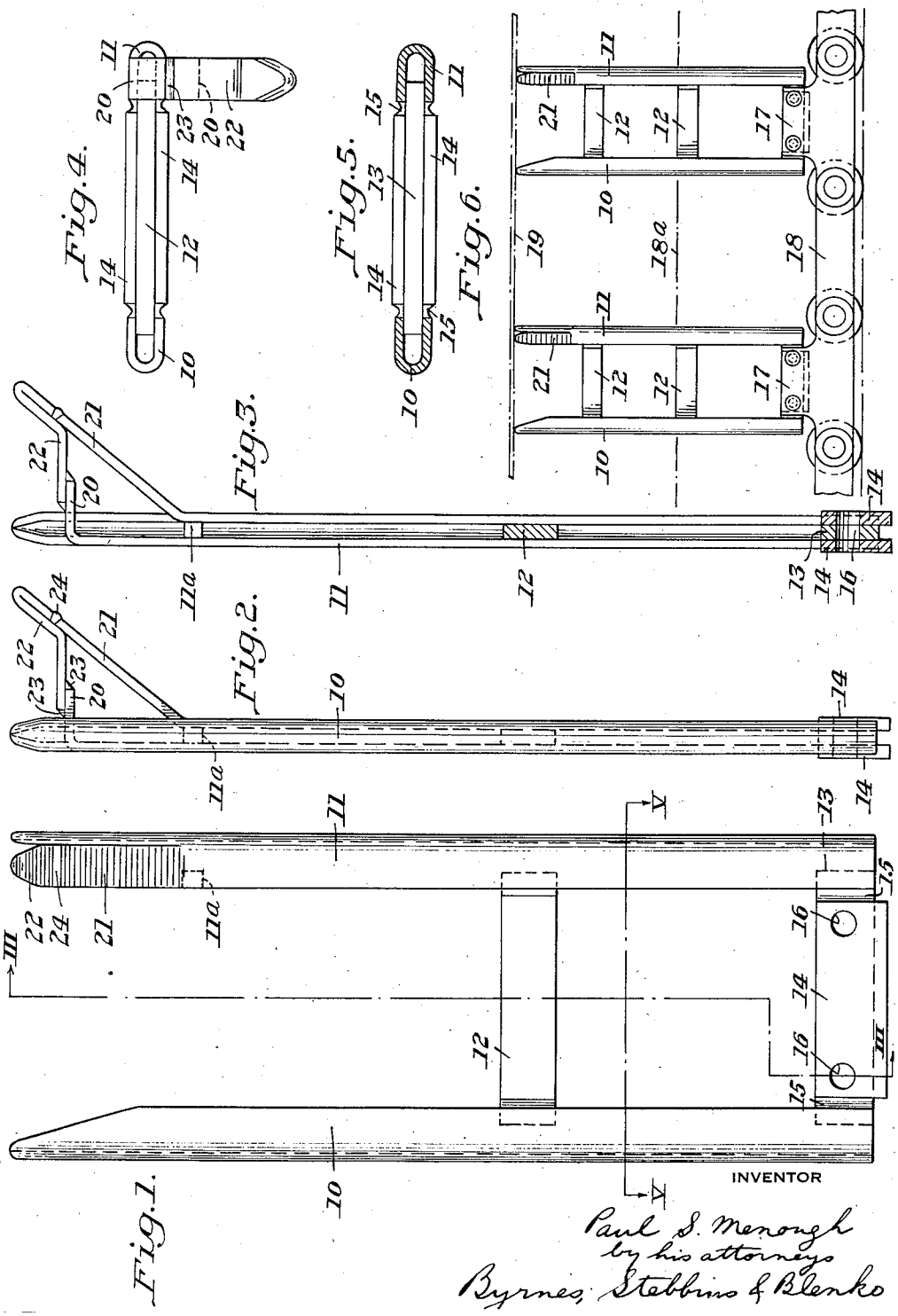
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FURNACE CONVEYER

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FURNACE CONVEYER

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10 Claims. (Cl. 263—8)

My invention relates to a conveyer for continuous furnaces and particularly furnaces adapted for heating sheets.

Continuous furnaces for heating sheets, as now constructed, are provided with conveyers comprising a plurality of chains trained around sprockets at opposite ends of the furnace, the upper runs of the chains traversing slots in the furnace hearth and the lower runs extending under the hearth. Carrier blades are attached to the chains at intervals and are adapted to project upwardly through the slot in the hearth to support the sheets above the hearth and carry them through the furnace for progressive heating. The supporting blades generally comprise a web adapted to be secured to the conveyer chain at its lower end and having brackets extending laterally from its upper end to engage the sheets. So far as I am aware, these blades have always been cast in one piece, of heat resistant alloy, since they are subjected to the heat of the interior of the furnace and, furthermore, are alternately heated and cooled as they pass through the furnace and then return below it.

The use of cast furnace conveyer blades has revealed numerous objectionable features. In the first place, the cast blade necessarily has a heavy section at the junction between the side brackets and the vertical web. This causes the development of so-called "shrinks". As is well known, these result from the fact that the heavier sections cool last and due to the shrinkage of the other portions of the casting, molten metal is drawn away from the heavier sections during cooling, producing cracks or depressions. These shrinks are particularly troublesome in alloy steels and are always found under the junction of the side brackets and the web of a cast alloy furnace blade.

Another objection to the cast blade is that segregations of lower alloys, which solidify after the unsegregated alloy, migrate to the heavier sections of the casting which solidify last. Such segregations are particularly objectionable in castings which are subjected to high temperatures for any substantial period of time because the segregations have a tendency to oxidize and grow. In cast furnace conveyer blades, this tendency is evidenced by the "rotting" of the joint between the bracket and the web. This action may even continue until the bracket falls off the web. It is accelerated, furthermore, because of the continued repetition of the heating and cooling cycle. The joint between the blade and brackets is, as before stated, of heavier section than the remainder of the blade and, therefore, heats and cools more slowly than the other portions. This produces differences of temperature between various parts of the blade, which hasten early failure.

A further objection to the cast blades is the amount of heat they remove from the furnace. Any casting must have a certain minimum thickness, which in the case of conveyer blades is about 3/8". The amount of heat necessary to raise the blades from substantially room temperature to that of the interior of the furnace is thus considerable, taking into consideration that each conveyer is provided with a relatively large number of blades. The sheet furnaces are over-fired, that is, the combustion gases are delivered downwardly from the upper portions thereof and the lower surfaces of the sheets on the conveyer are heated by convection currents of the gases. Anything that tends to prevent the flow of such gases around the edges of the sheet and across the lower surface thereof actually hinders the heating. The webs of the cast blades obviously have this effect since they constitute spaced baffles preventing the flow of hot gases around and under the sheets. The brackets, furthermore, prevent intimate contact of the gases with the sheet over a substantial area. Cast furnace conveyer fingers, therefore, prevent the delivery of heat to certain portions of the sheets and on top of that, actually remove heat from exactly the same portions of the sheets by conduction so that the sheets are not uniformly heated when discharged from the furnace. This introduces complications in the rolling.

The furnace conveyer blades, therefore, are very difficult to repair in case they become bent. The high carbon content necessary to render the alloy fluid when casting, gives rise to a condition known as "carbide embrittlement". Under the influence of continued high temperature, the carbide in the alloy comes out of solution and segregates at the grain boundaries, causing brittleness. Almost any effort to straighten a bent blade, therefore, will result in breakage.

My invention overcomes the above objections to cast conveyer blades and is characterized by further advantages which will be pointed out later. In accordance with the invention, I provide a furnace conveyer support similar to the cast blade but composed of wrought metal bars of heat resistant composition. The supports are attached to the conveyer chains in the same man-

ner as the cast blades but are not characterized by any of the defects of the latter which have been recited above.

For a complete understanding of the invention, reference is made to the accompanying drawing illustrating a present preferred embodiment, although it will be understood that other forms of the invention may be embodied within the scope of my broader claims. In the drawing:

Figure 1 is a side elevation of a support according to my invention, ready to be attached to a conveyer chain;

Figure 2 is an end elevation thereof;

Figure 3 is a sectional view along the line III—III of Figure 1;

Figure 4 is a plan view;

Figure 5 is a sectional view along the line V—V of Figure 1; and

Figure 6 is a partial side elevation of two of the supports mounted on a conveyer chain.

Referring now in detail to the drawing, the support of my invention comprises a pair of vertical members 10 and 11. These members preferably are of channel section and are composed of heat resistant alloy. The members 10 and 11 may be formed from flat bars by bending the edges thereof to channel shape. They may also be fabricated from a pair of flat pieces with spacers between. The members 10 and 11 are joined by a central cross member 12 welded thereto. Two such members may be incorporated in each support as shown in Figure 6, in cases where additional bracing is desired. A bottom cross member 13 and side plates 14 are welded to the members 10 and 11, as shown at 15 in Figure 5. The bottom cross member has holes 16 whereby the complete member may be bolted to a clevis 17 forming part of a furnace conveyer chain 18 shown in Figure 6. The hearth line is indicated by the line 18*a* in this figure.

The upper end of the member 10 is tapered and rounded to reduce the area of contact with the sheets which are placed thereon as indicated at 19 in Figure 6. The flanges of the channel forming the member 11 are slit from the bottom or web of the channel, downwardly from the upper end thereof, as shown in Figures 2 and 3. A spacer block 11*a* is welded between the flanges. One of the flanges 20 is bent over substantially at right angles to the member 11, while the other flange 21 is bent outwardly at an angle from the main body of the member. An auxiliary member 22 is welded as shown at 23 and 24 to the ends of the bent-out flanges 20 and 21. The member 22 is formed from flat bar stock of composition similar to that of the vertical members 10 and 11. Since the member 22 overlies both portions of the member 11 on which it is carried, the latter affords positive, structural support for the latter so that the weld is not relied on solely to sustain the member 22. Since only the portion of the support above the hearth line is subjected to the heat of the furnace interior, I may make only that portion of wrought metal, and utilize a casting for the lower portion. The upper wrought metal portion, furthermore, may be made removable for renewal or replacement.

As shown in Figure 4, a support in accordance with my invention engages the sheets at spaced points over a considerable area, the length of which measured by the distance between the members 10 and 11 and the width by the distance between the upper end of the member 11 and the bent-over outwardly projecting end of the member 22. The actual area of contact between the support and sheets, however, is very small, and free access to the bottom surfaces of the sheets is provided for the hot combustion gases. This insures prompt and thorough heating of the sheets. This is particularly important when sheets are being handled in packs, since the packs are heated to uniform temperature throughout. This facilitates the rolling of the packs and improves the quality of the resulting product.

Since the support of my invention is composed of wrought metal members, it is obviously free from the defects of the cast supporting blades previously used, which were peculiar to the method of manufacture thereof. No trouble is experienced with shrinks or segregations and, since the section of my support is substantially the same throughout its entirety, the support heats and cools to the same extent in all parts. The mass of my support, furthermore, is much less than that of the cast blade so that the amount of heat removed from the furnace by the conveyer supports is minimized. Since the supports have substantially point contact only with the sheets, very little heat is abstracted thereby by the latter and, as before stated, little or no obstruction is offered to the free flow of heating gases over the lower surfaces of the sheets. Since the supports of my invention are formed of rolled bars bent or shaped to a structure having an effective thickness much greater than the actual thickness of the material, they do not require the high carbon content of cast blades which gives fluidity to the alloy when heated to the melting point. The trouble experienced with cast blades from carbide embrittlement is not, therefore, to be expected in the supports of my invention. Since the support of my invention is composed entirely of wrought metal, it may be repaired quite readily, even if it has been severely bent or otherwise deformed.

Although I have described my invention by referring specifically to only one form thereof, it will be apparent that many changes in the exact construction described may be made without departing from the spirit of the invention or the scope of the appended claims on which I rely to define the bounds of the monopoly sought.

I claim:

1. A support adapted to carry flat sheet-like material through a furnace, comprising a plurality of upwardly extending wrought metal members U-shape in cross-section adapted to be attached adjacent their lower ends to a conveyer chain.

2. A conveyer for sheet furnaces comprising a chain, a plurality of wrought metal members of a heat resisting alloy bent to U-shape in cross-section attached to said chain and extending substantially perpendicular thereto.

3. A supporting structure for sheet furnace conveyers including a pair of wrought metal members each return bent in cross-section and disposed substantially parallel, and a cross member extending between and connecting said first-mentioned members.

4. A supporting structure for a sheet furnace conveyer comprising a pair of wrought metal members of a heat resisting alloy substantially parallel, and each U-shape in cross-section adapted to be attached to a conveyor chain, at

least one of said members having an auxiliary supporting means extending laterally thereof.

5. A supporting structure for a furnace conveyer comprising a pair of wrought channel-shaped members of heat resisting material extending substantially parallel, and a cross member having its ends extending into said channels and secured therein.

6. The supporting structure as defined by claim 5 characterized by the flanges of at least one of said channel-shaped members being slit back in the upper end thereof and bent outwardly, and an auxiliary supporting member secured thereto.

7. As a new article of manufacture, a supporting structure for a sheet furnace conveyer consisting of wrought metal members formed from flat metal stock to channel shape, and comprising upright and connecting members, each of said members being of heat resisting alloy.

8. The supporting structure as defined by claim 5 characterized by the flanges of at least one of said channel-shaped members being slit back in the upper end thereof and bent outwardly, and an auxiliary supporting member secured thereto, said auxiliary member overlying the bent ends of the flanges so as to transmit directly to said flanges the load on the auxiliary member.

9. A conveyer support comprising a pair of channel members disposed oppositely and substantially vertically, a bar extending into each of said channel members adjacent the lower ends thereof and secured thereto, said bar being adapted to be bolted to a conveyer chain, said bar and channel members being formed from a flat heat resisting alloy.

10. A support as defined in claim 9 characterized by a second bar extending into each of said channel members intermediate their ends and secured thereto.

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