

Aug. 13, 1929.

J. KARMAZIN

1,724,486

METHOD AND APPARATUS FOR FORMING RADIATORS

Filed Feb. 24, 1926

2 Sheets-Sheet 1

Fig. 1-

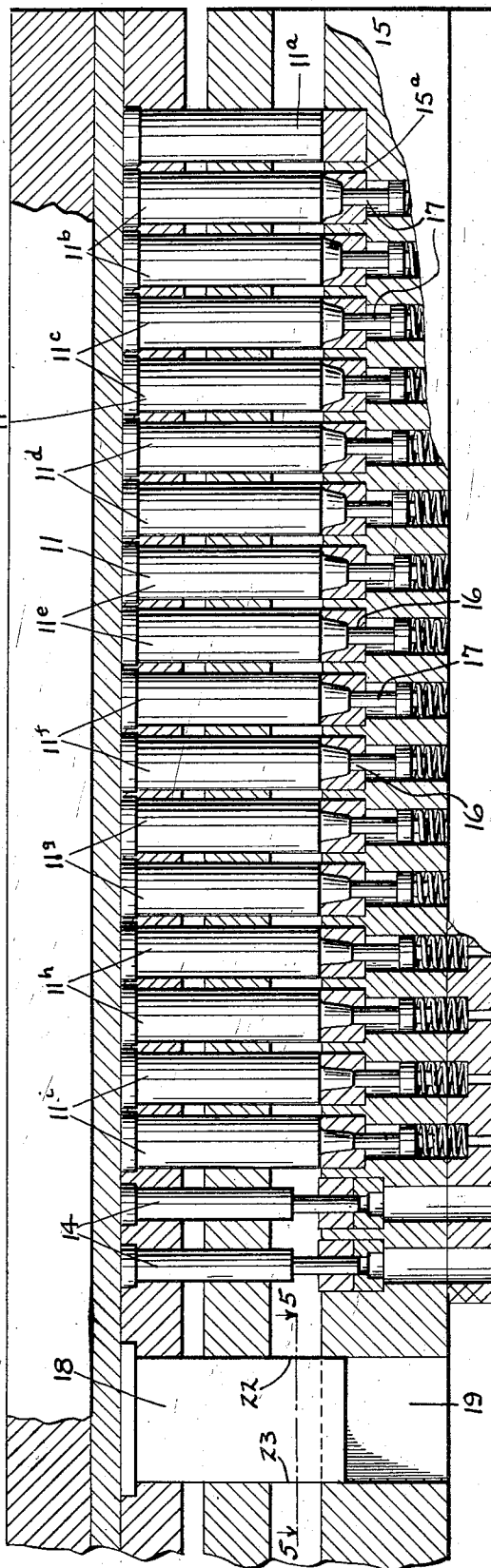
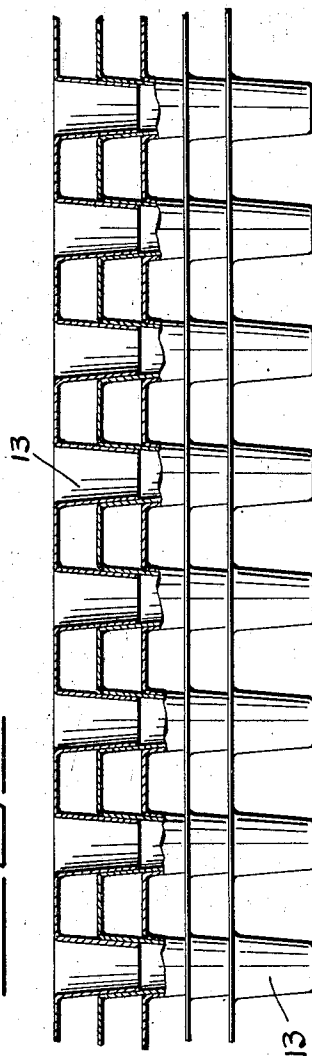


Fig. 2-



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2 Sheets-Sheet 2

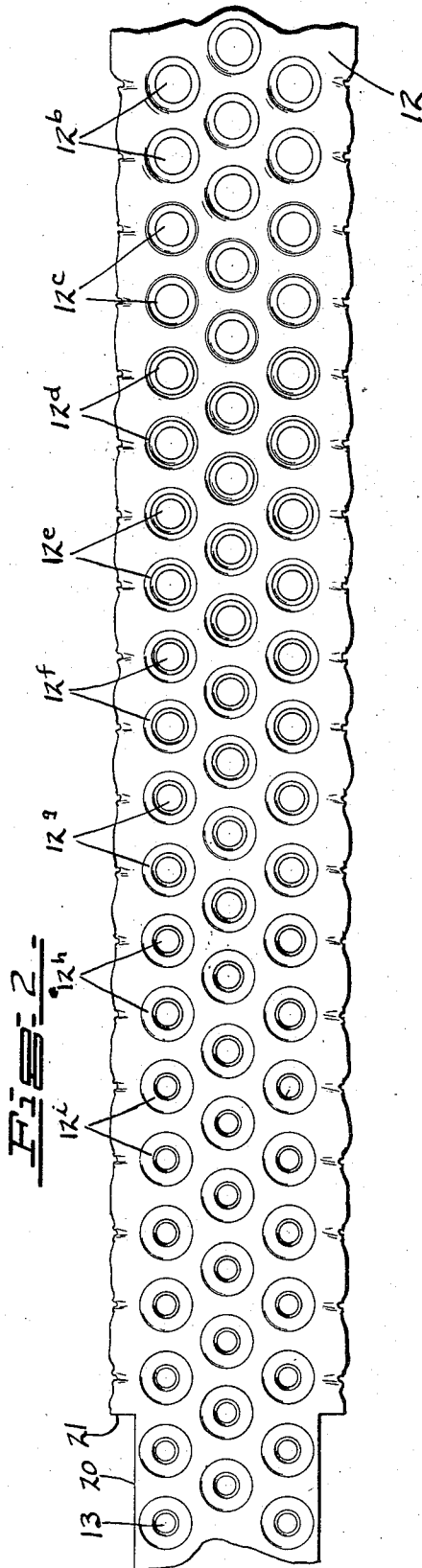


Fig. 5

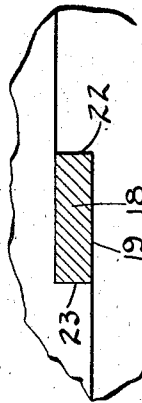
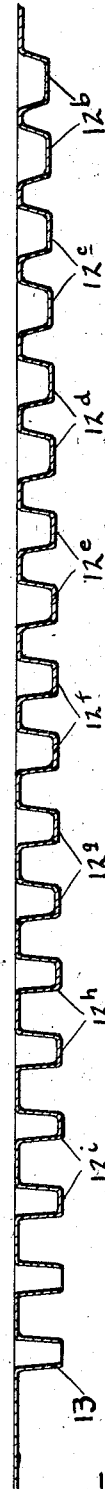


Fig. 3



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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR FORMING RADIATORS.

Application filed February 24, 1926. Serial No. 90,278.

This invention relates to improvements in machines for forming radiators of the type disclosed in my co-pending application Ser. No. 641,850, filed May 28, 1923.

In said application, I have disclosed a machine for forming these radiators in which radiator elements are formed from a strip of sheet metal by progressively subjecting the strip to the action of a die comprising a series of forming plungers and matrices, whereby rows of tubular projections are formed on and integral with the strip. At each revolution of the machine a completed row of tubular projections is formed and therefore, as many revolutions of the machine are required to form one radiator element as there are rows of tubes throughout the length of the elements.

In the forming of radiator elements of the type produced in the machine described in said application, Ser. No. 641,850, it is necessary to form wide shallow initial depressions in the strip of radiator forming material and to gradually decrease the diameter and increase the length of said depressions and as a last step perforate the bottoms of the depressions to form the integral tubular projections desired.

The greatest strain on the metal is the forming of the initial depression which draws a considerable volume of metal from the plane of the sheet, and it has heretofore been considered impossible to produce more than one wide shallow initial depression on the sheet at one time. I have discovered, however, that by proper arrangement of the dies it is possible to produce two initial depressions for each row of tubes on the strip simultaneously without causing the metal of the strip to rupture or tear, and that it is therefore possible to duplicate in the dies each of the plungers and matrices heretofore used.

It is the object of the present invention to reduce the number of revolutions of the machine required to produce an element with a given number of rows of tubes by at least one half, and thereby reduce the time required to manufacture a radiator.

Another object of the invention is to substantially double the output of a machine of the type referred to without increasing the speed thereof and without impairing the quality of the product.

Another object of the invention is to provide a die for said machine with twice the

capacity of the ordinary dies heretofore used and to reduce proportionately the number of parts to said die.

Other objects of the invention will appear as the description proceeds.

Referring now to the drawings:

Fig. 1 is a sectional side elevational view of a series of plungers and matrices embodying the invention.

Fig. 2 is a plan view of a strip of metal partly formed into a radiator element.

Fig. 3 is a longitudinal sectional view of the strip shown in Fig. 2, and

Fig. 4 is an elevational view, partly in section of a portion of radiator formed in accordance with my invention.

Fig. 5 is a sectional plan view of one of the cutters and power die taken on the line 5-5 of Fig. 1.

Referring more specifically to the drawings, a movable die head 10 is mounted in any suitable punch press and carries a series of plungers 11 cooperating with matrices 15^a in the die 15, adapted to form step by step tubular projections 13 from and on a strip of sheet metal 12. The first plunger 11^a is a flat faced plunger designed to flatten and remove any wrinkles in the sheet which might have been caused by the action of the first forming die. The next two plungers are duplicates and produce wide shallow depressions 12^b in strip 12 displacing into the depression more than enough metal required to form the final tube 13. The succeeding duplicate plungers 11^c, 11^d, 11^e, 11^f, 11^g, 11^h and 11ⁱ, form duplicate depressions 12^c, 12^d, 12^e, 12^f, 12^g, 12^h and 12ⁱ respectively in the strip 12, thus gradually narrowing and deepening the initial depression and moving the surplus metal back into the plane of the sheet until projections 12ⁱ of the proper width and depth have been formed. Punches 14 follow the plungers 11ⁱ and perforate the bottom of the projections forming the tubular projection 13, to permit the flow of water through the projections.

Cooperating matrices 15^a in the die 15 directly beneath the forming plungers are attached to the base of the machine, and in the center of each a hole 16 is adapted to receive a spring ejector pin 17 which lifts the radiator element forming strip 12 clear of the lower die 15 after each depression of the upper plungers 11.

A cutter and guide 18 is attached to the upper die head 10 and reciprocates in a re-

cess 19 in the die 15. When the cutter and guide 18 is depressed the edge of the strip 12 is trimmed off as at 20, leaving a shoulder 21 formed by the rear edge 22 of the cutter.

5 As soon as the die head 10 and cutter 18 is raised the strip 12 is drawn forward by constantly rotating feed rollers. The cutter recess 19 has an inwardly extended forward edge 23, which however, engages with the
10 shoulder 21 on the strip 12 when the strip has been moved forward the width of the cutter 18, and prevents further motion of the strip until after the next depression of the head 10 has formed a new series of initial depression in the strip 12, and reshaped those already formed. The width of the
15 cutter guide 18 is equal to twice the distance between two adjacent dies. It will thus be apparent that after a depression has been made on the strip 12 and the strip has been
20 moved forward a distance equal to the width of the cutter guide 18, the two depressions 12^b formed by dies 11^b will now be directly centered beneath the two dies 11^c and depression 12^c, 12^d, 12^e, 12^f, 12^g, 12^h, 12ⁱ
25 will be centered beneath dies 11^d, 11^e, 11^f, 11^g, 11^h, 11ⁱ and the two punches 14 respectively. In this die, therefore, two series of depressions are formed simultaneously, the
30 two tubular projections thus formed being simultaneously reshaped and completed in a series of steps so that the time required to make the radiator element is just half the time previously required where only projection
35 was formed at each lowering of the head 10.

It will be evident, however, that a larger number of projections may be made simultaneously by providing larger series of duplicate dies in the machine and the output of the machine correspondingly increased. This invention is therefore not to be considered as limited to any particular number of duplicate series of dies or to any
45 specific embodiment of the invention except as defined and limited by the appended claims.

I claim:

1. The method of manufacturing radiators which comprises the steps of simultaneously forming a plurality of rows of duplicate wide shallow depressions on a strip of radiator element forming material, progressively reforming said depressions in
50 a plurality of duplicate steps into recesses of a desired depth and shape and perforating the bottoms from said recesses to form tubes.

2. The method of manufacturing radiators which comprises the steps of forming
60 two or more duplicate wide shallow depressions on a strip of radiator element forming material, in rows lengthwise of said strip causing said strip to move at least twice the
65 distance between centers of a depression,

progressively forming said duplicate depressions into recesses of a desired depth and shape and simultaneously perforating the bottoms from two or more of said recesses to form tubes.

3. The method of forming rows of tubular projections lengthwise of and on a strip of sheet metal which comprises the steps of simultaneously forming a plurality of duplicate wide shallow depressions in each
75 row lengthwise of the strip, simultaneously reforming said plurality of depressions in progressive steps into recesses of the desired shape and depth and simultaneously punching the bottoms from said plurality recesses
80 to form tubes.

4. The method of manufacturing radiator elements which comprises simultaneously forming a series of duplicate initial depressions in a sheet of material lengthwise of
85 the sheet and progressively reshaping said depressions in series in a plurality of steps to form tubular projections of the desired size and shape.

5. A machine for manufacturing radiators comprising means for forming series of duplicate wide shallow depressions lengthwise of and on a strip of sheet material, means to move said strip twice the distance
90 between centers of a depression at each movement, means to progressively reform said depressions in series into recesses of the desired depth and shape, and means to punch the bottoms from said depressions to form tubes.

6. In a radiator element forming machine, means to form tubular projections on and of a strip of sheet material, comprising a plurality of rows of forming dies, lengthwise of said strip, each row containing a
105 plurality of dies of the same size and shape, and means to progressively press said dies upon said strip, so that not more than one die of a given shape and size will act upon a given portion of said strip.

7. In a radiator element forming die series of two or more duplicate shaping dies lengthwise of a strip of material to be punched, said series progressively changing in shape and size to form in progressive
110 steps tubular projection on and of the sheet of material.

8. In a radiator element forming die, a plurality of series of two or more shaping dies running lengthwise of a sheet of material to be worked on, said series progressively changing in shape and size to form in progressive steps tubular projection on and integral with the sheet of material, means
120 to perforate the bottom of said projections, when formed and means to trim the edges of said sheet, said trimming means adapted to trim at each stroke, a length of strip equal to the distance from corresponding dies of each series.

9. In a radiator element forming die, a single smoothing die, two or more duplicate initial shaping dies lengthwise of a strip of material to be worked on, two or more duplicate second dies lengthwise of the strip, two or more duplicate third dies lengthwise of the strip, two or more duplicate punches at the end of the dies, and a trimmer at the side of the sheet adapted to trim off at each stroke a length of strip equal to the distance 10 between the centers of the corresponding dies in each series.

In testimony whereof I have affixed my signature to this specification.

JOHN KARMAZIN.