugations adapted to intermesh with the corrugations of the clamping plate 60 and to engage the upper corrugated surface of the fin strip y^1 .

Above the die plate 75, the punch-head 70 is recessed to afford a seat for a vertically movable stripper bar 77 that is provided with depending stripper pins 78 that work

through perforations in the die plate 75. These pins 78 work adjacent to the punch passages 76 on the die plate 75 and perform a function that will be hereinafter described.

In Figs. 10 and 13, the stripper bar 77 and stripper pins 78 are shown as pressed upward into the head 70, but, as a matter of fact, under the conditions illustrated in said drawings, said elements 77 and 78 will be pressed downward by yielding means. The yielding means shown is a spring 79 anchored at its upper end to the head 70 and at its lower end attached to a lever 80 immediately pivoted to a lug 81 on said head 70. The inner end of the lever 80 is loosely pivoted to a vertical stem 82 that works through the head 70 and, at its lower end, is rigidly attached to the stripper bar 77.

For feeding the corrugated fin strip y^1 to punching position, I provide a manually operated feed device preferably constructed as follows:

A cross-head 83 is mounted to slide on horizontal guide bars 84, the front ends of which are rigidly secured to the bed plate 57, being as shown directly secured to a spacing plate 85 mounted on a supplemental plate 86, which, in turn, is directly and rigidly secured to the bed plate 57. Bolted or otherwise rigidly secured to the rear ends of the guide bars 84 is an inclined guide plate 87 and an angle strip 88. The angle strip 88 has a guide passage 89, through which the corrugated fin strip y^1 freely passes to and through a guide passage 90 formed in the upper portion of the cross-head 83. Here it may be noted that the cross-head 83 has a detachable lower bar 83^a and a detachable upper portion 83^b. The upper portion 83^b of said cross-head is provided with a pivoted spring-pressed driving dog 91 and a dog-locking finger 92. Said dog 91 works in a slot in the upper portion of the cross-head and the finger 92 is shown as formed on a plate 93, which, by means of machine screws 94, is adjustably secured on said cross-head for forward and rearward adjustments. The cross-head 83 is provided with a laterally projecting handle 95, (see Figs. 1, 2 and 11), by means of which it may be slid either forwardly or rearwardly. The rearward movements of the cross-head are adjustably limited by stop screws 96, which, as shown, have threaded engagement with the upstanding flange of the angle bar 88 and are equipped with lock nuts 96^a.

Rigidly secured on the front portion of the guide bars 84 is a guide bar 97 provided with a passage through which the corrugated fin strip y^1 is adapted to freely pass onto the guide plate 65. This guide bar 97 is provided with a forwardly projecting guide plate or finger 98 that directs the corrugated strip y^1 downward onto guide plate 65. The upper portion of the guide bar 97

is shown as provided with a pivoted spring-pressed retaining dog 99, the important function of which will be presently described.

In the construction illustrated, the cross-head 83 is further guided by laterally spaced guide rods 100 rigidly secured to the guide bar 97 and to the angle bar 88. Said guide rods pass through portion 83^b of the cross-head 83. For limiting the forward movement of the cross-head, a stop screw 101 is shown as adjustably applied to the guide bar 97, (see Fig. 11).

For cutting or shearing off the punctured and completed fin strip under downward movements of the punch-head 70, I provide a shearing bar 102, (see Figs. 1, 2 and 10), rigidly secured on the plate 58 and arranged to co-operate with the rear edge 75^a of the die plate 75, (see Fig. 10).

Operation.

The manner in which the metal ribbon y is formed into the corrugated fin strip y^1 by the mechanism A has already been clearly described. Between the mechanisms A and B there will always be more or less slack in the corrugated strip. The retaining dog 99 will hold the corrugated strip against backward movement while the cross-head 83 is being slid back to its normal position shown in Fig. 10, where the driving dog 91 will take its new grip on the corrugated strip y^1 , ready for forward feeding movement.

While the punch-head 70 is raised, as shown in Figs. 1 and 10, the cross-head 83 will be slid forward by the handle 95, thereby moving an unpunched portion of the strip y^1 over the punches 59, and, of course, carrying the previously punched portion of the strip beyond the shearing blade 102. When the corrugated strip is thus moved, it slides freely on the raised guide rails 66.

As the cross-head reaches its extreme forward movement, the finger 92 engages the rear end of the lock dog 99 and presses said dog tightly into engagement with the corrugated strip, thereby preventing said strip from being fed beyond its proper position by momentum or otherwise, and preventing the said strip from being drawn forward by the punching action.

Under downward movement of the punch-head 70, the depending stripper pins 78 will come into contact with the strip y^1 and will then be forced upward into the punch-head, as shown in Fig. 10. As the punch-head moves downward, the corrugated under surface of the die plate 75 will engage the corrugated strip y^1 and the first effect of this is to press the corrugated strip down onto the corrugated upper surface of the clamping plate 60, thereby causing said corrugated strip to be firmly held with a vise-like action between the said plates 60

and 75. Under further downward movement of the punch-head, the plates 75 and 60 will be further depressed and the corrugated strip will be carried thereby downward, causing the punches 59 to form in the strip y^1 , the triangular tubes passage y^2 and upturned lips y^3 shown in Fig. 16.

The above noted downward movement of the punch-head, as already indicated, carries the front end 75^a of the die plate 75 downward past the upper edge of the shearing blade or bar 102 and cuts off from the strip the previously punched fin-forming strips.

Of course, under upward movement of the punch-head 70, the clamping plate 60 and rails 66 automatically assume their normal position, and the said rails serve to lift the punched corrugated strip above the corrugated surface of said clamping plate, and the spring-pressed stripper pins 78 force the corrugated strip out of engagement with the corrugated surface of the die plate 75 as the latter moves upward.

While the punch-head 70 is raised, the cross-head 83 will be returned to its normal position by the handle 95, Fig. 10, where its dog 91 will take a new hold on the corrugated strip y^1 . As noted, the retaining dog 99 prevents the strip y^1 from being given rearward movement when the cross-head is moved rearward as just above stated.

Both of the mechanisms A and B may be driven continuously and, of course, the slack in the corrugated strip y^1 will vary because the mechanism A will feed the strip constantly while the punching mechanism operates thereon intermittently.

From what has been said, it, of course, will be understood that the mechanism illustrated in the drawings is capable of many modifications within the scope of my invention herein disclosed and claimed.

What I claim is:

1. In a strip-puncturing mechanism, a group of punches and a co-operating die plate, said punches having beveled ends arranged to puncture the strip by turning laterally therefrom partially severed tube-engaging lips, said die plate having a corrugated strip-engaging surface, and a yieldingly supported corrugated clamping plate having perforations through which said punches work freely.

2. The construction defined in claim 1 in further combination with yieldingly supported strip-guiding rails arranged to normally guide the strip slightly out of contact with the corrugated surface of said clamping plate.

3. The construction defined in claim 1 in further combination with a retaining dog operative on the strip to hold the same against backward movements, and a recip-

roccating feed device for feeding the strip forward.

4. A machine for puncturing fin strips, comprising a group of punches, a spring-pressed clamping plate through which said punches work freely, a vertically movable punch-head, a die plate carried by said punch-head and having punch passages co-operating with said punches and depressible strip-guiding rails for yieldingly guiding a fin strip normally above said clamping plate.

5. A machine for puncturing fin strips, comprising a group of punches, a spring-pressed clamping plate through which said punches work freely, a vertically movable punch-head, a die plate carried by said punch-head and having punch passages cooperating with said punches, said clamping plate and die plate being provided with cooperating corrugated surfaces, and depressible strip-guiding rails for yieldingly guiding a fin strip normally above the corrugated surface of said clamping plate.

6. The construction defined in claim 4 in further combination with a spring-pressed stripper having pins working through said die plate.

7. A machine for puncturing fin strips comprising groups of pointed punches constructed to punch holes in the strip by turning lips upward therefrom, a spring-supported depressible clamping plate through which said punches work freely, a vertically movable punch-head, a die plate secured to said punch-head and having punch passages through which said punches work with close engagement, said clamping plate and die plate having cooperating corrugated surfaces, and depressible spring-supported strip-guiding rails adapted to hold a corrugated fin strip above the corrugated surfaces of said clamping plate.

8. The construction defined in claim 7 in further combination with shearing devices

operative by downward movement of said punch-head.

9. The construction defined in claim 7 in further combination with a fixed shearing blade adjacent to one extremity of said clamping plate, and with which the corresponding end of said die plate co-operates to cut off the punctured strip under downward movement of said punch-head.

10. The construction defined in claim 7 in further combination with a fixed guide bar having a retaining dog operative on the fin strip, and a slidable cross-head having a feed dog operative on the fin strip to feed the same forward.

11. The construction defined in claim 10 in further combination with an adjustable stop for limiting the outward movement of said cross-head.

12. The construction defined in claim 10 in further combination with a finger on said cross-head engageable with said retaining dog to hold the same operative when said cross-head is moving forward.

13. The construction defined in claim 10 in further combination with a strip-guiding plate hinged to the receiving end of said clamping plate.

14. A mechanism for turning over the edges of a metal strip and for corrugating the same, comprising a plurality of forming rollers with flanges progressively arranged to turn over the edges of said strip, intermeshing corrugated rollers for corrugating said strip, said rollers being geared together and provided with means for rotating the same to press the strip to said corrugated rollers, and in which there is means for driving said corrugated rollers without driving said edge-turning rollers except by the frictional action thereon of the strip as it is fed between said corrugating rollers.

In testimony whereof I affix my signature.

MEINHARD WITTE.