No. 875,746. PATENTED JAN. 7, 1908.

F. H. STOLP.

MACHINE FOR MAKING RADIATORS.

APPLICATION FILED APR. 24, 1906.

3 SHEETS—SHEET 1.

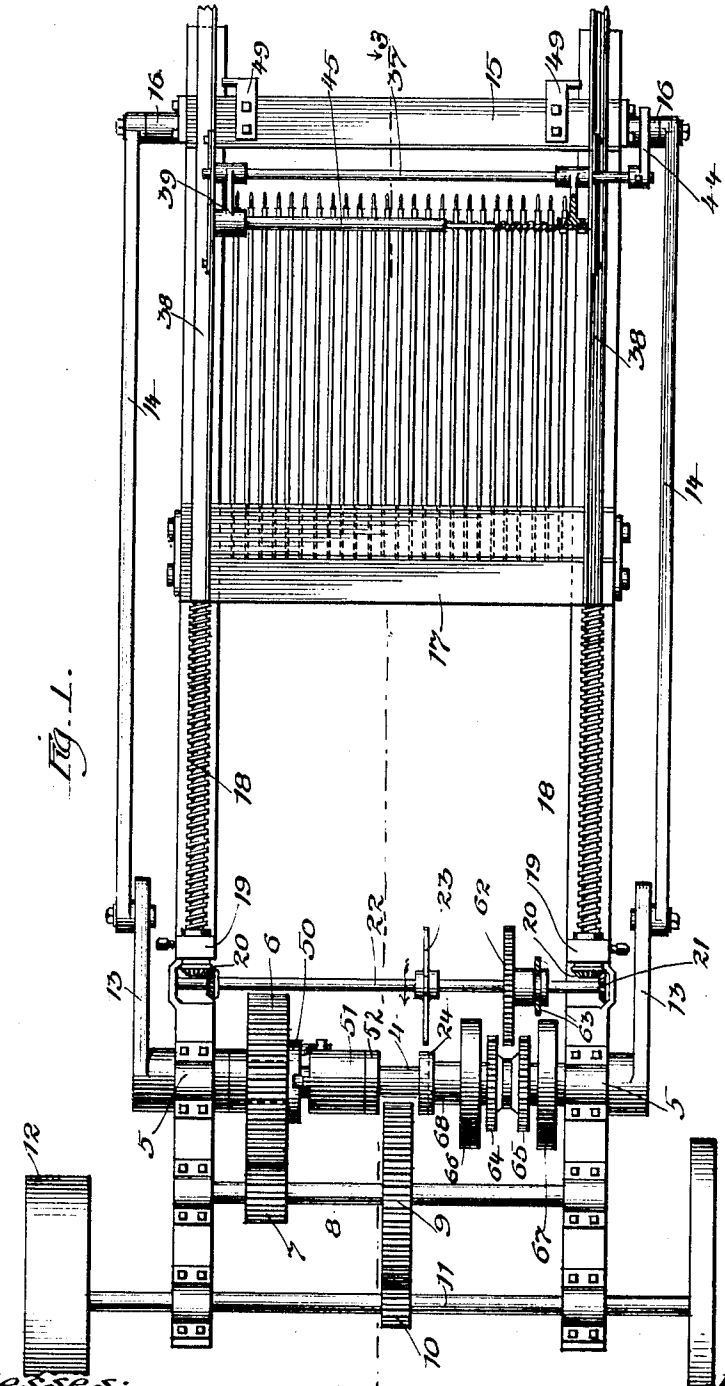


Fig. 1.

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3 SHEETS—SHEET 2.

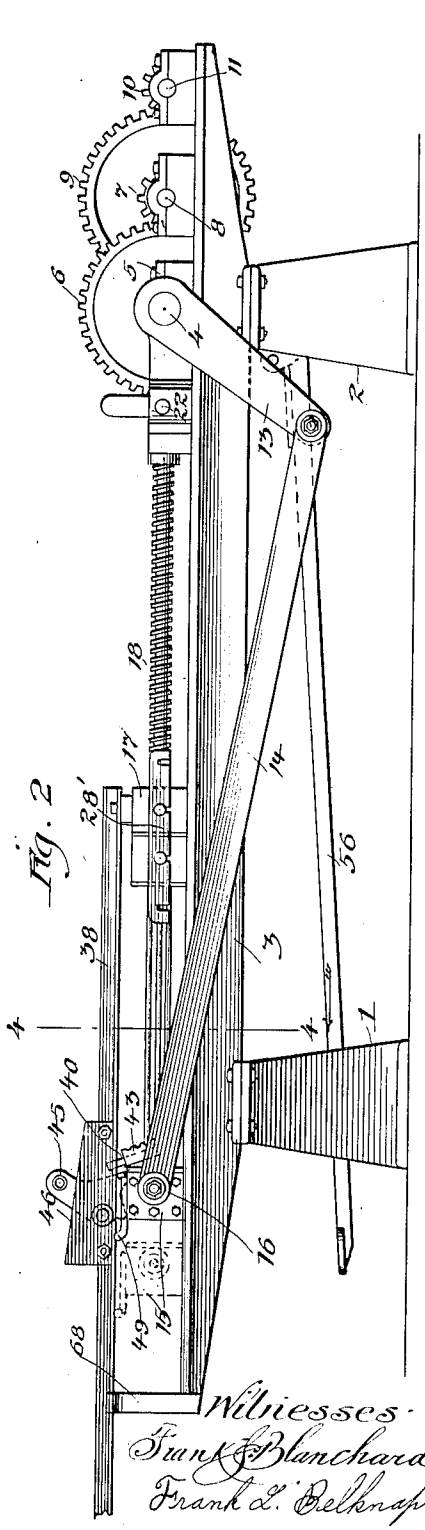


Fig. 2.

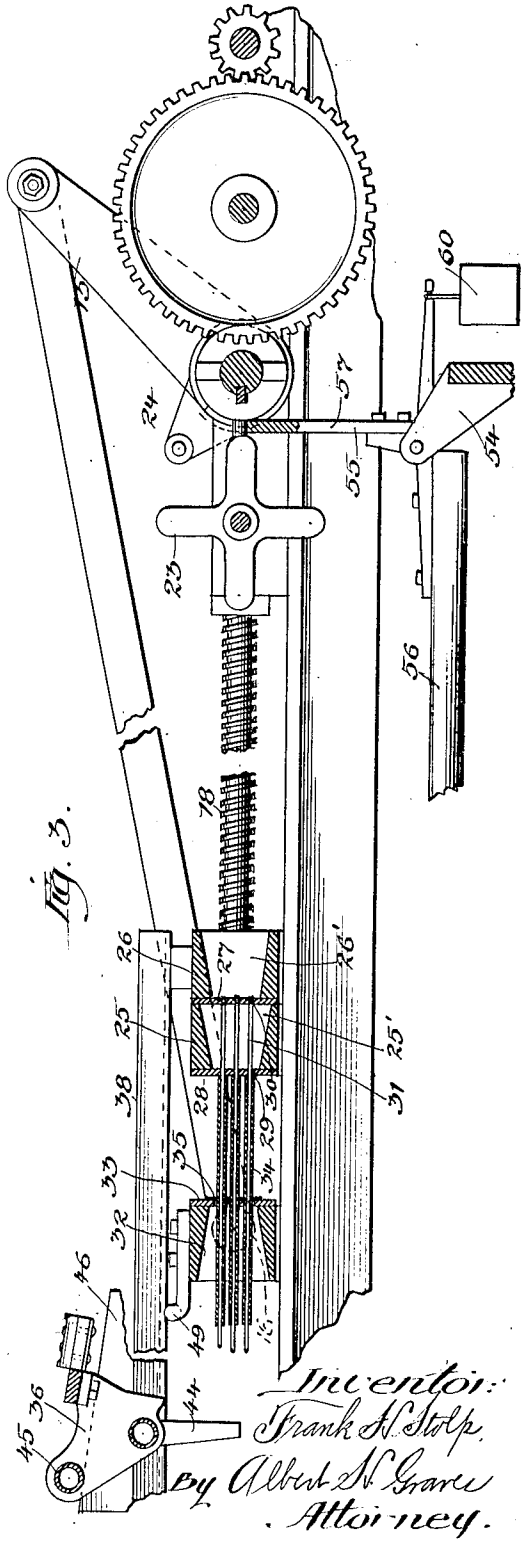


Fig. 3.

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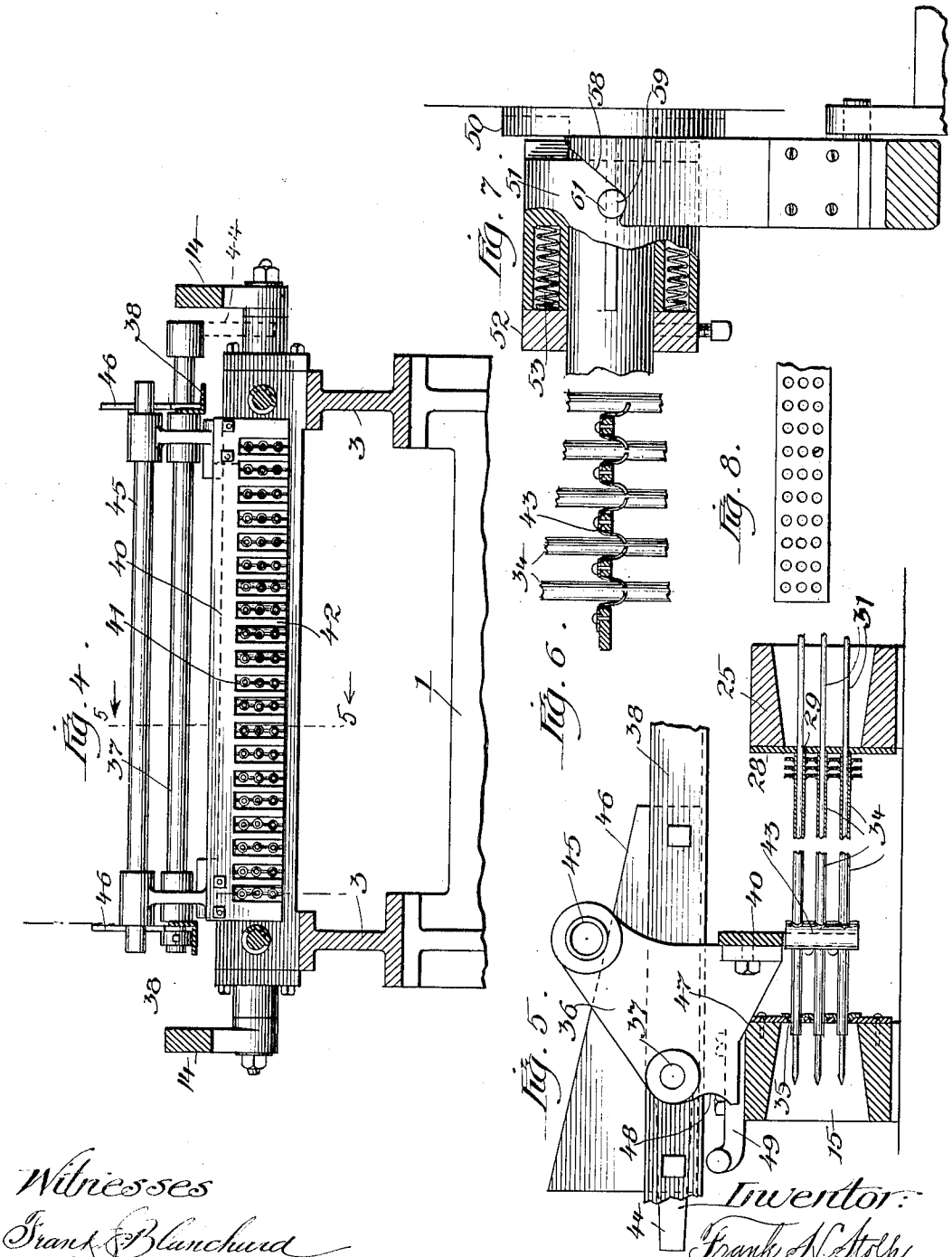
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

FRANK H. STOLP, OF CHICAGO, ILLINOIS.

MACHINE FOR MAKING RADIATORS.

No. 875,746. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed April 24, 1906. Serial No. 313,488.

To all whom it may concern:

Be it known that I, FRANK H. STOLP, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Machines for Making Radiators, of which the following is a specification.

This invention relates to improvements in machines for making radiators, and refers more specifically to a machine adapted for making radiators such as are commonly used in automobiles for dissipating the heat of jacket water.

Among the salient objects of the invention are to provide a machine by means of which radiating fins may be assembled upon circulating tubes with perfect regularity and uniformity and in a manner which is largely automatic; to provide a machine which is adapted for making radiators of various sizes, both as regards the number of circulating tubes and the length thereof; to provide a machine which stops automatically after completing each cycle of movements; to provide in such a machine means for reliably supporting the tubes to which the fins are applied during such application; to provide in such a machine an automatic supporting comb mechanism which serves to hold the several tubes and their internal supports in exact properly spaced relation to each other during that portion of the cycle of movements of the machine during which the fins are initially placed in position; to provide means for so adjusting the mechanism that the fins will be spaced at different but uniform intervals apart; and in general to provide an improved machine of the character referred to.

The invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims.

In the drawings—Figure 1 is a plan view of a machine constituting a preferred embodiment of the invention; Fig. 2 is a side elevation of the same; Fig. 3 is a longitudinal sectional view taken on line 3—3 of Fig. 1 and looking in the direction of the arrows; Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 2 and looking in the direction of the arrows; Fig. 5 is a view taken on line 5—5 of Fig. 4 and looking in the direction of the arrows; Fig. 6 is a horizontal sectional detail taken through a fragmentary portion of the supporting comb and showing the manner in which the comb grasps and supports the tubes; Fig. 7 is a detail of the automatic ungearing clutch. Fig. 8 shows a portion of one of the fin-plates employed in the construction of a radiator.

Referring to the drawings, 1 and 2 designate base frame standards upon which are rigidly supported a pair of parallel longitudinally extending bed frames 3, 3, spaced apart at a distance corresponding to the main width of the machine.

4 designates a main shaft which is journaled to extend transversely, in suitable bearings 5, 5, and is driven through a train of driving mechanism comprising a main spur-gear 6 freely mounted upon the main shaft, a pinion 7 rigid upon an intermediate shaft 8, a second spur-gear 9 upon the shaft 8, and a pinion 10 mounted upon a counter shaft 11 and driving the spur-gear 9. Shaft 11 may be driven by means of a belt and is to this end provided with a belt-pulley 12. By reason of the speed reduction of the train of driving mechanism described the main shaft is driven at a relatively slow speed and with corresponding power. Upon each end of the main shaft is keyed a crank 13; these cranks being of equal length and parallel with each other. With each crank is connected a pitman 14 which extends longitudinally of the bed frame and at its opposite ends is connected with a cross-head 15 provided with suitable connecting wrists 16. The cross-head is mounted and guided to slide on the upper faces of the bed frames 3 and obviously has a throw equal to twice the length of the crank arms.

Upon the bed-frame between the cross-head 15 and the remote end of the machine is mounted a transversely disposed traveling abutment head 17 which has for its function to hold a series of tubes and tube-supports, upon which the fins are to be threaded and is moved back step by step, a distance equal to the distance between fins, upon each successive reciprocation of the cross-head. To accomplish this movement of the abutment a pair of screws 18 are mounted upon the respective bed frames, each screw having one end swiveled in a journal bearing 19 and its opposite end threaded into the corresponding end of the abutment 17. The forward ends of these screws carry miter-gears 20 which intermesh with corresponding gears 21 upon a transverse shaft 22 which is provided with, and actuated by, a star-wheel 23. The star-wheel 23 is in the construction illus-

trated provided with four arms so as to be turned a quarter revolution at a time, and is actuated by means of a tappet crank 24 mounted upon and rotating with the main shaft 4.

The abutment 17 comprises two main cross bars 25 and 26, each relatively slotted throughout its main length, except at the ends thereof, as indicated at 25′ and 26′, and to the front side of each bar is secured a plate, as 27 and 28. The bars 25 and 26 are connected at each end by adjusting links 28′ (see Fig. 2). The plates 27 and 28 are provided with corresponding and registering series of apertures 29 and 30 within which are seated supporting rods 31; the ends of these rods being threaded into the plate 27, and the aperture through the plate 28 conforming closely to the size of the rods so as to hold the latter accurately spaced. The cross-head 15 is similarly composed of a longitudinally slotted cross-bar 32, to the rear face of which is secured a plate 33 provided with apertures registering with the several supporting rods 31. This plate 33 constitutes in effect a combing device which serves to force the fins upon a series of tubes 34 threaded upon the supporting rods 31, and to this end the apertures 35 in the plate 33 are of suitable size to easily accommodate the tube 34.

The throw of the cross-head 15 in its back stroke is such as to carry it entirely out of engagement with the set of supporting rods and the tubes mounted thereon, in order that the fins may be manually adjusted upon the ends of the rods, and in order to support and hold the tubes and rods in accurately spaced relation with each other while the cross-head is thus retracted, a supporting comb is provided, designated as a whole 36. This mechanism comprises a rock-shaft 37 having its ends journaled in a pair of angle-bars 38 and carrying at its ends bracket-like arms or castings 39, which arms in turn carry a cross-bar 40. The cross-bar 40 is provided with a series of vertical slots 41 extending from its lower edge upwardly a distance sufficient to accommodate the vertical rows of tubes (see Fig. 4), and upon the fingers 42 formed between the slots are mounted spring grippers 43 (see Figs. 5 and 6) adapted to straddle and grip each tube when the supporting comb is in lowered position. The supporting comb is forced into engagement with the tubes and rods contained therein during the retracting movement of the cross-head 15 and before the latter leaves the ends of the tubes, so that the tubes are supported against the down-thrust of the supporting comb as it moves into position. Vice versa, the supporting comb is withdrawn from the tubes during the advance movement of the cross-head, and is in fact actuated by the latter. To this end, the rock-shaft 37 is provided with a rigid arm 44 rigid therewith and extending downwardly in position to be encountered by the corresponding wrist projection 16 of the cross-head during the back stroke of the latter, thus oscillating the supporting comb forwardly and downwardly. A stop bar 45 extending between, and connected with, the upper portions of the bracket arms 36 encounters the upper edges of stop plates 46 mounted upon the angle members 38 and arrests the downward movement of the supporting comb, and in this connection it is to be noted that this comb is made relatively heavy so that its weight assists in bringing it into fully operative position. Upon the return stroke of the cross-head the forward edge of the latter encounters the inclined under edges 47 of the arms 36 (see Fig. 5) and lifts the comb a short distance and sufficient to bring the rear lower corners 48 of the arms 36 into position to be engaged by tappet arms 49 mounted rigidly upon the cross-head. These tappet arms complete uplifting of the comb; the latter being arrested in its raised position by the stop-bar 45 again encountering the upper edges of the stop-plates 46, as shown clearly in Fig. 3.

Automatic clutch mechanism is provided for ungearing the cross-head actuating mechanism from the main shaft after each reciprocation of the cross-head and at the point when the latter has reached its fully retracted position, and other mechanism is provided for throwing the machine into gear manually. Describing this mechanism, and referring more particularly to Figs. 1, 3 and 7, 50 designates a clutch-hub fast to the gear 6 and loosely mounted on the main shaft 4. Adjacent to this clutch member is splined a shiftable clutch 51 which is adapted to engage the clutch-hub 50 and is confined to reciprocate between the later and a collar 52 keyed upon the shaft. Springs 53 arranged in the clutch member and acting on said collar serve to normally thrust the clutch into engagement with the clutch-hub (see Fig. 7). Upon a suitable bracket 54 (see Fig. 3) upon the lower part of the front end of the main frame, is pivoted an angle-lever 55, with one end of which is connected a long foot-lever 56, while the other arm 57 extends vertically upward and rests against the rear side of the clutch member 51; the upper part of this arm 57 being curved to conform to the cylindric surface of the hub and terminating in an inclined cam surface 58 (see Fig. 7) and stop-notch 59. The angle-lever 55 is weighted, as indicated at 60, so that the arm 57 bears yieldingly against the clutch member. Upon the clutch member is fixed a cam-pin 61 which coöperates with the cam surface 58 to throw the clutch out of engagement with the hub during the forward rotation of the shaft. The notch 59 arrests the forward movement of the clutch member when the pin 61 encounters it. To throw the clutch into gear

the operator simply depresses the foot-lever 56 thus oscillating the arm 57 away from the clutch member, whereupon the springs throw the clutch into engagement and the mechanism performs one revolution and is automatically thrown out of gear when the pin 61 again encounters the cam surface 58; it being understood that the operator after depressing the foot-lever to start the mechanism releases the foot-lever and permits the arm 57 to return to position to throw out the clutch.

Means are provided for rapidly traversing the cross-head 17 to its initial forward limit of movement preparatory to starting a new radiator set. Describing this mechanism, 62 designates a spur-gear splined upon the shaft 22 (see Fig. 1) and shiftable in either of two directions by means of a shifting fork 63. Upon the main shaft 4 are loosely mounted two spur-gears 64 and 65, rotatable independent of each other, but each fast with a belt-pulleys as 66 and 67, respectively; the group of gears and pulleys on the main shaft are confined between a suitable collar 68 on one side and a journal bearing 5 on the other side. Separate belts are to be applied to these pulleys 66 and 67 to rotate them in opposite directions and at a relatively high rate of speed. If, now, gear 62 be shifted into engagement with gear 64 and the latter rotated in a direction the reverse of that of the main shaft it will be obvious that the screws 18 will be rapidly rotated in the proper direction to traverse the abutment cross-head 17 forwardly. The other gear 65 and associated belt pulley are convenient for rapidly shifting the abutment cross-head rearwardly, as for example when setting up to build a radiator having relatively short tubes.

The operation of the mechanism, constructed as described, has been indicated in connection with the description of the mechanism but may be briefly summarized as follows: The operator having determined the number of tubes and arrangement of the same to be used in making a given radiator, sets up the tubes accordingly by sliding them into position upon the supporting rods 31 with their ends in bearing with the abutment plate 28. The abutment cross-head 17 is now adjusted to its initial position, which will be that in which the first stroke of the cross-head will approach the abutment head to that point at which the first fin is to be located relatively to the forward ends of the tubes. This adjustment is accomplished by first adjusting the two cross-bars 25 and 26 of the abutment cross-head in proper relation to each other bymeans of the adjustment links 28′ and then rotating the traversing screws 18 to the proper initial position. In this connection it will be noted that the angle members 38 which carry the supporting comb mechanism are connected to move with the cross-bar 26 of the abutment cross-head and at their opposite ends slide through brackets 68 and by means of the adjusting links 28′ the forward cross-bar 25 may be adjusted in such relation to the member 26 and supporting comb mechanism as to bring the rear ends of the tubes in proper relation to said supporting comb. The radiator tubes having thus been set up, and the machine adjusted to its initial position, the operator places the first fin plate upon the ends of the rods which protrude beyond the ends of the tubes, as best shown clearly in Fig. 5, and then depresses the foot-lever, thereby throwing the machine into operation. Each fin-plate consists of a sheet metal plate provided with a series of perforations adapted to register with the radiator tubes. The cross-head 15 advancing encounters the fin-plate and forces it over the tubes and into position adjacent to the abutment plate 28; during the same rotation of the main shaft which precipitates the cross-head as described the tappet crank 25 encounters the star-wheel 23 and turns the latter forwardly a quarter of a revolution, advancing the connected abutment heads a distance corresponding to one-quarter of the pitch length of the screws 18.

During the advance movement of the cross-head 15 it encountered the supporting comb and elevated the latter out of engagement with the tubes, and during its return it encountered the supporting comb tappet arm 44 and returned the comb into position to support the tubes and hold them in exact spaced relation after the cross-head passed out of engagement with the same. The succeeding operations are repetitions of the foregoing, the abutment cross-head being stepped forwardly a distance equal to the distance between fins upon each reciprocation until the entire set of pins has been applied. The machine is thrown out of gear at the end of the cycle of movements and just as the reciprocating cross-head reaches its rearmost limit of movement. The assembled radiator is removed from the machine after completion by simply sliding it off from the set of supporting rods; it being noted that by the time the set of fins has been applied to the tubes the abutment cross-head will have been stepped forward far enough to leave space between the ends of the supporting rods and the reciprocating cross-head to thus remove the radiator when the cross-head is in retracted position.

I claim as my invention:

1. In a mechanism for applying fin plates to tubes, the combination of a set of supporting rods, an abutment member holding said rods at one end, a reciprocatory member operating to travel over said rods, and means for varying the relative approach of

the said abutment and reciprocating members.

2. In a mechanism for applying fin plates to tubes, the combination of a set of supporting rods, an abutment member supporting said rods at one end and holding them in parallelism, a reciprocatory member apertured to fit over said rods and operating to traverse the latter, and automatic means for moving one of said members relatively to the other step by step whereby their relative approach is varied upon each reciprocation.

3. In a mechanism for applying fin plates to tubes, the combination of a set of tube supports, means supporting said tube supports at one end, a reciprocatory member and means actuating said member to traverse the rods, mechanism operating to move one of said members relatively to the other a predetermined distance upon each reciprocation of the reciprocatory member, and means associated with said reciprocatory member and operating to support said tube supports in alternation with said reciprocatory member.

4. In a machine for applying fin plates to tubes, the combination of a set of supporting rods, an abutment member in which the end of each rod is supported and whereby the rods are held in parallelism, a reciprocatory cross-head apertured to fit over said rods, means for reciprocating said reciprocatory member, means for regularly varying the relative approach of the reciprocatory member and abutment member, a supporting comb movable into and out of engagement with the ends of the rods remote from the supporting abutment, and mechanism operating to shift said supporting comb in synchronism with the movements of the reciprocatory member.

5. In a machine for applying fin plates to tubes, the combination with a suitable bed frame, of an abutment member and a reciprocating member supported to traverse said main frame, a set of supporting rods mounted in said abutment member in parallelism with each other and with the line of reciprocation of said reciprocatory member, a rotating member, crank and pitman connections between said rotating member and said reciprocatory member, a traversing mechanism, operative connections between said rotating member and said traversing mechanism and between the latter and the abutment member, and an automatic ungearing mechanism for arresting the movement of the reciprocatory member.

6. In a machine for applying fin plates to tubes, the combination with a suitable bed frame, of an abutment member and a reciprocating member supported to traverse said main frame, a set of supporting rods mounted in said abutment member in parallelism with each other and with the line of reciprocation of said reciprocatory member, a rotating member, crank and pitman connections between said rotating member and said reciprocatory member, a traversing mechanism, operative connections between said rotating member and said traversing mechanism and between the latter and the abutment member, a constantly rotating member, a manually operable clutch for throwing said reciprocating mechanism into gear with said constantly rotating member, and an automatic unclutching mechanism arranged to disengage the driving connections at the end of each cycle of movements of the reciprocatory member.

7. In a machine for applying fin plates to tubes, the combination with a suitable bed frame, of an abutment member and a reciprocating member mounted to traverse said main frame, a set of supporting rods mounted in said abutment member, a shaft, crank and pitman connections between said shaft and said reciprocatory member, a rotatable screw operatively connected with said abutment member and confined against endwise movement, means for rotating said screw to a predetermined extent upon each reciprocation of the reciprocatory member, a supporting comb mechanism, operating mechanism connected to operate in synchronism with the reciprocation of the reciprocatory member for shifting said supporting comb into and out of operative engagement with the supporting rods, and a supporting frame for the supporting comb connected to travel with said abutment.

8. In a machine for applying fin plates to tubes, the combination with a suitable bed frame, of a two-part abutment member, a set of supporting rods mounted in one of said abutment members and extending through the other, a supporting comb mechanism, a frame supporting said comb mechanism and connected to move with one of said abutment members, means for adjustably fixing one abutment member in relation to the other abutment member, a cross-head, a drive shaft, crank and pitman connections between the drive shaft and cross-head, a pair of traversing screws journaled to rotate and confined against endwise movement and having threaded engagement with one of said abutment members, intermittently operating driving connections between the drive shaft and said traversing screws, automatic operative connections for shifting said supporting comb into and out of operative position, and means operating automatically to arrest said mechanism at the end of each cycle of movements.

9. In a machine for applying fin plates to tubes, the combination with a suitable bed frame, of a two-part abutment member, a set of supporting rods mounted in one of said

abutment members and extending through the other, a supporting comb mechanism, a frame supporting said comb mechanism and connected to move with one of said abutment members, means for adjustably fixing one abutment member in relation to the other abutment member, a cross-head, a drive shaft, crank and pitman connections between the drive shaft and cross-head, a pair of traversing screws journaled to rotate and confined against endwise movement and having threaded engagement with one of said abutment members, intermittently operating driving connections between the drive shaft and said traversing screws, automatic operative connections for shifting said supporting comb into and out of operative position, means operating automatically to arrest said mechanism at the end of each cycle of movements, a speed-gear mechanism, and clutch mechanism for operatively connecting and disconnecting said traversing screws with said speed-gear mechanism.

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