Aug. 4, 1925. 1,548,445

R. M. CORL

SHEET GLASS MAKING APPARATUS

Filed Nov. 8, 1922 2 Sheets-Sheet 1

Fig 10

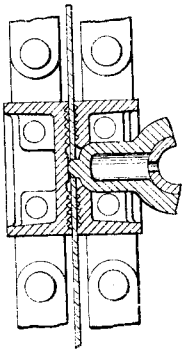


Fig 1

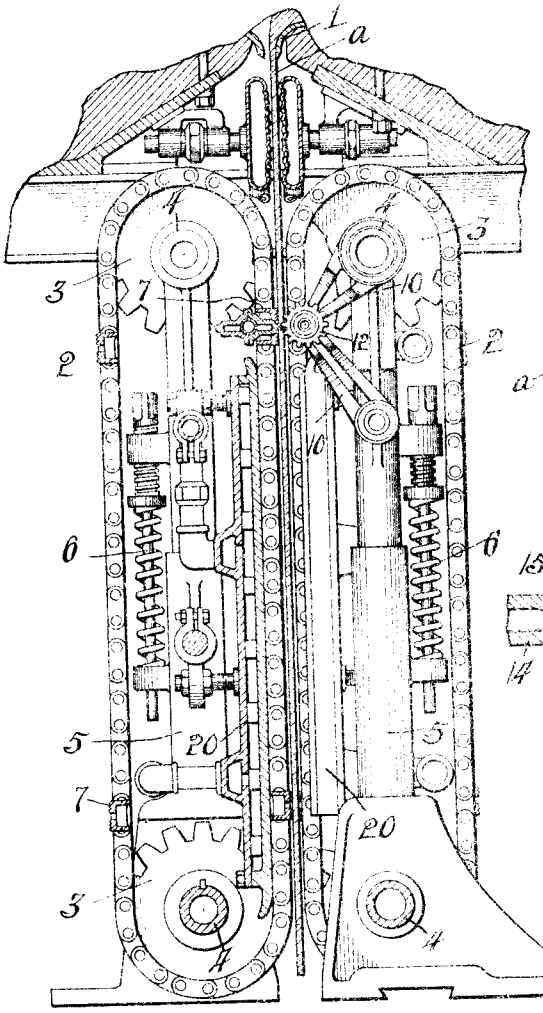
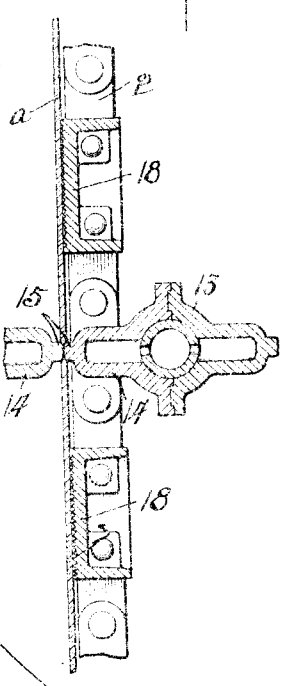


Fig 9



INVENTOR

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By Burdett & Crampton

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R. M. CORL.

SHEET GLASS MAKING APPARATUS

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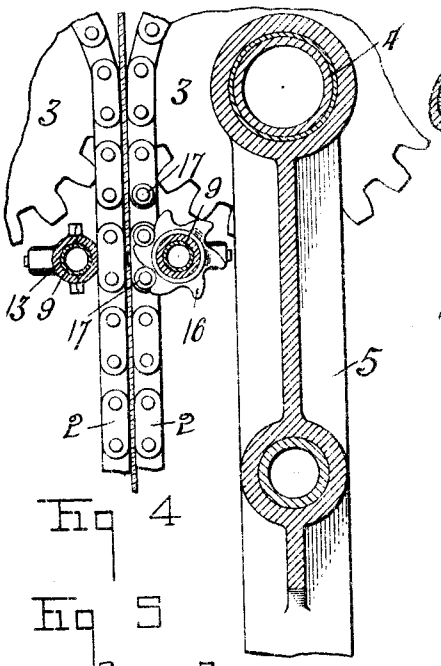


Fig 4

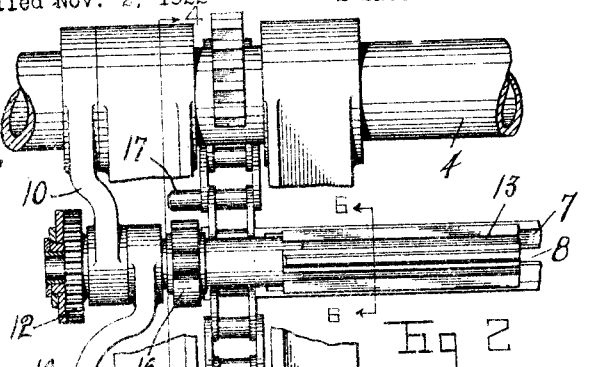


Fig 2

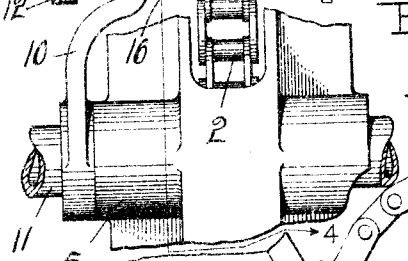


Fig 3

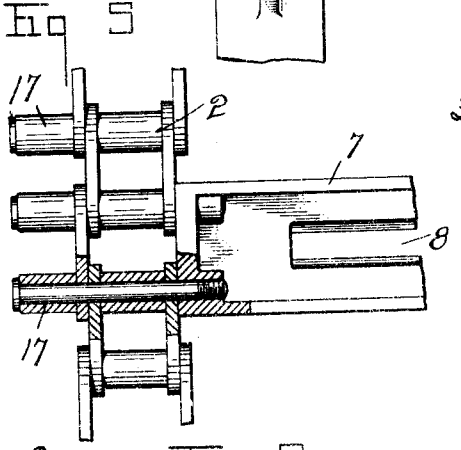


Fig 5

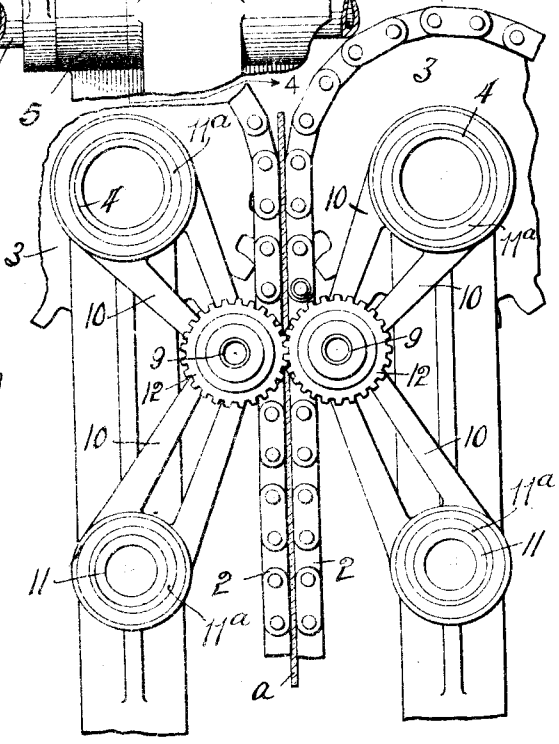


Fig 6

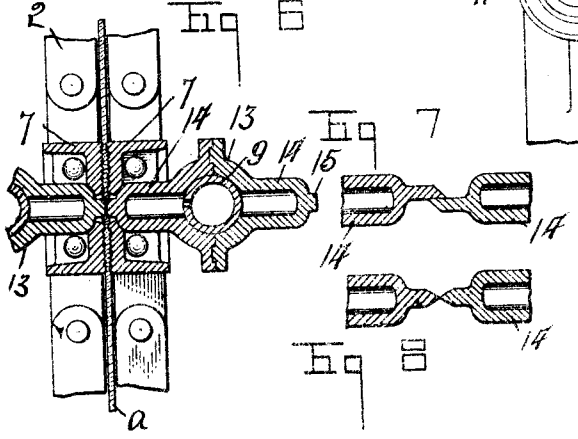


Fig 7

Fig 8

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Patented Aug. 4, 1925

1,548,445

UNITED STATES PATENT OFFICE.

ROBERT M. CORL, OF MAUMEE, OHIO, ASSIGNOR TO ERIE GLASS COMPANY, OF TOLEDO, OHIO, A CORPORATION OF DELAWARE.

SHEET-GLASS-MAKING APPARATUS.

Application filed November 2, 1922. Serial No. 596,496.

To all whom it may concern:

Be it known that I, ROBERT M. CORL, a citizen of the United States, and a resident of Maumee, in the county of Lucas and State of Ohio, have made an Invention Appertaining to a Sheet-Glass-Making Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to the manufacture of sheet glass and particularly applies to means for supporting the sheet, after leaving the forming point, controlling the speed of movement of the sheet from such point, and transversely severing the sheet into successive sections.

In apparatus of this class the sheet gripping and severing means in some cases constitute bars extending across a sheet throughout its width and supported at their ends by chains with which they move at the desired speed of movement of the sheet. These bars have a tendency to warp, bow or spring outwardly with respect to the sheet due to the length of the bars, the application of the clamping pressure thereto at its ends, and the heat to which they are subjected in use. This results in an ineffective clamping and severing of the sheet throughout its width, and with respect to the severing leaves a portion of the sheet, along the intended line of severing and intermediate the ends thereof, which is not completely severed with respect to the clamping action. The ineffectual or unequal gripping of the sheet throughout its width by the gripping members causes an unequal supporting of the sheet and permits a sagging of the unsupported portions.

An object of the invention is to remove the severing strain from the clamping bars so the clamping bars will not be bowed or sprung out by the severing action, thereby overcoming the above objections.

Another object of the invention is to utilize the severing means for securing a uniform pressure of the clamping bars against the sheet.

Other objects of the invention will be apparent from the following detailed description.

While the invention in its broader aspect is capable of embodiment in numerous forms, a preferred embodiment thereof, with some modifications, are illustrated in the accompanying drawings, in which,—

Figure 1 is a fragmentary sectional view of an apparatus embodying the invention, with parts in full. Fig. 2 is an enlarged fragmentary elevation of the sheet severing and supporting means with parts broken away. Fig. 3 is an enlarged fragmentary side elevation of the upper portion of said means. Fig. 4 is a section on the line 4—4 in Fig. 2. Fig. 5 is a fragmentary detail of a clamping bar and attached carrying chain. Fig. 6 is a section on the line 6—6 in Fig. 2. Figs. 7 and 8 are fragmentary sectional views of different modifications of the severing members. Fig. 9 is an enlarged sectional fragmentary view of a modified form of the clamping means, and Fig. 10 shows a modified form of the clamping and severing means.

Referring to the drawings, *a* designates a sheet of glass which, in the present instance, flows downward by gravity from a source of molten glass supply over and from a formative means 1, and thence passes down between a supporting and severing means therefor constituting the present invention.

The supporting means includes a pair of endless chains 2 at each side of the sheet and guided by respective sets of sprocket wheels 3, disposed to have a chain of each pair opposing a chain of the other pair outside the respective edge of the sheet. The sprocket wheels 3 are carried by respective upper and lower shafts 4 journaled in suitable supporting frames or standards 5, which may have upper and lower sections mounted for relative longitudinal adjustment to permit the taking up of slack in the chains. The standard sections are yieldingly held in outwardly extending relation by a tension means 6. The chains are guided to have their inner flights in prolonged paral-

lel relation to the sheet as shown. The chains of opposing pairs are connected to any suitable driving means not shown, so that the speed of movement of the chains may be controlled to regulate the speed of movement of the sheet.

The chains 2 of each pair are connected at intervals by cross sheet-clamping bars 7 and these bars are adapted to cooperate with opposing cross-bars of the other pair of chains during the inner flight of movements thereof to clamp the sheet *a* therebetween. These bars are preferably of channel form to give them rigidity, and the outer side of their cross portions form the sheet gripping surfaces of the bars and are roughened or serrated as shown, to facilitate the gripping action. Each bar is provided in its cross portion longitudinally thereof with a slot 8, which is disposed centrally of the side edges of the bar to leave a sheet gripping surface at each side thereof, and is of sufficient length to extend entirely across the sheet to be acted on. The cross-bars 7 are intended to remain in gripping engagement with a sheet *a* throughout substantially the entire length of their inner flights of movement with the chains, as is apparent. Any number of clamping bars may be provided to suit the length of the sections into which the sheet is to be separated.

A pair of shafts 9 are mounted in opposed relation, one at each side of the sheet *a*, and preferably near the upper ends of the inner chain flights. Each shaft 9 is journaled in a pair of bearing arms 10, one of which projects downward and inward from the adjacent upper shaft 4 and the other from a shaft 11 mounted in the upper sections of the bearing standards 5. The shafts 9 are intended to extend entirely across and beyond the edges of a sheet *a*, and a pair of bearing arms 10 is provided therefor at each end. The shafts 9 are connected by gears 12 to cause them to rotate in unison.

The bearing arms 10 carrying the severing wheel shafts 9 are preferably mounted on eccentrics 11^a on the shafts 4 and 11 so that an adjustment of the eccentrics will effect a relative inward and outward adjustment of the severing wheels to vary the spacing therebetween, as it may be desired to either secure a complete severing of the sheet or merely a scoring of the same to facilitate a subsequent breaking off of the sheet along the scored or weakened line. This adjustment also enables the means or supporting standards carrying the chains 2 to be adjusted inward or outward relative to the severing wheels to suit the thickness of the sheet being acted on. For instance, if the clamping means has been adjusted to act on a thin sheet and it is desired to form a much thicker sheet, the supporting means for the chains are outwardly adjusted and the severing means may then be adjusted inward the extent that the chains were adjusted outward.

Each shaft 9 carries a severing wheel 13 of a length equal at least to the width of the sheet and having one or more longitudinally extending radial arms 14 projecting therefrom and terminating at their outer edges in sheet severing, pinching off or scoring ribs 15. In the present instance the severing wheel is provided with two arms 14 arranged in opposed relation. When a set of clamping bars 7 moves into register with a set of opposed severing wheels 13, an arm 14 of each wheel bears at its outer end against the inner side of the respective clamping bar 7 at the edges of its slot 8, and the ribs 15 of the two opposed arms project through the slots and have severing, biting-off or scoring coaction with the sheet. The wheels 13 are sufficiently massive and rigid in their construction to prevent any possibility of warping or springing out of shape during use, thereby insuring a clean uniform severing or scoring of the sheet throughout its width. The pressure of the wheels against the clamping bars 7 also serves to hold such bars in clamping relation to the sheet and to maintain the clamping faces of the bars parallel so that one portion of the sheet will not be gripped by a set of bars more closely than another portion. This prevents any springing out tendency of the clamping bars intermediate their ends and maintains a uniform gripping coaction of the bars throughout their lengths with the sheet. The shafts 9 and severing wheels 13 are preferably made hollow for the circulating of a cooling medium therethrough, the interior of the shafts and the interior of the cutting wheels mounted thereon being in communication.

A cutter shaft 9 has a toothed ratchet wheel 16 mounted on an end thereof adjacent to a respective chain 2, and the teeth of this wheel are so disposed that a pin or roller tooth 17 projecting from a side of the adjacent chain 2 will engage a tooth of the ratchet wheel as the pin tooth passes the same in its downward flight of movement with the chain and impart a turning movement of the wheels. In the present instance the severing wheels 13 are provided with two severing arms 14, the ratchet wheels are provided with six teeth, and the chains are provided adjacent to each clamping bar 7 with three pins 17, the latter arranged to engage successive teeth on the coacting ratchet wheel 16 and impart a half rotation to the wheel as the chain teeth 17 pass downward by the same, thus moving a severing arm 14 into and out of severing engagement with the sheet. Inasmuch as the cutter shafts 9 are geared together it is necessary to provide only a single ratchet wheel 16 adjacent to a chain 2 in order to

impart simultaneous and uniform rotation to the two severing wheels.

In Figs. 7 and 8 the severing ribs of the severing wheels are slightly modified over those of the ribs 15, the ribs in Fig. 7 being shown as lapping each other to have a shearing action, and the ribs in Fig. 8 being shown as terminating in sharp cutting edges.

In Fig. 9 the clamping means is shown as constituting separate bars 18 disposed above and below the severing points with the severing wheels acting on the sheet between such bars instead of through a slot disposed therein.

In Fig. 10 a form of the invention is illustrated wherein a severing wheel at one side of the sheet and a clamping bar at the other side of the sheet coact to effect a severing or scoring of the sheet instead of employing two opposed severing wheels as previously described.

It is evident in the operation of the clamping and severing means embodying the invention, that the sheet *a* in its movement from the forming point and while still in a soft or moist condition is clamped at intervals by successive sets of clamping bars 7 and that as each set of clamping bars passes the severing means, the pins 17 on one of the chains will engage the ratchet wheel 16 and impart rotation thereto and to the opposed severing wheels 13 to move a pair of severing arms 14 thereof into and out of severing relation to the sheet, a half turn, in the present instance, being given to each severing wheel. The wheels act against the bars 7 to maintain them in true parallel gripping relation to the sheet throughout their lengths and the severing ribs of the wheels project through the slots of the clamping bars in severing relation to the sheet.

The chains and clamping bars may be guided during the inward flights of their movement by guide plates 20, which are apertured throughout the width of the sheet and so follow to facilitate the circulation of a cooling medium therethrough.

While I have referred particularly to the severing means as effecting a severing of the sheet, it is evident that the same means, by spacing the sheet engaging edges thereof slightly apart may serve as a scoring means for the sheet when it is desired to weaken the sheet along successive transverse lines for subsequent breaking off instead of severing the sheet. It will therefore be understood that the term "severing" as used throughout the specification is not necessarily limited to a complete severing of the sheet, but rather means a separation of the sheet and is intended to be sufficiently broad to cover both scoring and a complete severing.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts as it is capable of embodiment in various forms without departing from the spirit of the claims. It will also be understood that the invention is not restricted to the use alone in connection with a downwardly moving sheet as it may as well be used in connection with a sheet which is severed upward from the forming source.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. In apparatus of the class described, clamping bars, means to move the bars in an endless path one portion of the path being parallel with the path of a glass sheet being drawn and the bars leaving spaces across the sheet, said spaces being alternately short and long longitudinally of the sheet, and severing means actuated conjointly of the bars and adapted to act upon the sheet in said short spaces.

2. In apparatus of the class described, clamping bars, means to move the bars in an endless path one portion of the path being parallel with the path of a glass sheet being drawn and the bars leaving spaces across the sheet, said spaces being alternately short and long longitudinally of the sheet, rotatable severing means adjacent the path of the bars, and means connected with the bar-moving means for intermittently causing the severing means to act upon the sheet in said short spaces.

3. In apparatus of the class described, two sets of clamping bars, means to move the bars of the two sets in opposed clamping relation on the opposite sides of a sheet of glass being drawn, the bars leaving spaces across the sheet, said spaces being alternately short and long longitudinally of the sheet, and severing means adapted to act upon the sheet in said short spaces.

4. In apparatus of the class described, two sets of clamping bars, means to move the bars of the two sets in opposed clamping relation on the opposite sides of the sheet of glass being drawn, the bars leaving spaces across the sheet, said spaces being alternately short and long longitudinally of the sheet, rotatable severing means mounted on parallel axes on opposite sides of the path of travel of the sheet, and means to actuate the severing means to act on the sheet in each successive short space while still clamped by the bars at the ends of said space.

5. In an apparatus of the class described, means having a set of clamping bars for opposed clamping engagement across a sheet as it moves from a forming point and constituting in engagement with the sheet and moving therewith for a predetermined distance said sheet out of the sheet, and

means independent of the clamping bars and operable during the period of gripping of the sheet by the bars to sever the sheet between the upper and lower points of gripping of the sheet by the set of bars.

6. In an apparatus of the class described, means having a set of clamping bars operable to have opposed clamping coaction with a sheet after leaving its formative point and while still soft and remaining in engagement with the sheet for a predetermined length of its travel, the bars leaving alternately a short space for severing and a long uncontacted space, and means having rotatable severing parts automatically operable to periodically engage the sheet in successive severing spaces.

7. In an apparatus of the class described, means having sets of cross bars operable to successively move into opposed clamping relation with a sheet while still soft and continuing a distance in engagement with the sheet, and means having rotatable members actuated at predetermined intervals by movements of the clamping means to engage and constrict the sheet during the clamping operation and adjacent to the point of clamping of the sheet.

8. In an apparatus of the class described, means having sets of cross bars operable to successively move into opposed clamping relation with a sheet while still soft and continuing a distance in engagement with the sheet, and means having rotatable severing members operable to engage the clamping bars of the clamping means and maintain them in parallel clamping relation to the sheet and to sever the sheet at points intermediate the upper and lower sheet gripping edges of the clamping parts.

9. In an apparatus of the class described, means including a set of chains and cross-clamping bars carried by the chains to have gripping coaction with a sheet of glass passing from a formative point and to remain in contact therewith until the sheet is substantially set, the clamping bars having gripping coaction entirely across vertically spaced portions of the sheet, such spaced portions leaving alternately a short space for severing and a comparatively long space unmarred by the mechanism and severing means actuated by movements of the clamping means and having rotatable severing members movable into opposed severing coaction with the sheet while gripped by the bars and in the severing space.

10. In an apparatus of the class described, a pair of opposed rotatable members operable to engage and sever a sheet of glass therebetween as it passes away from a formative point, means operable to successively grip strips across the sheet at longitudinally spaced intervals and to remain in gripping contact therewith throughout a predetermined portion of its movement, the gripping means gripping the sheet before the severing action and at each side of the severing point adjacent thereto, and means actuated by movements of the clamping means to impart periodical severing movements to the severing members.

In testimony whereof I have hereunto signed my name to this specification.

ROBERT M. CORL.