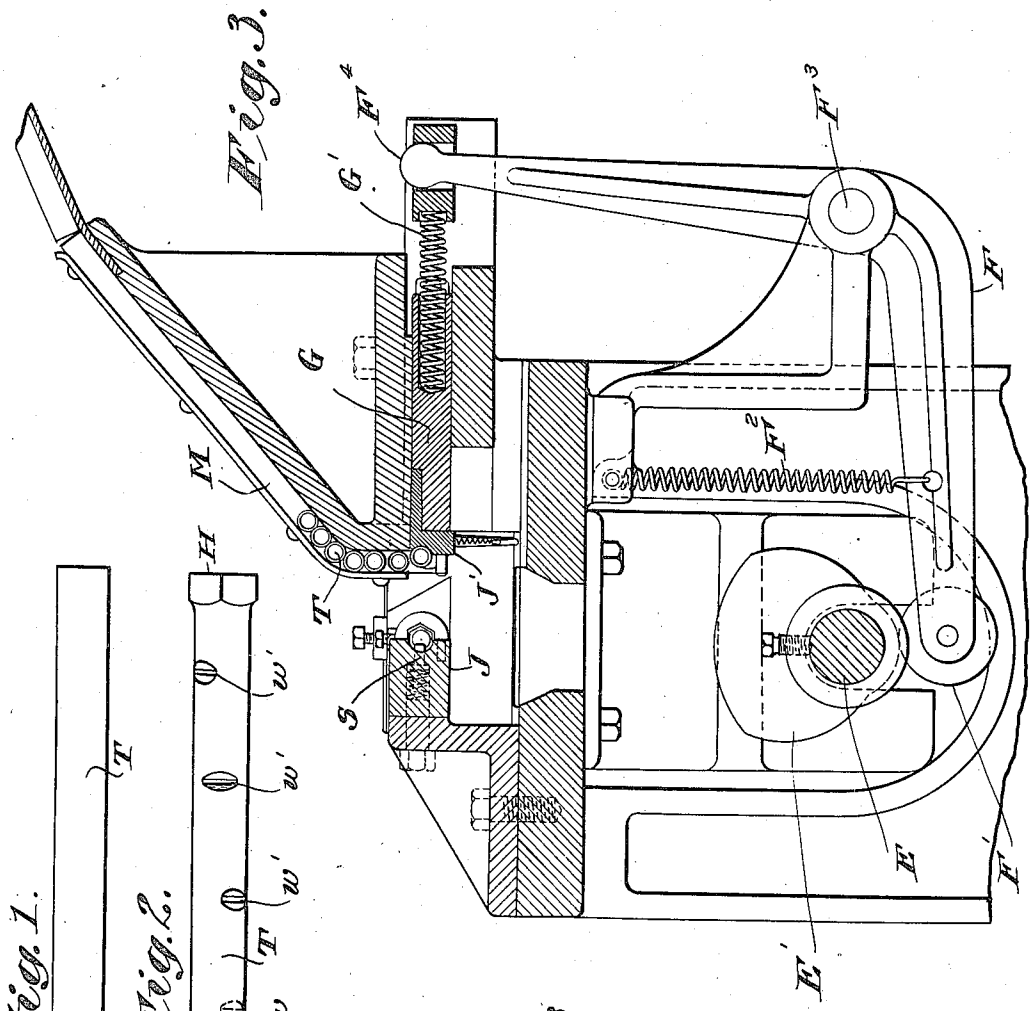
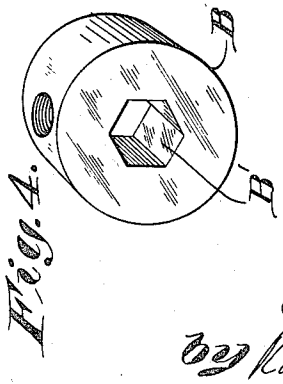
Nov. 4, 1924. 1,514,589

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MECHANISM FOR INDENTING RADIATOR TUBES

Filed May 5, 1920 3 Sheets-Sheet 1





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MECHANISM FOR INDENTING RADIATOR TUBES

Filed May 5, 1920 3 Sheets-Sheet 2

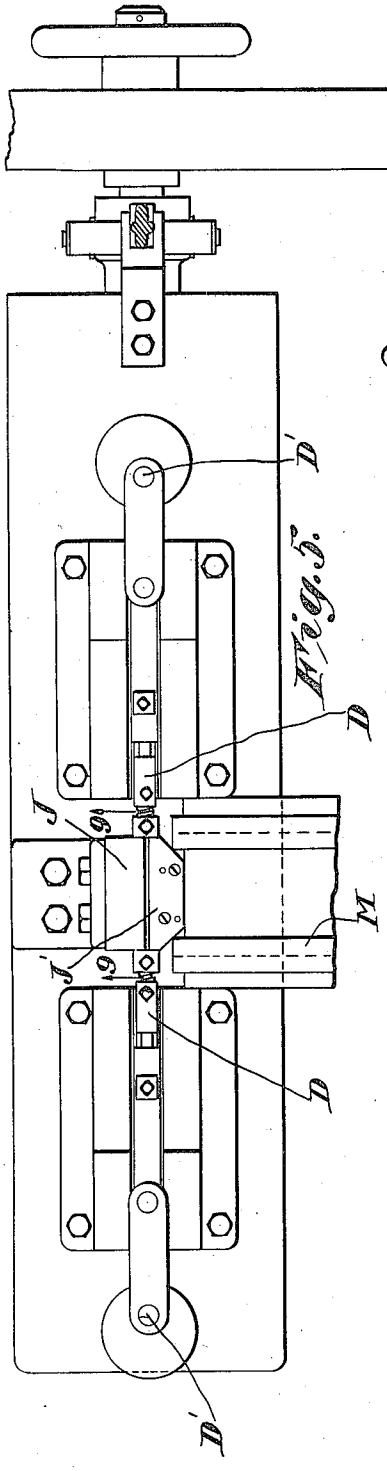


Fig. 5.

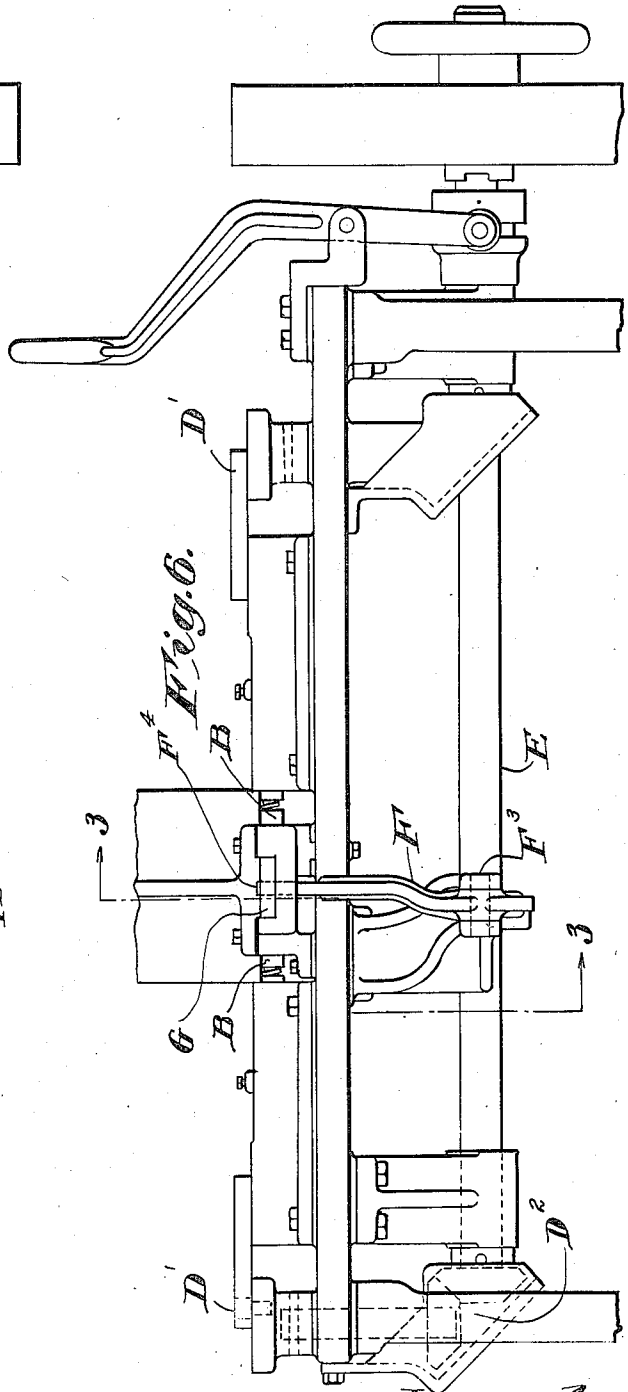


Fig. 6.

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MECHANISM FOR INDENTING RADIATOR TUBES

Filed May 5, 1920 3 Sheets-Sheet 3

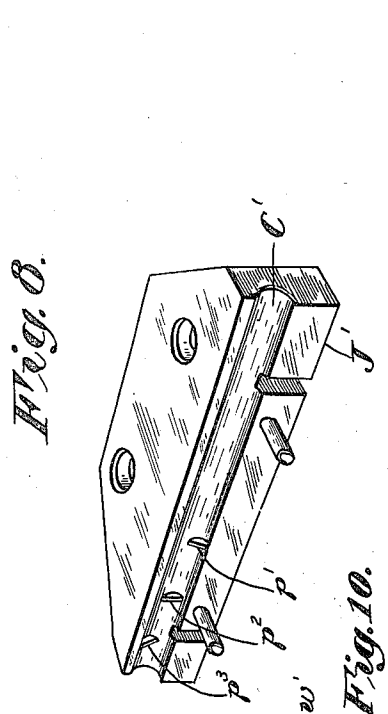


Fig. 8.

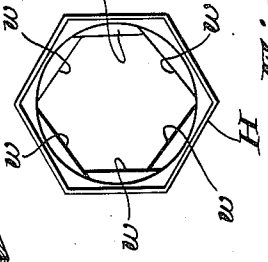


Fig. 10.

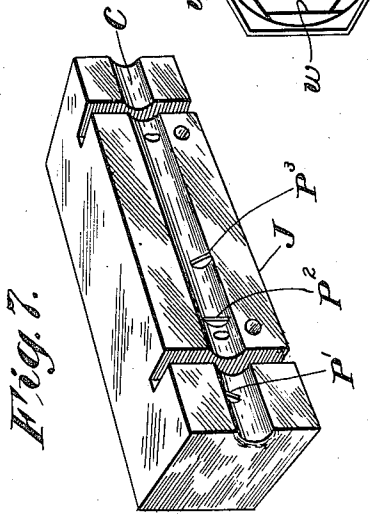


Fig. 7.

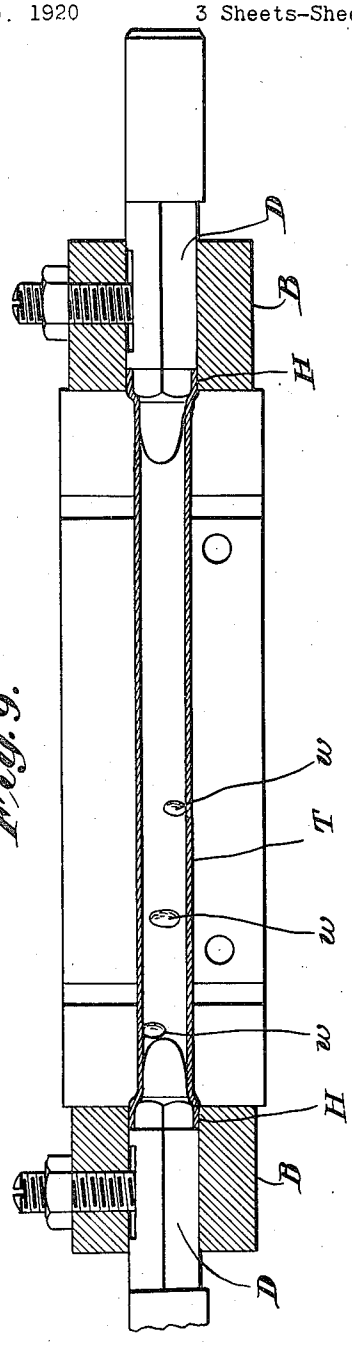


Fig. 9.

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Patented Nov. 4, 1924. 1,514,589

UNITED STATES PATENT OFFICE.

GEORGE A. FOISY, OF LOWELL, MASSACHUSETTS, ASSIGNOR TO UNITED STATES CARTRIDGE COMPANY, OF LOWELL, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

MECHANISM FOR INDENTING RADIATOR TUBES.

Application filed May 5, 1920. Serial No. 379,163.

To all whom it may concern:

Be it known that I, GEORGE A. FOISY, citizen of the United States of America, and resident of Lowell, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Mechanism for Indenting Radiator Tubes, of which the following is a specification.

My invention relates to the manufacture of thin metal tubes, such as the tubes which are assembled to form radiators for motor vehicles, and consists in improvements of which the object is to produce a series of indentations in the cylindrical walls of such tubes, without warping or stressing the tube as a whole. Tubes such as are here contemplated are made of seamless drawn copper or alloy from stock as thin as is practicable, so that unless the indenting operation is properly performed the tube is liable to be asymmetrically distorted.

The present purpose of indentations in tubes of this character is to form integral obstructions or baffles in the air-conducting barrel of the tube, which, by diverting the air stream from point to point prevent the maintainence of a heat insulating air film along the wall of the tube and thus increase the heat-exchanging efficiency of the tube, and of the radiator as a whole. The tube thus provided with integral baffle-indentations, is described and claimed in application for United States Letters Patent, Serial No. 367,142, filed March 19, 1920. The invention herein described relates to mechanism for automatically producing the tube.

In the drawings hereto annexed, which illustrate the invention,

Figure 1 represents a radiator tube blank;

Figure 2 the finished tube;

Figure 3 a machine for shaping the tubes, in vertical section at the line 3—3, Fig. 6;

Figure 4 a perspective view of one of the head-dies;

Figure 5 a top plan view of the machine, in part fragmentary;

Figure 6 a rear elevation of the machine;

Figure 7 a perspective view of one of the tube holding and indenting jaws;

Figure 8 a perspective view of the jaw which opposes that shown in Fig. 7;

Figure 9 a section, longitudinally along a tube, viewed in the direction of the arrows 9—9 in Fig. 5; and

Figure 10 is an end view of a finished tube.

In general, the machine here shown is no different from machines heretofore used for expanding the hexagonal heads of radiator tubes, and a brief description of the machine will therefore suffice.

Cam E′ on shaft E (Fig. 3) acting on the follower roll F′ against the stress of spring F^2 intermittently oscillates bell crank lever F on its fulcrum F^3, to reciprocate slide G, through the medium of the spring G′ and ball-head F^4 on lever F. Jaw J is fixed on the machine frame, jaw J′ on the head of slide G. Tubes T, in blank form (see Fig. 1) are fed by gravity from magazine M so that the movable jaw J′ picks off one blank at a time and moves it to jaw J; where the blank is held while die bars D (see Fig. 9) actuated from crank pins D′ (see Figs. 5 and 6) rotated through the agency of bevel gears at D^2, expand hexagonal heads M at the ends of the tube, coacting with the hexagonal holes B′ in head dies B (see Figs. 4 and 9). On retirement of movable jaw J′, yielding spring-actuated pins S (see Fig. 3) push the finished tube T out of jaw J.

The concavities in the faces of jaws J and J′ are substantially semi-cylindrical, that in jaw J fully a half cylinder, that in jaw J′ somewhat less, so that the grip of jaw J on the tube is sufficiently superior to allow the jaw J′ to free itself from the tube T when the slide G retires.

Referring to Figs. 7, 8, 9 and 10, which illustrate the improvement which has for its objective the simultaneous impression and indentation of a radiator tube at points evenly distributed along its length and about its axis of curvature; the cylindrical recess C in the face of the jaw J carries a number of projections P′, P^2, P^3, spaced apart along approximately half the length of the recess, and spaced angularly and equally about the axis of curvature of the surface of the recess. Preferably these projections are as shown, symmetrical, being each bounded by a chord of the cylindrical surface so that when pressed against the cylindrical wall of the tube they form dimple-like indentations of symmetrical, substan-

tially elliptical contour elongate transversely of the length of the tube. Similarly, the cylindrical recess C′ of the jaw J′ is provided with projections p', p^2, p^3, located along approximately one half the length of the recess C′, this half being that which will be opposed to the smooth cylindrical half of the recess C, when the jaws J and J′ are placed face to face in the machine.

Taken in the aggregate, the projections P′, P^2, P^3, p', p^2, p^3, occupy the full circuit of the cylinder composed of the surfaces of recesses C and C′, when these are juxtaposed, and are substantially equally spaced both along the recesses and angularly about the axis of their cylindricity. One half the projections lie at one side, the other half on the other side, of a plane coincident with the contacting plane faces of the jaws J and J′.

The angular distribution of these projections, in the instance here shown, is such that when the jaws are in contact the projections are equally spaced along a spiral. They can be distributed angularly in other sequence than this, or they may alternate on the two jaws, in their longitudinal spacing.

When a tube blank is clamped between the jaws J and J′, the wall of the tube is indented simultaneously at all points of projection, the smooth cylindrical surfaces of the recesses C and C′ support the thin metal tube, and thus assist the simultaneity of indentations in preserving the general straightness of the tube. Thus with the indenting protuberances fixed relatively to the cylindrical surfaces of the dies, as a consequence of which the protuberances engage the tube before the cylindrical surfaces engage and therefore tend to flatten the tube in the indenting operation, the cylindrical surfaces counteract this tendency by engaging the tube around the indentations and reshaping same. The hexagonal heads H are then expanded in the usual manner, and the tube T discharged from the machine. The projections P′, p' etc., hold the tube against endwise movement while the die bars D are being forced into the ends of the tubes to expand the hexagonal heads H, thereby avoiding inequalities between the lengths of the heads H at the opposite ends of the tube due to the endwise slippage of the tube which otherwise might occur.

The arrangement of indentations on the tube is shown in Figs. 9 and 10.

I claim:

1. Apparatus for producing projections in the interior of metallic radiator tubes comprising means for simultaneously forming a plurality of integral dimple-like baffle indentations at predetermined points in the cylindrical wall of a tube, and means associated with said first means and engaging the exterior surface of the tube to reshape the tube after such indentation.

2. Apparatus for indenting metallic radiator tubes comprising means for simultaneously forming a plurality of spaced depressions at predetermined points in the cylindrical wall of a tube, said depressions being elongate circumferentially of the tube, and means for embracing the adjacent surface of the tube to reshape asymmetrical deformation thereof at other points.

3. Apparatus for forming radiator tubes comprising tube clamping means having projections adapted to be pressed into the circumferential wall of a tube, said clamping means comprising surfaces engaging the tube to prevent deformation thereof at all other point as a result of such pressure, and means for expanding the end of the tube while the projections are pressed into the wall of the tube, whereby the projections hold the tube against endwise displacement while the end of the tube is being expanded.

4. Apparatus for forming radiator tubes comprising clamping means having elongate ridges adapted to be pressed into the tube transversely thereof, and means for expanding the end of the tube including a die bar arranged to be forced into the end of the tube while said ridges are indented in the tube, whereby the ridges hold the tube against endwise displacement while the die bar is being forced into the end of the tube.

5. Apparatus for forming radiator tubes comprising dies movable toward and from each other, the dies having opposed grooves to receive the opposite sides of the tubes, the grooves having protuberances for indenting the tubes at spaced intervals, and means for individually feeding the tubes sidewise into the space between said dies.

6. Apparatus for forming radiator tubes comprising dies horizontally movable toward and from each other and having opposed horizontal grooves in their opposed faces, the grooves having protuberances for indenting the tubes at spaced intervals, and means for automatically dropping a tube into the space between the dies when they move apart.

7. Apparatus for forming radiator tubes comprising opposed dies for gripping the periphery of a tube therebetween, and opposed dies having a polygonal cross-section for concomitantly expanding the ends of the tube while maintaining the ends axially parallel with the body of the tube.

8. Apparatus for forming radiator tubes comprising opposed dies for gripping the periphery of a tube therebetween, said dies having protuberances for indenting said periphery, and means for concomitantly expanding the ends of the tube.

9. Apparatus for forming radiator tubes comprising opposed dies for gripping the periphery of a circular tube therebetween, and means for concomitantly rendering the

cross-sectional contour of the ends of the tube polygonal.

10. Apparatus for forming radiator tubes comprising opposed dies provided with spaced protuberances and having relative movement toward and from each other for indenting the periphery of individual tubes, opposed dies having relative movement at right angles to the movement of said first dies for concomitantly shaping the ends of the tubes, and means for feeding the tubes transversely of said movements to a position between said dies.

11. Apparatus for forming radiator tubes comprising opposed dies having relative movement toward and from each other for indenting the periphery of individual tubes, opposed dies having relative movement at right angles to the movement of said first dies for concomitantly changing the cross-sectional contour of the ends of the tubes, and means for feeding the tubes transversely of said movements to a position between said dies.

12. Apparatus for forming radiator tubes comprising dies engaging the opposite sides of each tube, and opposed dies arranged concomitantly to enter the ends of the tubes to shape the ends, the first named dies having recesses complemental to the last named dies.

13. Apparatus for forming radiator tubes comprising opposed dies concomitantly to expand the opposite ends of the tubes, and complemental dies arranged to engage the outer surfaces of the ends of the tubes, said complemental dies being separable to remove the expanded tube.

14. Apparatus for forming radiator tubes comprising opposed dies concomitantly to expand the opposite ends of the tubes, and separable dies arranged to engage the outer surface of the ends of the tube, said dies having shaping surfaces extending longitudinally of the tube.

Signed by me at Lowell, Mass., this 28th day of April, 1920.

GEO. A. FOISY.