June 17, 1958 A. H. BAILEY ET AL 2,838,880

FLOW SPOUT CONSTRUCTION

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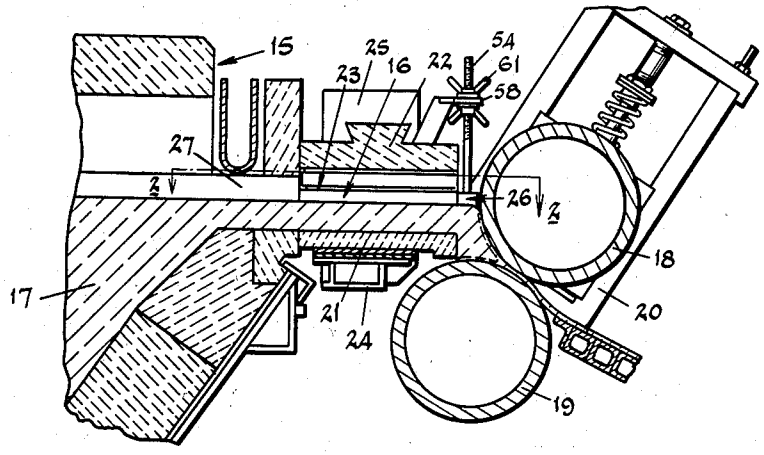


Fig. 1

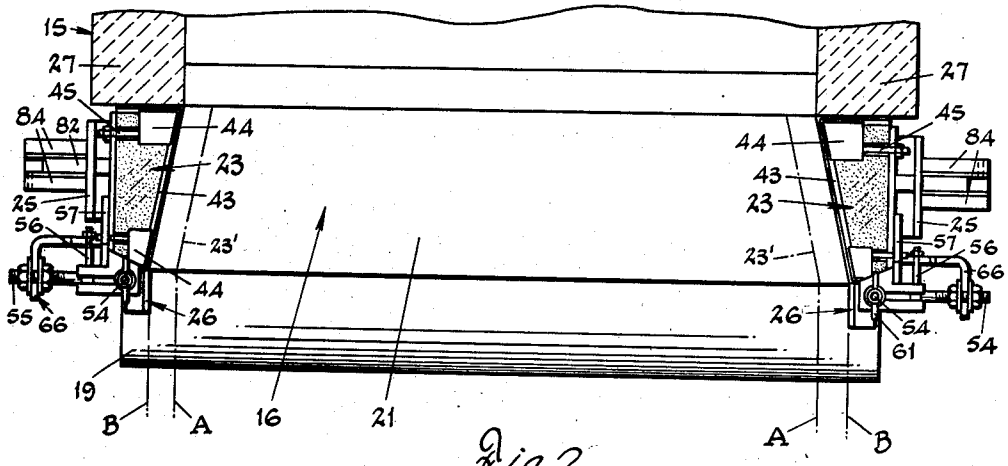


Fig. 2

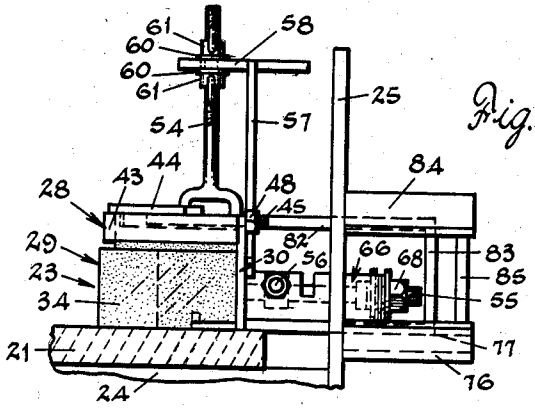


Fig. 3

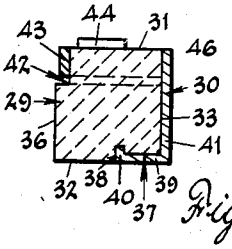


Fig. 4

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2 Sheets-Sheet 2

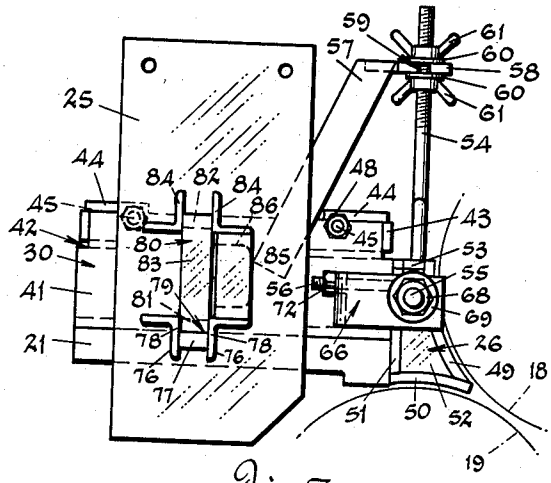


Fig. 7

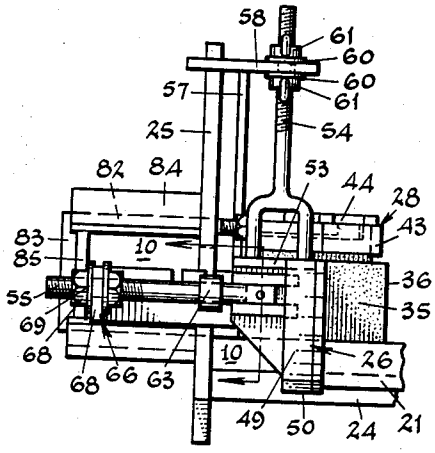


Fig. 8

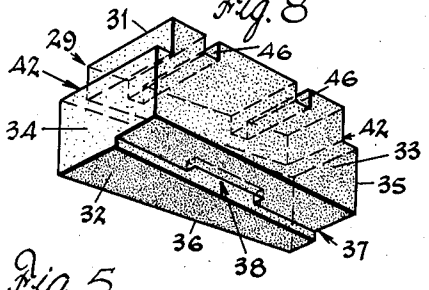


Fig. 5

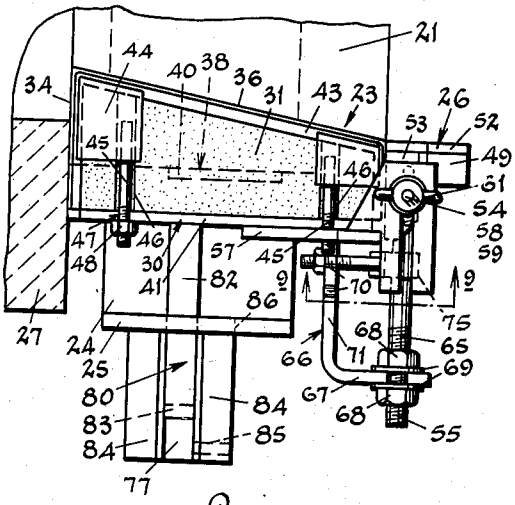


Fig. 6

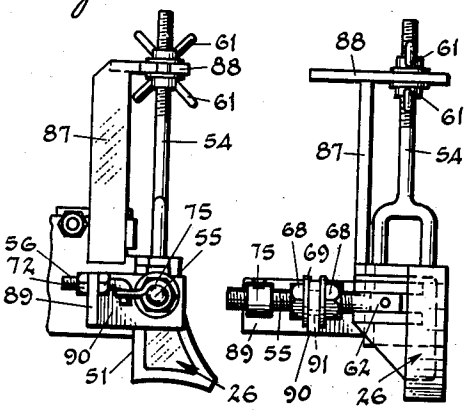


Fig. 11

Fig. 12

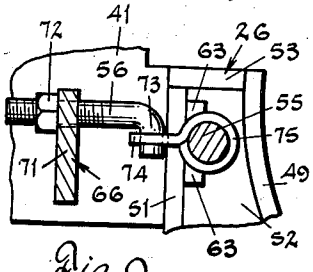


Fig. 9

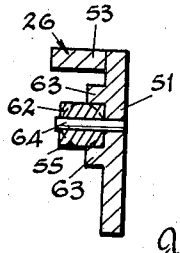


Fig. 10

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FLOW SPOUT CONSTRUCTION

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Application January 2, 1957, Serial No. 632,158

7 Claims. (Cl. 49—55)

The present invention relates broadly to continuous melting furnaces, and more particularly, is concerned with an improved outlet or flow spout for such furnaces.

According to one known method of producing flat glass, glass melting tank furnaces are equipped with so-called "flow-spouts" through which the molten glass is discharged as it passes between conventional forming rolls. The glass, while moving through the flow-spout area, is confined by means of side wall blocks which are adapted to define the width of the continuous ribbon as it emerges from the rolls. These blocks are commonly referred to as "shoulder" and "edger" blocks; the shoulder blocks being disposed between the actual end wall blocks of the furnace while the edger blocks are arranged between shoulder blocks and the forming rolls. Preferably the surfaces of these edger blocks adjacent the rolls are curved to the circumference of the rolls to limit outward and lateral escape of the molten glass at the moment it enters the pass between said rolls.

It is of course obvious that in establishing a distance between the opposed inner faces of the shoulder blocks it is possible to quite accurately control the width of the glass ribbon; also, that by laterally moving the blocks the desired width can be varied. However, unless means is provided for easily moving the shoulder blocks and in addition correctly positioning the associated edger blocks, the adjustment to produce various widths of glass becomes time-consuming and laborious. As disclosed herein, an improved support structure is provided for the shoulder blocks to facilitate the easy and accurate movement thereof. Also, and quite importantly, the associated edger blocks are so mounted that upon shifting the shoulder blocks the established relation between these and the edger blocks will be maintained. In addition the mountings for the edger blocks include means for adjustably moving the same in relation to both the forming rolls and the associated edger blocks respectively.

It is therefore the principal aim of this invention to provide an improved structure for controlling the width of molten glass as it is formed in a continuous ribbon.

An object of the invention is to provide an improved shoulder and edger block mounting structure whereby both blocks can be shifted substantially as an integral unit to vary the width of a glass ribbon prior to being formed.

Another object of the invention is to provide an improved shoulder and edger block mounting structure wherein the edger block is supported for movement with the associated shoulder block and including means for independently adjusting the position of the edger block relative to the shoulder block.

A further object of the invention is to provide mounting means for positioning an edger block in a plurality of different planes with respect to an associated shoulder block while permitting the two blocks to be adjusted as a unit in a direction transverse to the glass ribbon.

Other objects and advantages of the invention will become more apparent during the course of the following

description, when taken in connection with the accompanying drawings.

In the drawings, wherein like numerals are employed to designate like parts throughout the same:

Fig. 1 is a fragmentary longitudinal, vertical section of a glass tank furnace;

Fig. 2 is a horizontal section of the furnace as taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary front elevational view of an improved edger and shoulder block arrangement constructed in accordance with this invention;

Fig. 4 is a vertical cross-sectional view through the shoulder block and its support frame;

Fig. 5 is a perspective view of a shoulder block when viewed from the bottom surface;

Fig. 6 is a plan view of the shoulder and edger block structure;

Fig. 7 is a side elevational view of shoulder and edger block structure as employed on one side of a furnace;

Fig. 8 is a front elevational view of the shoulder and edger block structure;

Fig. 9 is a cross-sectional detail view as taken on line 9—9 of Fig. 6;

Fig. 10 is a cross-sectional detail view as taken on line 10—10 of Fig. 8;

Fig. 11 is a fragmentary side elevational view of a modified form of mounting for the edger block; and

Fig. 12 is a front elevational of the modified mounting.

With reference now to the drawings and particularly Figs. 1 and 2, there is shown the forehearth portion **15** of a glass tank furnace which is provided at its outlet with a spout **16** through which molten glass **17** flows between counter-rotating forming rolls **18** and **19** driven in a well-known manner and conventionally journaled at their opposite ends in machine assemblies indicated at **20**.

The confines of the spout **16** are defined by floor slabs **21**, a cover **22** and oppositely disposed side walls formed by shoulder blocks **23**; the spout thus defined is supported by means of a frame structure **24** carried at its opposite ends by spout frame end plates **25**. The shoulder blocks **23** determine the actual width of the molten glass as it flows through the spout and approaches rolls **18** and **19**. Between the shoulder blocks **23** and the forming rolls **18** and **19** are edger plates or blocks **26** closely abutting the blocks **23** and, is shown in Fig. 7, contoured to agree with the peripheral surfaces of the rolls. The blocks **26** are provided for the purpose of confining the margins of the molten glass as it passes the blocks **23** and prior to moving between the forming rolls.

Now, it is known that the shoulder blocks, by an inwardly or outward transverse movement, can be positioned to gauge the width of the forming glass ribbon and, where a change in such width has been found necessary, these blocks have been moved accordingly to define the desired width. However, presently known structures have not lent themselves to immediate adjustment when a similar re-positioning of the edger blocks is made necessary to maintain such desired width at the forming rolls **18** and **19**. Also, due to the particular shape necessitated by the location of these edger blocks, and the high heat they must withstand, it has been found advantageous to construct them of a metal, such as stainless steel, thereby increasing the active life of the blocks and allowing them to be mounted for movement with the shoulder blocks as well as to various positions relative to the shoulder blocks.

In accordance with the present invention, and as shown generally in Fig. 3, the shoulder blocks are carried in a rigid frame **28** which is adapted to also support novel mounting and adjusting means for the edger blocks which will later be described in detail. As a result of the particular construction of the mounting and adjusting means, the edger blocks can be initially positioned adjacent the

adjoining surface of the shoulder blocks and also moved vertically, horizontally and radially with respect to the shoulder blocks. Also due to the novel mounting means, the position of the edger blocks in relation to the forming rolls may be adjusted and positioned at the same time the edger blocks and shoulder blocks are moved transversely as a unit.

The shoulder blocks 23 comprise a refractory basic member 29 which is fixedly secured within a support member 20 of frame 28. The base member 29, which may be of a suitable refractory material, such as crystallite, regular flux-type clay or like materials, is substantially rectangular in a vertical transverse plane; the top and bottom surfaces 31 and 32, respectively, being normal to the outer side wall surface 33 while the opposite end walls 34 and 35 are likewise normal to side wall 33. The remaining or inner side wall 36, while normal to the top wall 31, is angularly disposed with respect to the opposite side wall 33 so that when the shoulder blocks are bodily arranged in the furnace, as shown in Fig. 2, the walls 36 thereof function to gradually increase the width of the glass channel therebetween.

In order to easily mount the shoulder blocks 23, the base members 29 thereof are formed so as to be carried and positioned by the support members 30. For this purpose, each base member, in its lower surface 32, is provided with stepped or rabbeted portion 37 in which is formed a substantially rectangular recess 38. The base 29 is placed on a ledge plate 39 of support 30 so that the recessed area 38 will receive an upwardly directed tongue 40 of plate 29. This will accurately locate the wall 33 of the base member 29 with reference to the vertically disposed wall plate 41 of the support 30.

As shown in Fig. 3 the top surface 31 of the members 29 has a rabbeted portion 42 in the upper corner of walls 34, 35 and 36 in which is received a retainer strap 43 of support member 30. This strap is bent in conformity with the angular relation of these walls and is reenforced by cap plates 44 in the corner areas defined by the juncture of walls 34—36 and 35—36. When the shoulder blocks 23 are installed in their functional position, as in Fig. 2, the walls 33 and plates 41 are outwardly directed.

As illustrated in Fig. 6, rigidly clamp the upper portions of base member 29 by means of the strap 43 and against the plate 41, each of the cap plates 44 is equipped on the lower surface with a rigidly affixed threaded rod 45 that is positioned in grooves 46 in the upper surface 31 of the base members 29 so that the ends thereof will pass through notches 47 in the upper edge of plate 41. By means of nuts 48, the rods 45 will cooperate with the strap 43 to draw the base member firmly against plate 41. Since each base 29 is seated on an associated ledge plate 39 and positioned by the interfitting relation of recess 38 and tongue 40, the base will be more or less rigidly secured by the strap 43 against teetering or other displacements.

The edger blocks 26, which are arranged in abutting relation to the walls 35 of their respective shoulder blocks 23 as herein shown in Fig. 7, are formed of a heat-resistant and non-corrosive metal such as stainless steel. In elevation, each block 26 is provided with a forward surface 49 curved to substantially agree with the roll 18, a bottom surface 50, similarly curved to agree with roll 19, and a rearwardly disposed flat surface 51 to be closely associated with the adjoining shoulder block wall 35. The various surfaces of the edger block may, more particularly, be formed as a suitably cast unit or by suitably shaped plates that are welded or otherwise integrally assembled with a vertically disposed end wall plate 52 and top plate 53.

The edger blocks are supported for vertical adjustment by means of a vertically disposed threaded rod 54; for substantially horizontal adjustment by means of horizontally disposed threaded rod 55, and can further be angularly or radially shifted in a horizontal plane relative to the shoulder blocks by means of a threaded rod 56. Thus, each of the edger blocks 26 may be fixedly supported in any one of a plurality of positions with respect to their associated shoulder blocks 23. As previously mentioned by means of threaded rod 54, the edger block can be raised or lowered, and for this purpose the rod is supported by an upwardly directed bracket 57 fixedly secured to the plate 41 of the shoulder block frame 30. This bracket has a horizontally disposed top plate 58 which is equipped with a slot 59 for receiving rod 54. The rod 54 is thus fixedly secured to the top plate 53 of the edger block and beneath and above plate 58 carries washers 60 and threaded clamping members 61 by which the rod and associated block can be vertically adjusted.

On the other hand, when it is desired to shift the edger block 26 laterally with reference to its associated shoulder block 23, means is herein afforded by the threaded rod 55. As shown in Fig. 10, the end 62 of rod 55 is somewhat loosely received between lugs 63 affixed to the inner surface of rear wall 51 of the edger block in which position it is supported on pin 64. The opposite or outer threaded end 65 of rod 55 is slidably carried in an L-shaped bracket 66 secured to wall 41. On opposite sides of the notched leg 67 of bracket 66, the rod is equipped with nuts 68 and washers 69 which operate to adjustably lock said rod. Thus, when it is desirable to shift the edger block 26 laterally, and this may be necessary during assembly to align the wall 52 of said block with the adjacent corner of the shoulder block, loosening of nuts 68 will permit the rod to suitably maneuver the block into the desired position. Simultaneously, the vertically disposed rod 54 will traverse the slot 59 of bracket 57. Also, by the combined use of rods 54 and 55, the vertical disposition of the wall 52 of the edger block can be obtained since the end of rod 54 passing through the slot 59 will function as a fulcrum point.

As best shown in Fig. 6, to support and maintain the wall 51 of the edger block in closely abutting relation to the wall 35 of the shoulder block and in substantially surface parallelism therewith, the threaded rod 56 is associated with rod 55 in such a manner as to employ the rod 55 as a lever. For this purpose, the rod 56 is slidably carried in one of the notches 70 in the leg 71 of bracket 66. Outwardly of the leg 71, rod 56 carried a nut 72. At its opposite end, as is shown in Fig. 9, the rod is bent to form a hook 73 which is positioned in an outwardly directed ear 74 of clamping ring 75. This ring is carried by the rod 55 and is located thereon so that when the nut 72 is drawn up on the rod 56, the nut will operate to pull on the rod 55. Since the end 65 of the rod 55 is substantially stationary in the bracket 66, the opposite end 62 will be forced against wall 51 of the edger block to urge the same against the wall 35 of the associated shoulder block.

It thus becomes apparent that although independently and adjustably movable with respect to the associated shoulder blocks 23, the edger blocks are carried thereby when the shoulder blocks are shifted laterally to control the width of the forming glass ribbon. As shown in full line in Fig. 2, the oppositely disposed shoulder blocks, at the corners formed by their end walls 35 and facing walls 36, are substantially aligned with the side walls 27 of the furnace 15. In the event that there is a demand for a narrower width of glass ribbon, as it is formed, the shoulder blocks may be moved inwardly to positions, shown arbitrarily in phantom line A. This will of course reduce the width of the channel between the shoulder blocks and the width of the ribbon will consequently be narrowed from the lines indicated at B to the lines indicated at A. Also, as previously set forth, shifting of

the shoulder blocks provides an equal shifting inwardly of the edger blocks.

In order to support the shoulder blocks for lateral movement, the spout end plates **25** shown in Fig. 3 are equipped with angular supports **76**, located on their outwardly directed surfaces and a guide track is provided to directively cause the shoulder blocks **23** to move in planes parallel to the adjacent face of the furnace wall blocks **27**. For this purpose, the angles **76** have a horizontally disposed plate **77** integrally located therebetween. The plate **77**, with the vertically disposed legs **78** of the angles **76** (Fig. 7), is adapted to serve as a slideway **79** for bars **80** that are fixedly attached at their inner ends to the plate **41** of frame **30**. More particularly each bar **80** includes a horizontally disposed runner or base **81**, an upper runner **82** and a vertically disposed strut **83** arranged at and between the outer ends of said runners. The runner **81** is thus adapted to be slidably located in the track or slideway **79** while the upper runner **82** is similarly disposed between angles **84** which are affixed to the plate **25** and arranged in parallel with angles **76** (Figs. 5 and 6). Also a vertically disposed plate **85** is fixedly secured to adjoining angles **76** and **84**.

Now, when it is desired to move the shoulder and edge block structures inwardly from the positions shown in Figs. 2 and 8, in relation to the end frame plate **25**, to positions as shown in Figs. 3 and 6, a conventional type of hydraulic jack is placed between the wall plate **41** of frame **30** and the plate **85**. To accommodate such a tool, the plates **25** may be suitably notched as at **86** in Fig. 7. Accordingly, the thrust of the jack against plate **85** will cause the respective shoulder block to be moved inwardly to a position generally indicated by line **23'** in Fig. 2. However, when the combined block structure is to be shifted outwardly the jack is positioned so as to engage the strut **83** of bar **80**. Bracing the jack against the outer surface of the immediate frame plate **25** will enable the thrust thereof to be exerted against said strut and consequently the bar **80** will slide with track **79** and thus move the block to a more outwardly disposed relation.

According to the modified form of construction, illustrated in Figs. 11 and 12, the supporting structures for the adjusting rods **54**, **55** and **56** have been altered to enable the use of the combined shoulder and edger blocks under conditions which require a more compactly arranged relationship. Accordingly, a bracket **87** is provided for the rod **54** which bracket is disposed in a substantially parallel relation to said rod. The bracket at its upper end carried a slotted top plate **88** similar to the slotted plate **58** previously described. Likewise, a shorter bracket **89** is employed to support rods **55** and **56**. The bracket **89** has a notched leg portion **90** extending therefrom at substantially a right angle for receiving the rod **55** which passes through the notch **91** and is secured to the leg portion by nuts **68** and washers **69** arranged on the opposite surfaces of the leg.

In this modified form, however, the threaded rod **56** is located on bracket **89** outwardly of the leg **90**. This positions the clamping ring **75** in the vicinity of the outer end of rod **55** so that by means of the nuts **72** on rod **56** the rod may be adjusted with reference to the bracket **87**. Accordingly, as the nuts are moved outwardly along the threaded rod, the hooked end **73** thereof will impart a thrust on the outer end of rod **55** to cause the inner end **62** thereof to bear against the wall **51** of the edger block.

It will thus be seen by employing the improved flow spout construction of this invention that adjustment in the width of formed glass ribbon can be more rapidly carried out by moving the shoulder blocks with the assurance that the cooperating edger blocks will be maintained in their established positions without time-consuming readjustment. Also, since suitable adjusting means are herein provided, initial and minor adjustment of the edger blocks can be effected to obtain their accurate position both with respect to the shoulder-blocks **23** as well as the forming rolls **18** and **19**.

It is to be understood that the forms of the invention herewith shown and described are to be taken as illustrative embodiments only of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

We claim:

1. In a melting furnace for containing a body of molten material and provided with an opening through which the molten material flows in a continuous sheet form, a shoulder block provided at each side of the opening, an edger block provided at each side of the opening beyond the shoulder block along the path of movement of the sheet, support means engageable with the shoulder block for supporting said shoulder block for movement transverse to the path of movement of the glass sheet for controlling the width of said sheet, and mounting means carried by the support means and engaging the edger block for selectively positioning said edger block in any one of a plurality of planes.

2. In a melting furnace as defined in claim 1, wherein the mounting means includes a first adjusting means for positioning the edger block vertically with respect to the shoulder block and a second adjusting means for positioning said edger block with respect to said shoulder block in a direction transverse to the direction of movement of the sheet.

3. In a melting furnace as defined in claim 1, wherein the support means includes a guide track, and a guide member secured to the shoulder block and received by the guide track for positioning said shoulder block for movement along said guide track.

4. In a melting furnace as defined in claim 3, wherein the mounting means is carried by the guide member for movement therewith.

5. In a melting furnace as defined in claim 1, wherein the mounting means includes adjusting means for positioning the edger block vertically, said adjusting means comprising a base member engaging the shoulder block, and a vertical support engaging the edger block and adjustably carried by the base member for positioning said edger block for movement.

6. In a melting furnace as defined in claim 1, wherein the mounting means includes adjusting means for positioning the edger block in a direction transverse to the sheet, said adjusting means comprising a base member engaging the shoulder block, and a support engaging the edger block and adjustably carried by the base member for positioning said edger block for movement.

7. In a melting furnace containing a body of molten material and provided with an opening through which the molten material flows in continuous sheet form, a shoulder block provided at each side of the opening, an edger block provided at each side of the opening beyond the shoulder block along the path of movement of the sheet, means for supporting the shoulder block for movement transverse to the path of movement of the sheet to control the width of said sheet, and mounting means engaging the edger block for selectively positioning said edger block in any one of a plurality of planes.

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