

V. J. MAYO & S. GARGIULO.
MACHINE FOR MAKING RADIATOR SECTIONS.
APPLICATION FILED MAR. 31, 1909.

1,012,568.

Patented Dec. 19, 1911.
3 SHEETS-SHEET 1.

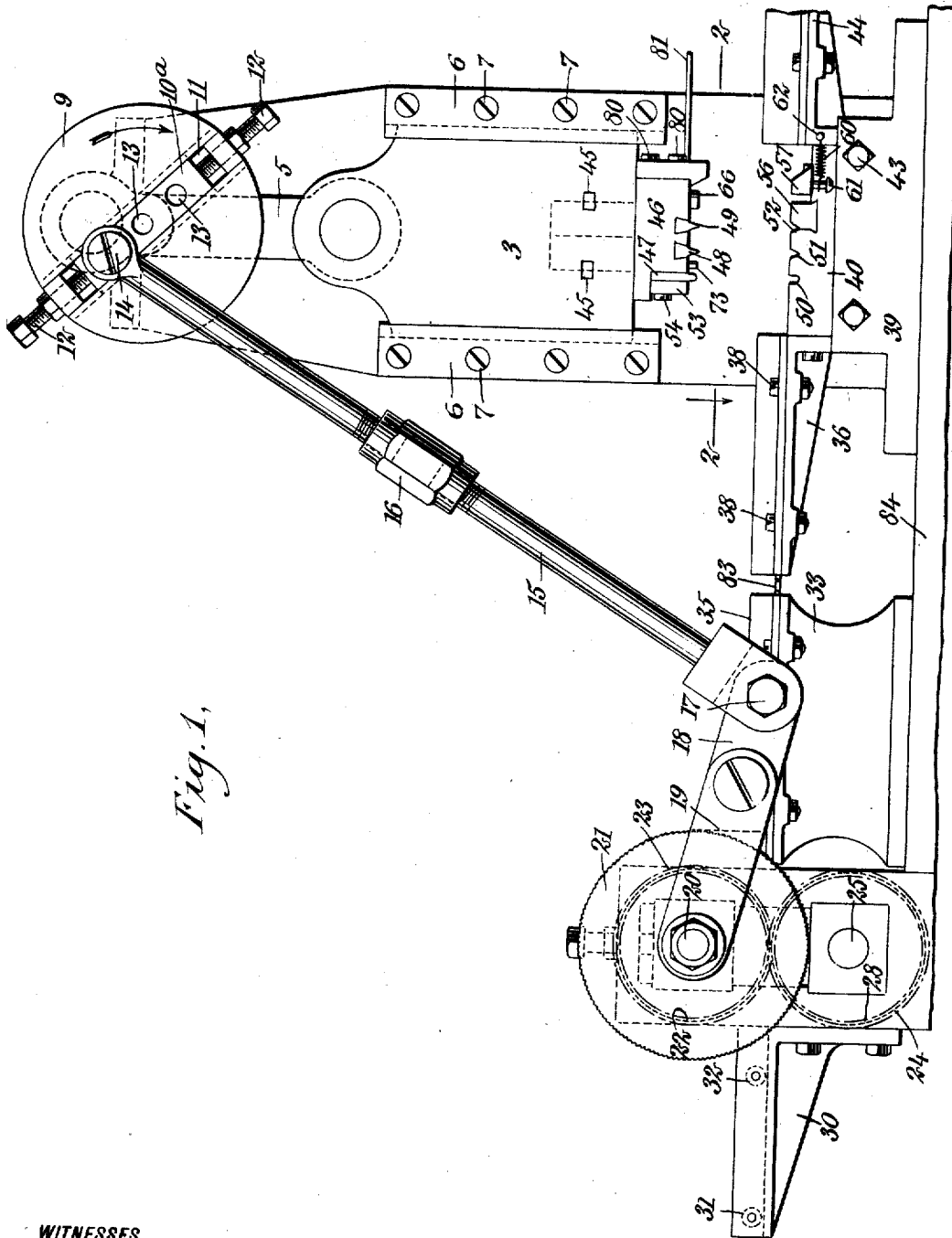


Fig. 1.

WITNESSES

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H. Whiting

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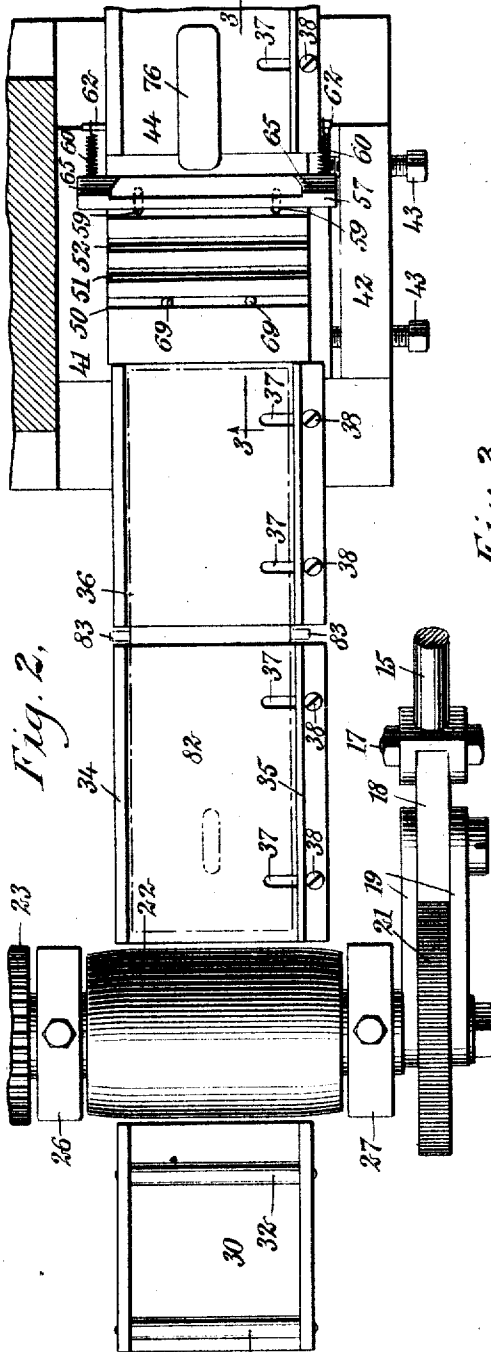
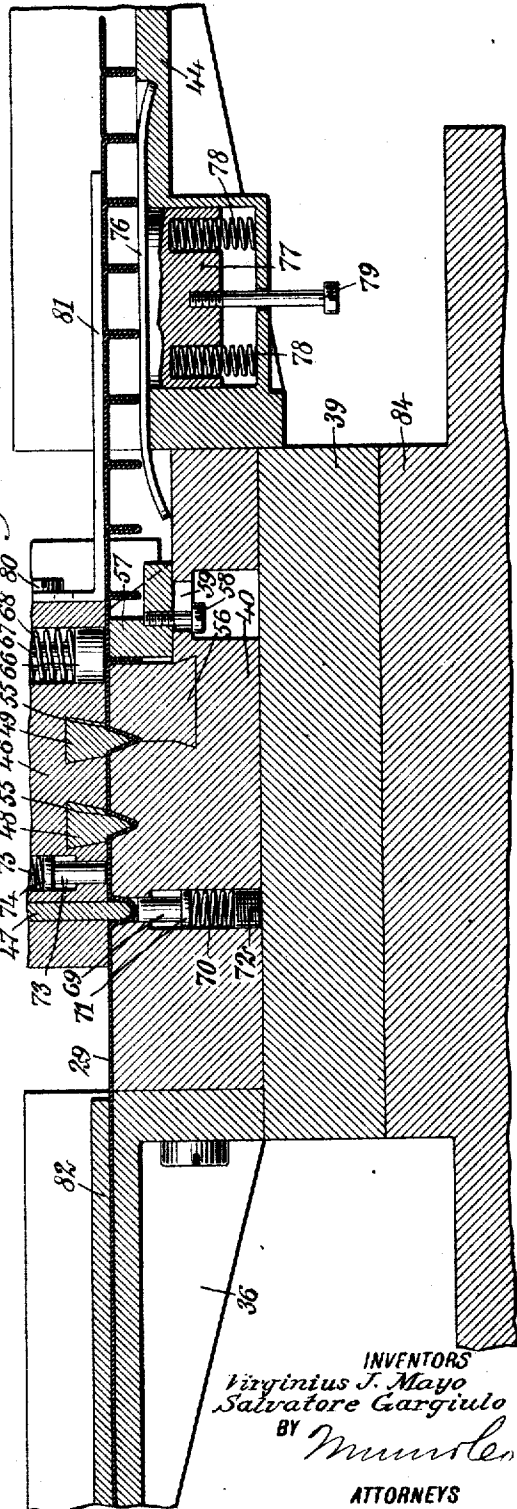


Fig. 2.

WITNESSES

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Fig. 3.



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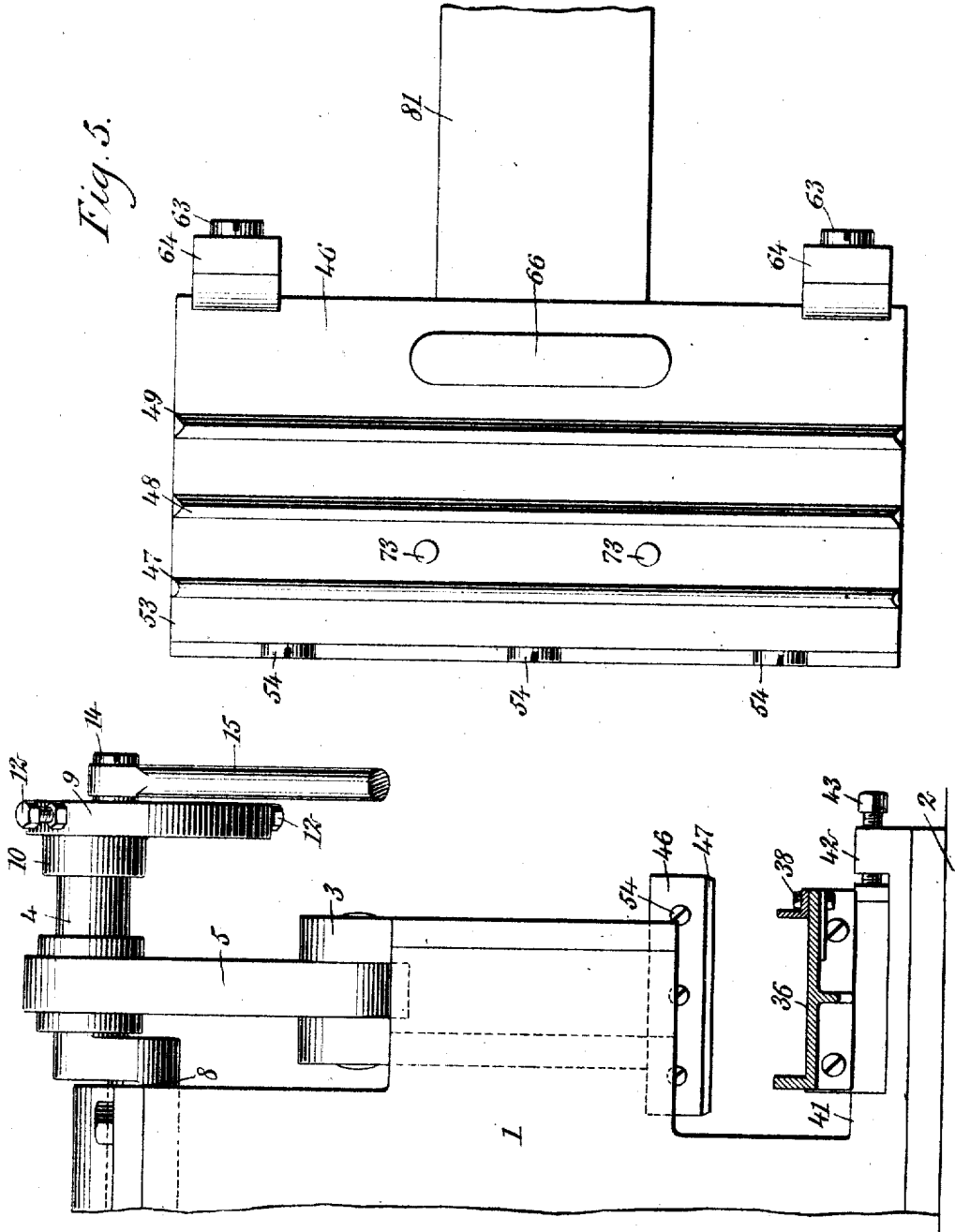
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3 SHEETS-SHEET 3.

Fig. 5.



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Fig. 4.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING RADIATOR-SECTIONS.

1,012,568.

Specification of Letters Patent.

Patented Dec. 19, 1911.

Application filed March 31, 1909. Serial No. 486,909.

To all whom it may concern:

Be it known that we, VIRGINIUS J. MAYO and SALVATORE GARGIULO, both citizens of the United States, and residents of New Haven, in the county of New Haven and State of Connecticut, have invented a new and Improved Machine for Making Radiator-Sections, of which the following is a full, clear, and exact description.

This invention relates to a machine to be used in bending and plaiting metal which is to be built up into radiator sections.

The object of the invention is to provide a device, simple in construction, accurate in its operations, and which will plait a strip of metal quickly and accurately.

The machine is adapted to feed a strip of metal such as copper, brass or the like, to a stamping die which is adapted to first bend the metal by means of a blunt punch; second, sharpen the angles of the bends thus formed; third, further accentuate the angles in the bend in the metal; and, fourth, force the sides of the bend of the metal together, so as to form a plait. This operation is to be continuous, so that the metal will have a series of plaits formed at an angle to the plane of the metal.

The invention consists in the construction and combination of parts, to be more fully described hereinafter and particularly set forth in the claims.

While we have shown the grooves on the lower die or die-bed, and the punches on the upper die, the position of these grooves and punches may be reversed and still be within the scope of our invention.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a side view, in elevation, of the device; Fig. 2 is a plan view, partly in section on the line 2—2 in Fig. 1; Fig. 3 is an enlarged vertical section on the line 3—3 in Fig. 2; Fig. 4 is an end view, in elevation, partly in section; and Fig. 5 is a bottom view of the die, showing the parts in detail.

Referring more particularly to the separate parts of the device, 1 indicates the frame of a stamping machine, which may be of any suitable form, having preferably

a bed 2, on which a die may be placed, and a reciprocating slide 3, to which may be fastened a die, and which is adapted to be driven by means of a crank 4 through the connecting link 5, which is suitably pivoted to the crank 4 and the slide 3. This slide 3 is guided in any suitable manner in the frame 1 as by guiding strips 6, which are secured to the frame in any suitable manner, as by set screws 7. The crank 4 is driven from the shaft 8, which in turn is driven in any suitable manner, as by means of a belt or motor.

A disk 9 is secured to the crank 4 in such a manner that it will run true as if it were directly connected to a continuation of the shaft 8. This is done by means of a hollow boss 10, which is placed eccentrically on the back of the disk 9, which is for the purpose of driving the feed that advances the sheet of metal to be bent and plaited.

A wedge-shaped adjusting block 10^a is slidably engaged in the wedge-shaped slot 11 in the disk 9, and has bearing on the ends thereof adjusting screws 12, which are engaged in screw-threaded openings in the disk 9 and are adapted to reciprocate the wedge-block 10^a back and forth in the slot 11, so as to give an adjustment to the driving connection with the feed, to be described.

The adjusting block 10^a has a plurality of openings 13 therein, in which is adapted to be fastened in any suitable manner, a screw 14, which in turn secures a connecting link 15 to the adjusting block 10^a. The connecting link 15 is formed in two parts, having threaded ends which are joined by a turn-buckle 16, so as to adjust the length of the connecting link. Pivoted to the connecting link 15 in any suitable manner, as by means of a pin 17, is a dog 18, which is also pivoted to suspending links 19, which are in turn pivoted to the extension of a shaft 20. Adapted to be engaged by the dog 18 is a disk 21, rotatably secured to the shaft 20 and preferably having its periphery serrated, so as to form a good gripping surface for the toe of the dog 18. Secured to the shaft 20 in any suitable manner is also a feed roller 22, which has its outer ends slightly beveled off so as to form a crown at the center, thus creating a tendency for a band of metal to keep near the middle thereof. Also secured to the shaft 20 is a gear 23, which meshes with a gear 24 se-

cured on a shaft 25 parallel to the shaft 20 and which is suitably journaled in bearings on vertical supports 26 and 27. The shaft 25 has secured thereto a feed roller 28, which is adapted to co-act with the roller 22, to feed between them a strip of metal to be bent and plaited.

The strip of metal, which is designated by the numeral 29, is adapted to feed from any suitable support, such as a reel (not shown) over a guide 30, on which are retaining guide rollers 31 and 32, to the feed rollers 22 and 28. The strip of metal to be bent and plaited passes between the feed rollers 22 and 28 and over a suitable guide 33, which is of any suitable form, preferably having upwardly-extending flanges 34 and 35, one of which (35) is adjustable relative to the other by slot and pin connections 37, 38, so as to allow for different widths of metal. The sheet of metal then passes from the guide 33 to another guide-bed 36, which is similar to 33, being adjustable as to width by any suitable means, such as slot and pin connections 37, 38, and supported on the frame by any suitable means, to the die-bed support 39. The strip of metal to be bent passes from the guide 36 over a die-bed 40, which is supported on the die-bed support 39 in any suitable manner, preferably being held between upwardly-extending flanges 41 and 42, the latter having screw-threaded perforations therein which are engaged by clamping screws 43, which in turn clamp the die-bed 40 to the support 39. Extending from the opposite side of the die-bed support 39 and suitably secured thereto is a guide 44, which is similar to a certain extent to the guide 36, and is adapted to lead the metal away from the machine after it has been plaited.

Supported in the slide 3 in any suitable manner, as by means of bolts 45, and superposed above and adapted to coact with the die-bed 40 is a die 46, which has punches 47, 48 and 49 suitably secured thereto and which are adapted to coact with grooves 50, 51 and 52 in the die-bed 40. These punches and grooves are so arranged that the first, 47 and 50, will form a blunt bend in a strip of metal fed therebetween, and the second pair, 48 and 51, will sharpen the angles in the bend thus formed, and the third pair, 49 and 52, will further accentuate and sharpen the angles in the bend previously formed. The punch 47 is therefore made with a blunt bottom edge, rounded in form, and extends the full width of the die, to which it is fastened in any suitable manner, as by means of a clamp plate 53, through which extend holding screws 54, which are adapted to pass clear through the punch 47 and into screw-threaded openings in the die 46. The punches 48 and 49 are secured in any suitable manner to the die 46, as by means of a wedge-shaped slot arrangement, as shown in

detail in Fig. 3, and are of a form such that the bottom edge is a sharp ridge from which slope upwardly, sides which terminate in angle bends, as at 55. The groove 52, which, together with the other grooves, extends the width of the die-bed 40, has its lowest bend formed in a separate cross bar 56. This is done so that the groove 52, which has the sharpest angle of the three, may be kept accurately to the same height and width without having to renew the whole die-bed.

The bar 56 is secured in any suitable manner to the die-bed 40, as by means of a dove-tailed slot and groove arrangement, and also furnishes a surface which is adapted to coact with a plait-former 57. The plait-former 57 is of any suitable form, but preferably consists of a cross rod having a surface adapted to co-act with the facing surface of the cross bar 56 and slidingly engages the die-bed 40 in any suitable manner, as by means of pins 58 which slide in suitable slots 59 in the die-bed 40, which has a concavity and openings in its lower surface through which access may be gained to these screws 58 to place and replace them. The plait-former 57 is adapted to slide back and forth the length of the slots 59, and is normally held away from the bar 56 by means of springs 60, which engage screws 61 on opposite ends of the plait-former, yieldingly holding it to the pins 62, which are suitably secured to the guide frame 44.

Suitably secured to the die 46 at opposite ends thereof, as by means of screws 63, are cams 64, which are adapted to co-act with the cam-surfaces 65, on the ends of the plait-former 57 and thus force the plait-former 57 against the action of the springs 60, so that the bend of metal formed by the grooves and punches on the die-bed and die will be crimped up and formed into a plait. The bend of metal formed by the punches and grooves is forced into the space between the bar 56 and the plait-former 57 by means of a plunger 66 which is slidingly supported in a concavity in the under surface of the die 46, and has a rod 67 extending into the concavity which is surrounded by a spring 68 that engages the upper surface of the plunger 66 and tends to force it out from the die. This plunger 66 is held in any suitable manner within the concavity in the under surface of the die 46, so that it will not be forced all the way out, but will be extended to a point where its lower surface will be level with the lower edge of the punch 49. This plunger 66 thus tends to yieldingly force the bend formed by the punches and grooves in between the plait-former 57 and the bar 56 and hold it there until the plait is formed.

Directly below the groove 50 and adapted to extend upwardly into said groove are a plurality of clearing pins 69, which are

adapted to reciprocate in openings in the bottom of the groove 50 and are normally pressed upward by means of springs 70 which bear on the under surface thereof; but are prevented from being forced entirely up into the groove by means of a retaining rim 71 on the lower end of the pin 69. The pins 69 and the spring 70 fit in cylindrical grooves in the under surface of the die, and are held therein by any suitable means, such as a closing screw 72. The spring-pressed pins 69 serve to force the bend of metal out of the groove 50 when the die 46 has been raised after its downward stroke, thus permitting the strip of metal 29 to be advanced to its next position, where the bend which came out of the groove 50 coincides with the next groove 51. The die 46 also has pins 73, which are similar to the pins 69, having retaining flanges 74 and extending springs 75. The clearing pins 73 serve to force the metal strip 29 away from the face of the die 46, permitting it to be advanced by the feeding rollers 22 and 28.

In order to clear the plait formed between the die 46 and the plait-former 57, there is provided on the guide-bed 44 a clearing-plate 76, which is bent down at its ends so as to form a good guiding surface, and has a downwardly extending lug 77, which engages a suitable concavity in the guide-bed 44, and is adapted to be reciprocated therein against the action of the springs 78, and is prevented from being ejected from the concavity by any suitable means, such as a retaining pin 79. Any other suitable means may be substituted for these springs and pins, such as a single spring and a single pin, the object being merely to form a surface which will lift up the plaited strip of metal when the die 46 has been raised after its downward stroke.

Secured to the die 46 in any suitable manner, as by means of screws 80, is a right-angle member 81 to be designated as the keeper, which has a horizontally-extending arm, which is adapted to co-act with the clearing plate 76, so as to grip the plaited strip between them and prevent it from curling up.

Shown in dotted lines in Fig. 2, and in full lines in Fig. 3, is a plate 82, which is adapted to be laid on top of the strip of metal to hold it in place and to prevent it from being covered with oil. It has on its edges, about the center, a pair of lugs 83 which project through the space between the guide 33 and the guide 36, and prevent the plate 82 from being fed forward with the strip of metal.

The die-bed support 39, the guide-way 33 and the upright supports 26 and 27 for the feed rollers are all supported in any suitable manner on the bed-plate 84, which

is secured in any suitable manner to the bed 2 of the stamping frame.

In the operation of the device, the strip of metal is conveyed from any suitable means, such as reels, not shown, to the guide-way 30, between the bottom thereof and the guide rolls 31 and 32, from which it passes between the feed rollers 22 and 28, which are adapted, by reason of their connection with the crank 4, to intermittently feed the strip of metal over the guide 33 and the guide 36, to a position between the die-bed 40 and the die 46. Here the metal is subjected to the action of the punches and grooves on the die-bed, the die being reciprocated by means of the slide 3, which is operated by the crank 4 through the connecting link 5. The strip of metal is first subjected to the action of the punch 47 and the U-shaped groove 50, which makes a U-shaped bend in the strip of metal. On the return stroke of the slide 3, the clearers 69 for the die-bed and the clearers 73 in the die remove the strip of metal from the grooves and punches. While the slide 3 is being raised and ready to return, the feed rollers 22 and 28 have been revolved a sufficient amount to advance the U-shaped bend in the strip of metal from its position over the groove 50 to a position over the groove 51. Here, on the return stroke of the die 46, the bend in the metal is sharpened somewhat by the punch 48. The slide 3 again withdraws the die 46, and the clearers 69 and 73 again force the strip of metal away from the die-bed and the die, and in the meantime, the feed rollers again advance the strip of metal the same amount as before, bringing the V-shaped bend formed by the V-shaped groove 51 and the punch 48, over the groove 52, which is also V-shaped and has an angle somewhat sharper than the groove 51. On the downward stroke of the die 46, the V-shaped groove in the metal is subjected to the action of the groove 52 and the punch 49, where its angles are somewhat sharpened. On the withdrawal of the die 46 by the slide 3, the metal is again forced from the die-bed and die by means of the clearers 69 and 73, and also again advanced by the feed rollers 22 and 28 the same amount as before, bringing the V-shaped bend over the space between the cross bar 56 and the plait-former 57. On the downward stroke of the die 46, the plunger 66 forces the bend downward into a position where its sides are between the facing surfaces of the bar 56 and the plait-former 57. The downward stroke of the die 46 also brings the cams 64 in contact with the cam surfaces 65 on the plait former, forcing the plait-former toward the bar 56 and thereby forming the bend in the metal into a plait. The strip of metal is thus corrugated.

gated by means of the die and die-bed, and the corrugations are then bent to form plaits, as described above.

By the term "plait" it is not desired to limit it to a bend in the metal being at right-angles to the plane of the metal and having its sides in intimate contact throughout the entire length. The plait may be formed by merely forcing the outer edges of the plait together, leaving a space between the sides thereof, and the plait may also be formed at an angle to the plane of the sheet of metal other than a right-angle.

The operation is continuous, forming a series of plaits at an angle to the plane of the sheet of metal, the plaited strip of metal passing on to the right, over the guide 44, to where it is subjected to another operation, which does not form a part of this invention.

While we have shown the plaits all formed on one side of the metal and at equal distances apart, this distance being preferably such that the depth of the plait from the under surface of the metal is substantially one-half the distance between the plaits, we may form these plaits in any other manner within the scope of this invention. We may form the plaits in the metal at an equal distance, such that the distance between the plaits is substantially equal to the depth of the plait, or we may form the plaits at other distances by adjusting the turn-buckle 16 and the pivot point 14.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:—

1. In a device of the class described, the combination with a die-bed, of a die, means co-acting with said die-bed and said die to form corrugations in a sheet of metal, means for clearing said sheet of metal from the die-bed, means for clearing said sheet of metal from the die, means for forming said corrugations into plaits and means for clearing said plaits from said last-mentioned means.

2. In a device of the class described, the combination with a die-bed having grooves, the angle in each successive groove being sharper than the angles in the preceding groove, of a plait-former adapted to co-act with said die-bed, a die adapted to co-act with said die-bed and said plait-former, punches for said die adapted to co-act with the grooves in said die-bed, and means for actuating said die.

3. In a device of the class described, the combination with a die-bed having grooves therein, the angles in each groove being sharper than those in the groove next preceding, of a die or said groove, punches on said die adapted to coact with said grooves,

and means for intermittently feeding a strip of metal between said die-bed and said die, so as to bring points at intervals in said sheet of metal successively between each of said grooves and punches.

4. In a device of the class described, the combination with a die-bed having grooves therein, the angles in each successive groove being sharper than the groove next preceding, of a die for said die-bed, punches for said die adapted to co-act with said grooves, a plait-former adapted to co-act with said die-bed, and means for intermittently feeding a strip of metal between said die and said die-bed so that points at intervals on said strip of metal will be successively brought into the sphere of operation of each of said grooves and punches and said plait-former, so as to accurately form a plait in said sheet of metal.

5. In a device of the class described, the combination with a die-bed having grooves therein, of a die for said die-bed, punches for said die adapted to co-act with said grooves, a plait-former adapted to co-act with said die-bed, means for feeding a strip of metal so that portions at intervals on said strip of metal will successively come into the sphere of operation of each co-acting groove and punch and said plait-former, means adapted to clear the sheet of metal from the grooves in said die-bed, means adapted to clear the sheet of metal from said die, means adapted to force said sheet of metal into coöperation with said plait-former, and means adapted to force said sheet of metal from said plait-former.

6. In combination with a die-bed having grooves therein, each of said grooves being sharper than the groove next preceding, of a pin adapted to reciprocate in a slot in said die-bed, a spring adapted to actuate said pin, and means for supporting said spring in place.

7. The combination with a die-bed having female grooves therein, of a cross bar forming part of one of said grooves, a plait-former adapted to slide relatively to said die-bed and also adapted to co-act with said cross bar, and a clearer for said die-bed.

8. The combination with a die-bed having a plurality of grooves therein, each successive groove being sharper than the groove next preceding, of a cross bar for said die-bed, said cross bar forming one of the sides and the bottom edge of said groove, a plait-former adapted to slide on said die-bed and adapted to co-act with said cross bar, means for retaining said plait-former in coöperation with said die-bed, and a clearer for said die-bed.

9. A die, comprising a body portion, a series of punches for said body portion, each of said punches being sharper than the one next preceding, a plunger slidingly se-

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cured in said body portion, means adapted to normally force said plunger out from said body portion, and a clearer for said body portion.

5 10. A die, comprising a body portion, a series of punches removably secured in said body portion, each of said punches being sharper than the punch next preceding, a plunger adapted to slide in said body portion, spring means adapted to force said plunger out from said body portion, and a spring-pressed pin adapted to act as a clearer for said punches.

11. In a device of the class described, the combination with a die-bed having a series of grooves therein, of a die adapted to co-act with said die-bed, punches for said die adapted to co-act with said grooves, a plait-former adapted to co-act with said die-bed, a cross bar adapted to co-act with said plait-former, means for normally holding said plait-former away from said cross bar, and means on said die adapted to force said plait-former toward said cross bar.

12. In a device of the class described, the combination with a die-bed having a series of grooves therein, of a die for said die-bed, a series of punches in said die adapted to co-act with said groove, a cross bar for said die-bed, a plait-former adapted to co-act with said cross bar, spring means adapted to normally hold said plait-former away from said cross bar, and a cam on said die adapted to force said plait former toward said cross bar.

13. In a device of the class described, the combination with a female die having parallel grooves therein, of a die having parallel members adapted to co-act with said grooves to form widthwise corrugations in a sheet of metal, means for forming said corrugations into a plait, and means for clearing said sheet of metal from the grooves.

14. In a device of the class described, the combination with a die-bed, of a die, said die-bed and said die being constructed as to form widthwise corrugations in a sheet of metal when forced together with said sheet of metal between them, means for clearing said sheet of metal from the die-bed, and means for clearing said sheet of metal from the die.

15. In a device of the class described, the combination with a die-bed, of a die, pressure means co-acting with said die-bed and said die to form grooves in a sheet of metal, spring means for clearing said sheet of metal from the die-bed, and spring means for clearing said sheet of metal from the die.

16. In a device of the class described, the combination with a die-bed, of a die, a plate former adapted to co-act with said die-bed to form a bend in a strip of metal, spring-

pressed means adapted to force said bend of metal between said die-bed and said plait-former, spring-pressed means adapted to force said bend of metal from between said die-bed and said plait-former, and mechanism on said die adapted to actuate said plait-former.

17. In a device of the class described, the combination with a support, of means for forming a corrugation in a sheet of metal, means for simultaneously accentuating the angle of said corrugation throughout its entire length, and means for forming said corrugation into a plait.

18. A machine for forming a series of parallel plaits in a strip of metal, comprising a plurality of dies having a plurality of spaced portions thereon extending in parallel relation, each portion being adapted to be brought successively and separately into engagement with identical sections of a strip of metal spaced apart from each other by predetermined intervals, and a plait former adapted to engage said sections subsequent to the action thereon of said portions of said dies.

19. A machine for forming a series of parallel plaits in a strip of metal, comprising a plurality of dies having a plurality of spaced portions thereon extending in parallel relation, each portion being adapted to be brought successively and separately into engagement with identical sections of a strip of metal spaced apart from each other by predetermined intervals, an intermittent feeder for advancing said strip of metal so as to bring said sections successively into conjunction with said portions on said die, and a plait former adapted to engage said sections subsequent to the action thereon of said portions of said die.

20. A machine for forming a series of parallel plaits in a strip of metal, comprising cooperating dies having parallel punches and grooves cooperating in pairs with each other, a feeder adapted to bring successive sections of a strip of metal separated from each other by predetermined intervals, into the sphere of operation of each pair of punches and grooves, whereby a continuous series of parallel corrugations is formed, and a plait former adapted to engage said corrugations and form them into plaits.

21. A machine for forming a series of parallel plaits in a strip of metal, comprising cooperating dies having parallel punches and grooves cooperating in pairs with each other, each pair being of different form with respect to the next adjacent pair, a feeder adapted to bring successive sections of a strip of metal separated from each other by predetermined intervals, into the sphere of operation of each pair of punches and grooves, whereby a continuous series of parallel corrugations is formed, and a plait former

adapted to operatively engage said corrugations and form said corrugations into plaits.

22. In a device of the class described the combination with a corrugator including a plurality of graduated sets of corrugation formers, of a plait-former, and a feeder adapted to shift a sheet of metal from said corrugator to said plait-former, the spacing of said corrugation formers and plait-former being so correlated to said feeder as to cause corrugations formed on a single sheet to be shifted to and properly positioned relatively to said plait-former to receive the action thereof.

23. In a device of the class described, the combination of a set of graduated corrugation formers, of a plait-former and a feeder adapted to intermittently shift a strip of metal from said corrugation formers to said plait-former, the spacing of said corrugation formers and plait-former being so correlated to said feeder as to cause the corrugation formed on a single sheet to be shifted to and properly positioned relatively to said plait-former to receive the action thereof.

24. In a device of the class described, the combination of a die mechanism, to form a corrugation in a sheet of metal, a co-acting plait-former at one end of said die mechanism parallel thereto, a sheet shifting mechanism coöperating with the die mechanism and plait-former, and means for actuating said shifting mechanism in the interval between the action of the die mechanism and plait-former to shift successively the bends formed in the sheet by the die mechanism from said die mechanism to said plait-former, and to properly position such bends

successively with relation to said plait-former, and means to free said sheet from the die mechanism, and plait-former preceding the operation of the feeding mechanism.

25. In a device of the class described, means for forming a series of parallel corrugations extending across a flat strip of metal, co-acting plait forming means arranged parallel thereto and adapted to receive that end of the strip having a series of corrugations and to transform the corrugations therein into plaits, means for transferring the corrugated strip from the corrugating means to the plaiting means, both of said means being so spaced that each plait in said strip will be shifted to and properly positioned relatively to the plait forming means to receive the action thereof.

26. In a device of the class described, a corrugating mechanism adapted to form a series of parallel plaits extending across a flat sheet of metal, a co-acting plait-forming mechanism adapted to receive that end of the strip having a series of corrugations, and transform the same into plaits, and a driving means in common to said corrugating and plait-forming means to cause the same to simultaneously operate upon a single strip of metal passing therethrough.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

VIRGINIUS J. MAYO.
SALVATORE GARGIULO.

Witnesses:

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JOHN F. FABIAN.