

May 4, 1948.

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2,440,692

COOLING CHAMBER HAVING BAFFLES FOR DIRECTING AIR OVER DRIED MATERIAL

Original Filed July 6, 1942 4 Sheets-Sheet 1

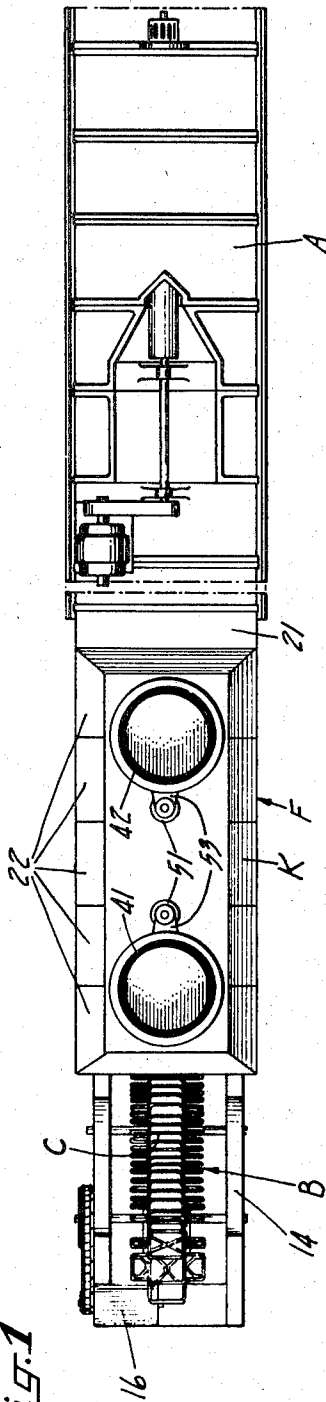


Fig. 1

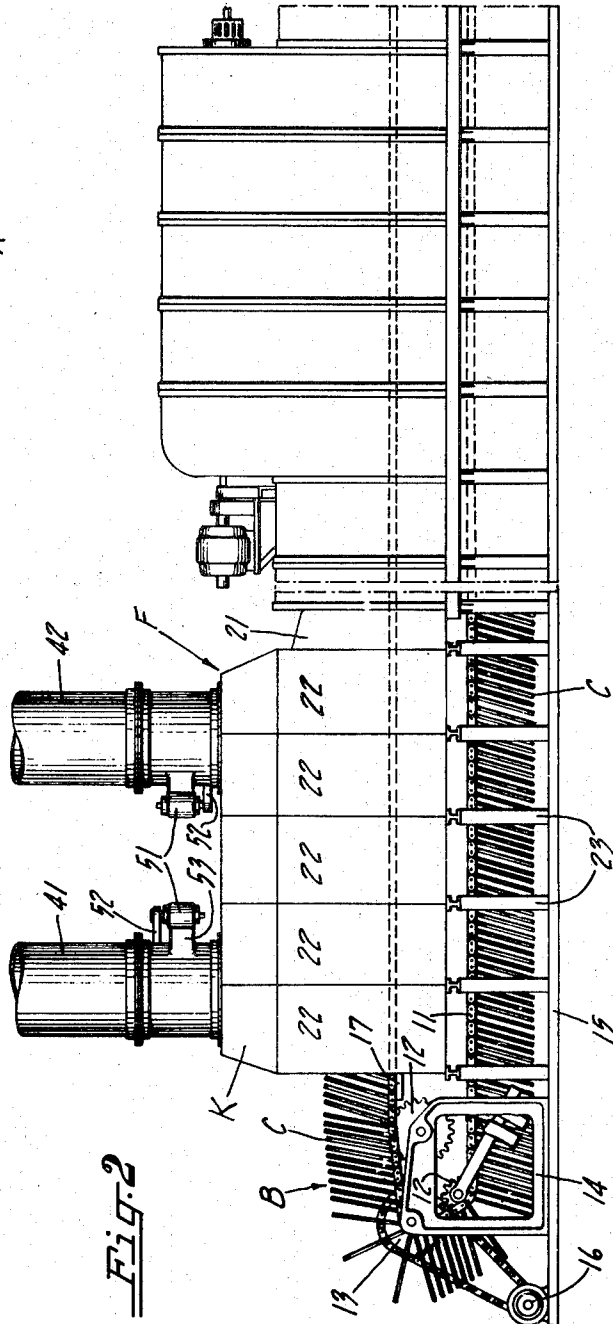


Fig. 2

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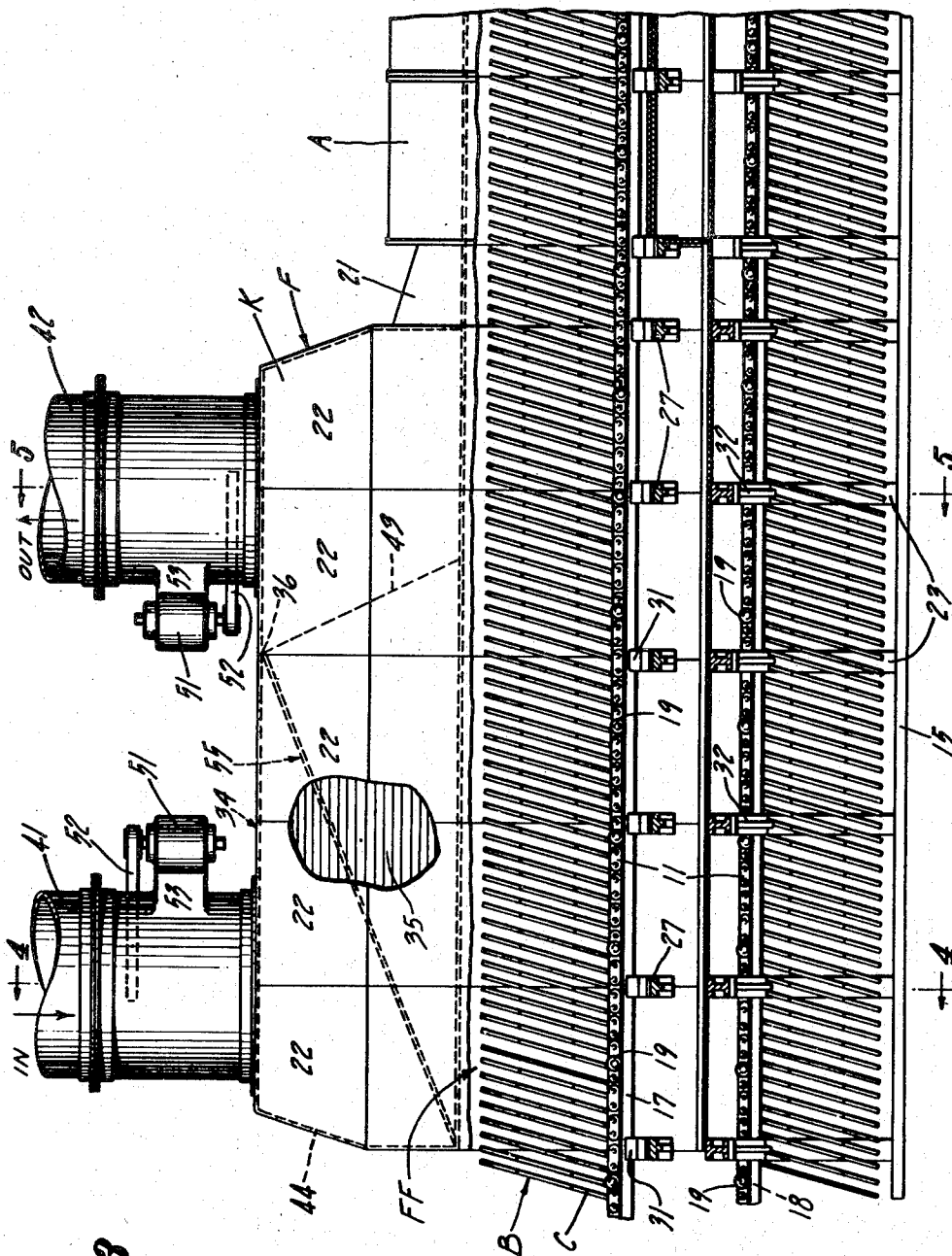


Fig. 3

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4 Sheets-Sheet 3

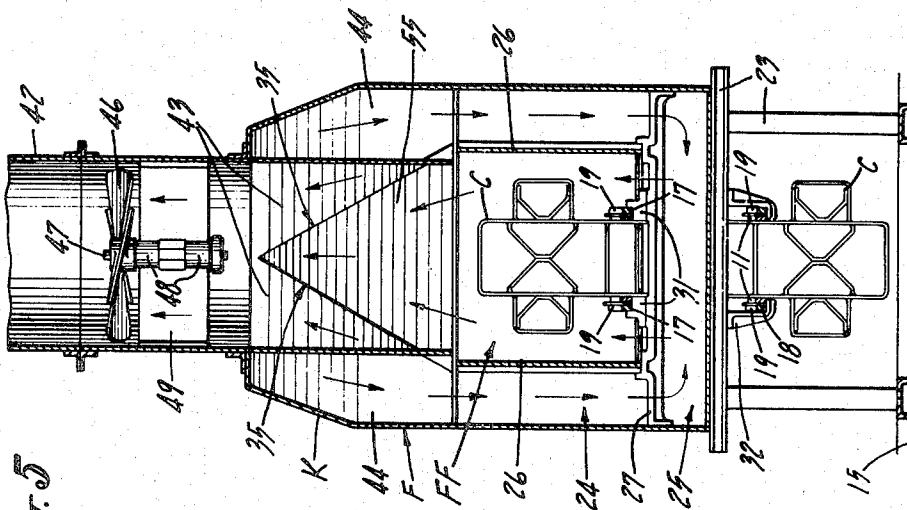


Fig. 5

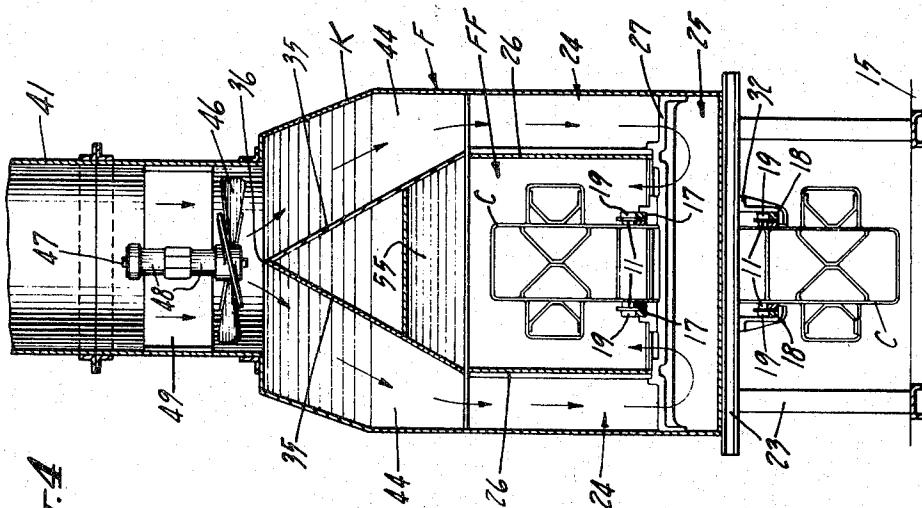


Fig. 4

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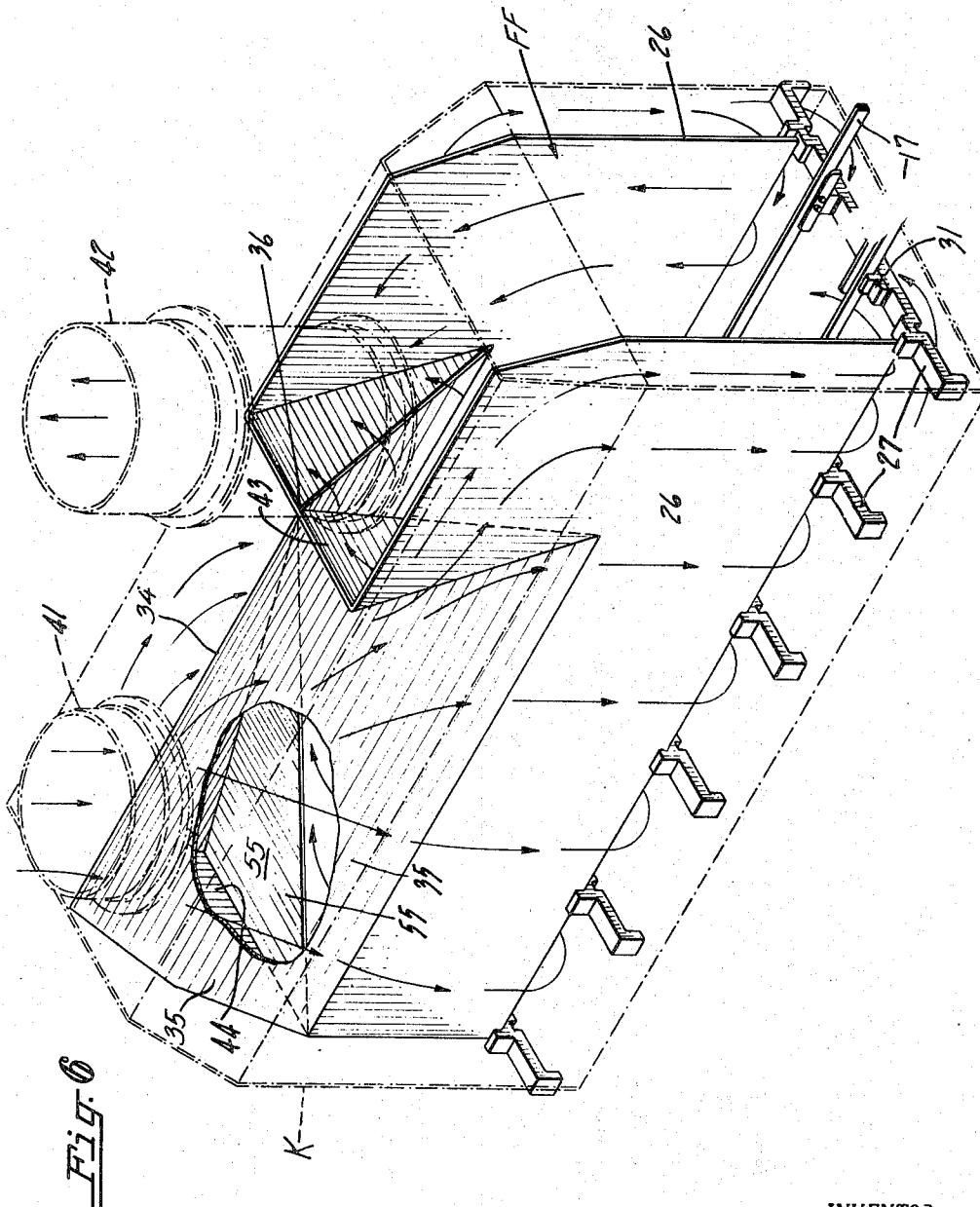
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Original Filed July 6, 1942 4 Sheets-Sheet 4



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2,440,692

COOLING CHAMBER HAVING BAFFLES FOR
DIRECTING AIR OVER DRIED MATERIAL

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Original application July 6, 1942, Serial No. 449,940, now Patent No. 2,364,080, dated December 5, 1944. Divided and this application May 24, 1944, Serial No. 537,159

4 Claims. (Cl. 34-66)

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The present invention relates to ovens for drying coated or lithographed sheets or the like and has particular reference to a cooling section of the oven in which cool air is circulated downwardly through the sides of the cooling section and thence upwardly from below and between the sheets for cooling them as they pass through the cooling section. This is a division of my original United States application Serial Number 449,940, filed July 6, 1942, now Patent No. 2,364,080, issued December 5, 1944.

An object of the invention is the provision in a drying oven of a cooling section arranged with an intake stack and an exhaust stack wherein cooled air is circulated downwardly through the sides of the cooling section along the length of the section and thence is directed upwardly from the bottom of the section to between the sheets for cooling them as they pass therethrough, the spent cooling air being discharged from the section through the exhaust stack.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan view of a drying oven embodying the instant invention, the view illustrating a cooling section connected to the discharge end of the oven, with parts broken away;

Fig. 2 is a side elevation of the apparatus shown in Fig. 1, with parts broken away;

Fig. 3 is an enlarged longitudinal view of the cooling section of the oven, with parts broken away;

Figs. 4 and 5 are transverse sectional views taken substantially along the respective lines 4-4 and 5-5 in Fig. 3; and

Fig. 6 is a schematic perspective view of the air deflecting walls located inside the cooling sections of the oven shown in detail in Figs. 4 and 5, the view also showing schematically other parts of these sections in dot and dash lines.

As a preferred embodiment of the invention the drawings illustrate an elongated drying oven A of the character disclosed in United States Patent 1,591,683, issued July 6, 1926, to C. G. Preis. The oven includes a drying chamber in which freshly coated or lithographed sheets of tin plate or the like material are received on a horizontal conveyor B from any suitable source of supply such as a coating or printing machine and are carried in an upright "on-edge" position through the oven for drying or baking. The sheets are main-

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tained in spaced relation by a plurality of wire wickets C which are secured to the conveyor at closely spaced intervals along its length.

After the baking process, the conveyor B carries the hot sheets through a cooling section F which is enclosed in a cooling casing K and where the temperature of the sheets is reduced sufficiently to permit of handling. The coating material on the sheets when they leave the oven is in a tacky condition and passage of the sheets through the cooling section sets and hardens the tacky material so the sheets can be handled. The cool sheets are discharged at the end of the conveyor to any suitable place of deposit. This discharge of the sheets may be effected by removing them manually from the conveyor or by automatic discharge mechanism connecting with the conveyor.

The conveyor B extends the full length of the oven A and the cooling section F and includes a pair of spaced and parallel endless chains 11 (Figs. 2, 3, 4 and 5) which are tied together transversely of the conveyor by the wickets C hereinbefore mentioned. Adjacent the ends of the apparatus the conveyor chains operate over idler sprockets 12 and driving sprockets 13 which are mounted on rotatable shafts journaled in bearings formed in sub-frames 14 secured to a base plate 15. The driving sprockets are slowly rotated by chain and sprocket connection with an electric motor 16.

Intermediate the driving sprockets 13 the upper and lower runs of the long chains are supported on longitudinal rails 17, 18 secured to suitable frame structure of the oven and the cooling section. Rollers 19 secured to the chains at intervals along the length operate on the rails to maintain the conveyor in a horizontal position.

The cooling section F of the oven is located at the discharge end of the apparatus and immediately adjacent the end of the oven A. A hood 21 (Figs. 1 and 2) fastened to the cooling section extends up to the oven and provides an enclosed connection to protect the hot sheets as they move from the oven into the cooling section.

The cooling section F includes five sheet metal sections 22. These sections are supported on frame legs 23 which are secured to the base plate 15. The interior of each cooling section is formed with down draft passageways 24 (Figs. 4 and 5) which are located along the outside longitudinal walls, and a bottom passageway 25 disposed adjacent the bottom of the sections. All the passageways 24 connect with each other and all the

passageways 25 are similarly connected and thus extend the full length of the cooling section.

These passageways 24, 25 are set off by inner longitudinal side walls 26 which are mounted in spaced relation to the outer walls of the sections. The side walls 26 rest on and are secured to transverse floor beams 27 and to vertical angle irons which are bolted to the floor beams. The floor beams are spaced along the bottom of the sections and provide a top outlet for the bottom passageway 25. The ends of these beams are bolted to the outer walls of the cooling sections.

The side walls 26 and the floor beams 27 set off a cooling chamber FF through which the sheets pass on the conveyor B. The conveyor chain guide rails 17 which extend into and through the cooling chamber are carried on brackets 31 which are bolted to the floor beams. The rails 18 for the lower run of the conveyor chains in the cooling section are carried in brackets 32 bolted to the cross bars of the frame legs 23.

At the top of the cooling section, the inner or chamber walls 26 merge inwardly and upwardly into an inclined longitudinal inner roof, the ridge 34 of which extends along the middle of the three rear cooling sections 22. The inclined walls of this inner roof, designated by the numeral 35, terminate in a peak 36 (Figs. 3, 4 and 6) at the top of the juncture between the third and fourth sections 22 (Fig. 3). These inclined walls 35 set off an inverted V-shaped deflector wall member. Above this inner roof, an intake stack 41 (Fig. 4) is mounted on the cooling sections and leads fresh cool air into the housing K.

Within the two inner or forward cooling sections 22 not enclosing the inner roof, the chamber said walls 26 extend substantially straight up to the top of the housing. This brings the interior of the cooling chamber FF into communication with an exhaust stack 42 (Figs. 3 and 5) which also is mounted on the top of the cooling sections, the inner roof 35 forming a barrier for air entering from the intake stack 41.

The edges at the open end of the roof walls 35 within the fourth section (Figs. 3 and 6) are connected with transverse walls 43 which also join with the outer casing wall. The ends of the cooling section F are closed by end walls 44 having rectangular openings therein to permit the passage of the conveyor B and its sheets there-through. In other words, only the cooling chamber FF and not the surrounding interior space within the housing K including the down draft passageways 24, is open at the ends.

Each of the stacks 41, 42 house blower fans 46 (Figs. 4 and 5) which are mounted on vertical shafts 47 journaled in bearings 48 formed in brackets 49 secured inside the stacks. The fans are rotated at high speed by electric motors 51 (Fig. 3) which are operatively connected by endless belts 52 to the fans. The motors are bolted to brackets 53 secured to the outside of the stacks while the belts extend through slots formed in the sides of the stacks.

The fan 46 in the intake stack 41 forces fresh cool air downwardly through the stack and against the deflector roof walls 35. This divides the air into two streams flowing into the side down draft passageways 24 and thence into the bottom passageway 25. In this bottom passageway the two currents of air meet and pass upwardly into the cooling chamber FF and between the hot sheets moving through the chamber. It is this flow of cool air that cools the sheets.

The fan 46 in the exhaust stack 42 draws the

used or heated air from the cooling chamber FF and forces it up through the stack to any suitable place of discharge. An inclined transverse flat deflector or diverting wall section or plate 55 (Figs. 3, 4, 5 and 6) is located within the inverted V-shaped deflector member formed by the walls 35 and slopes upwardly from the side walls 26 of the first section 22, said plate extending completely across the space between the inclined walls 35 and is preferably upwardly inclined longitudinally of the chamber FF to the peak 36 in the third section 22. The inclined plate 55 facilitates the described drawing up of the used air into the exhaust stack and prevents trapping of this air in the space above the plate 55 at the intake end of the cooling section. This completes the cooling action on the sheets.

After leaving the cooling section F, the cooled sheets are ready for discharge from the conveyor B. This may be done manually or automatically as hereinbefore suggested. Usually the sheets are removed manually and are arranged in stacks on hand trucks for subsequent operations.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A drying oven for coated or lithographed metal sheets, comprising in combination, an elongated casing enclosing a drying chamber, a conveyor for carrying sheets to be dried through said chamber, a cooling section disposed adjacent said chamber including side walls enclosing an inwardly spaced cooling chamber through which said conveyor passes with said sheets, an intake stack located on top of said cooling section at one end thereof for admitting cool air into the cooling chamber, an exhaust stack located on top of said cooling section at the opposite end thereof for exhausting used air therefrom, said cooling chamber being enclosed by longitudinally disposed spaced vertical side wall members and a connecting transverse wall member defining with one of the vertical side wall members and a said cooling section wall, a vertical passageway for directing incoming air downwardly adjacent the outer sides of the chamber, said downwardly directed incoming air thence passing upwardly from below the conveyor through said cooling chamber between the sheets carried on said conveyor, and a transverse deflector wall member disposed above said vertical side wall members in said cooling chamber for thereafter diverting and discharging the upwardly moving air into the exhaust stack after cooling the sheets as the same pass through said cooling chamber.

2. A drying oven for coated or lithographed metal sheets, comprising in combination, an elongated casing enclosing a drying chamber, a conveyor for carrying sheets to be dried through said chamber, a cooling section including an outer casing disposed adjacent said chamber for enclosing an inwardly spaced cooling chamber through which said conveyor passes with its supported sheets for cooling said sheets, an intake stack located on top of said cooling section at one end thereof for admitting cool air into said cooling chamber, an exhaust stack located on

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top of said cooling section at the opposite end thereof for exhausting used cooling air from the cooling chamber, rotatable fans respectively disposed in said stacks for directing air in opposite directions therethrough, vertical side and end wall members located within said cooling section, said side wall members being arranged in spaced relation to said cooling section casing to set off down-draft passages between the inner side of said cooling section casing and the outer side of said cooling chamber wall members, an inverted V-shaped deflector wall member located within said cooling casing connecting with the upper edges of said vertical wall members, said deflector wall member directing incoming air downwardly through said passages and thence upwardly from below the conveyor through said cooling chamber between the sheets carried on said conveyor, and a transverse wall in said cooling chamber for thereafter diverting and discharging the air into said exhaust stack after cooling the sheets as the same pass through said cooling chamber.

3. In a drying oven for coated lithographed metal sheets, the combination of a cooling section having an outer casing including side walls, vertical side and end wall members spaced inwardly from said casing enclosing a cooling chamber open at its opposite ends and at its bottom and extending longitudinally of said cooling section, said wall members setting off with said cooling section walls down-draft passages communicating with the open bottom of said chamber, a conveyor operating through said chamber for carrying sheets to be cooled there-through, an air inlet in said casing communicating with said down-draft passageways, an air outlet also in said casing communicating with the top of said chamber, an inverted V-shaped deflector wall member located within said casing between said down-draft passageways and said air inlet for directing air from the inlet downwardly through said passageways adjacent the outer walls of the cooling chamber into the open bottom of said chamber, means for circulating the air from the bottom of the chamber upwardly through the chamber between the sheets on the conveyor, and a transverse wall member

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in said cooling chamber connected at its opposite sides to the opposed inner sides of said deflector wall member for diverting and exhausting the spent cooling air from the cooling chamber into said air outlet.

4. In a drying oven for coated lithographed metal sheets, the combination of a cooling section having an outer casing including side walls, side and end wall members spaced inwardly from said casing for enclosing a cooling chamber within said casing, said chamber being open at its opposite ends and at its bottom and extending the full length of said cooling section, said casing and chamber wall members setting off down-draft passages arranged exteriorly of said chamber and communicating with the open bottom thereof, a conveyor operating through said chamber for carrying sheets to be cooled there-through, an air inlet in said casing communicating with said down-draft passageways, an air outlet also in said casing communicating with the top of said chamber, an inverted V-shaped deflector member having inclined side walls located within said casing between said down-draft passageways and said air inlet for directing air from the inlet through said passageways downwardly into the open bottom of said chamber, means for circulating the air from the bottom of the chamber upwardly through the chamber between the sheets on the conveyor into said air outlet, and a transverse diverting wall member disposed within and extending between the side walls of said inverted V-shaped deflector wall member, said transverse wall member also being inclined upwardly from the air inlet end of said cooling section toward said air outlet for directing therebeneath the spent cooling air from said chamber to said air outlet.

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