Sept. 24, 1929. F. B. WALDRON 1,729,498

PRODUCTION OF GROUND AND POLISHED PLATES OF GLASS AND APPARATUS THEREFOR

Original Filed Jan. 5, 1927 2 Sheets-Sheet 1

Fig. 2.

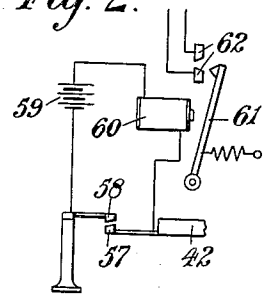

Fig. 1.

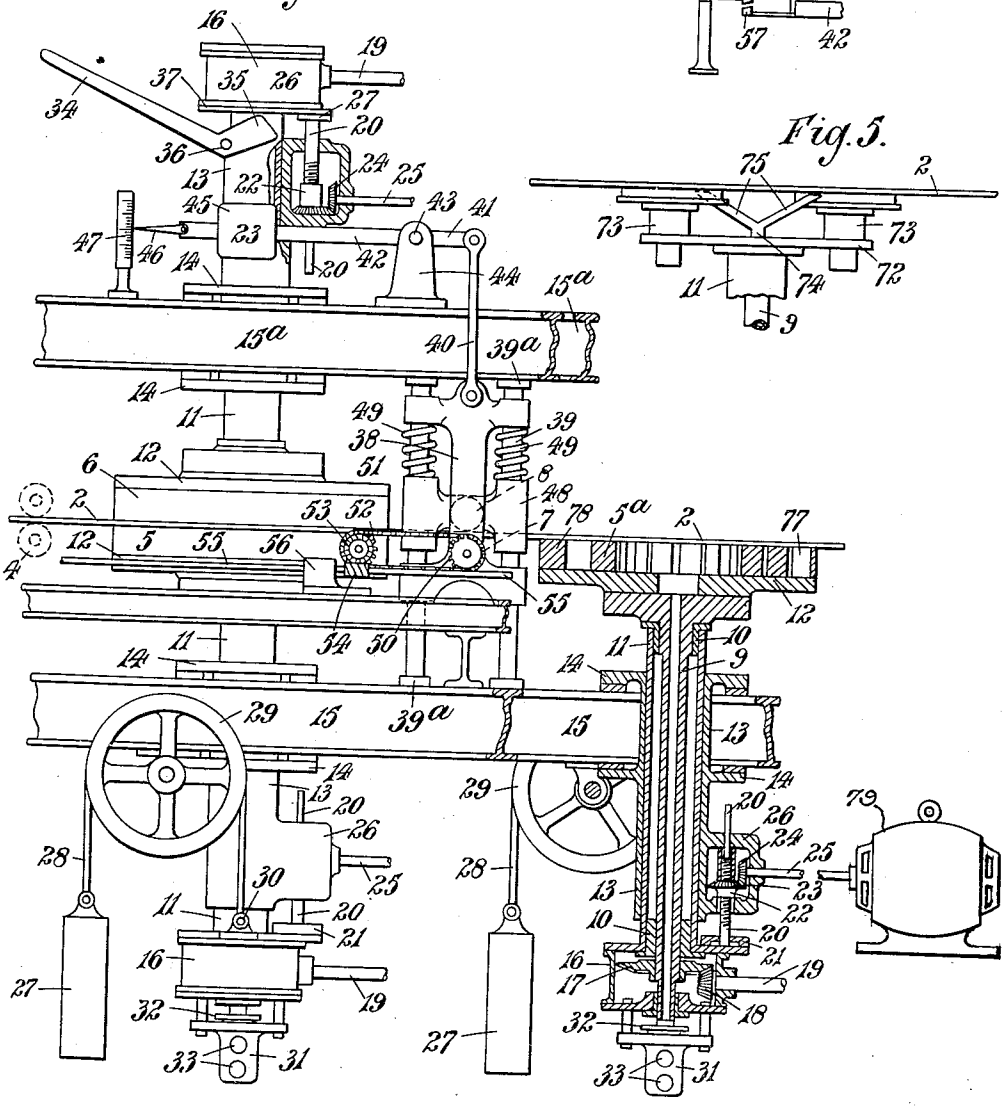

Fig. 5.

Inventor.
F. B. Waldron
By Rogers, Kennedy & Campbell
Attys.

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Fig. 3.

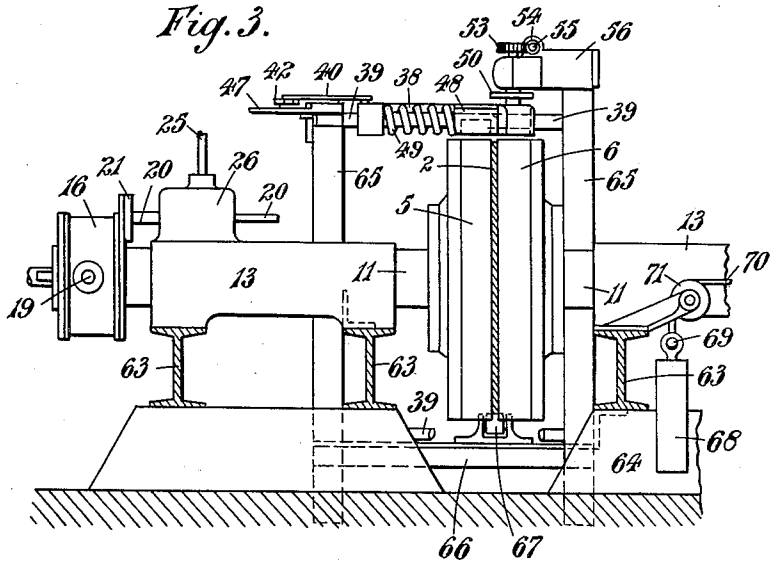


Fig. 6.

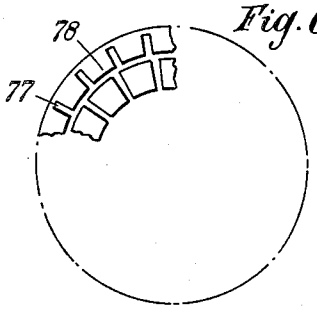
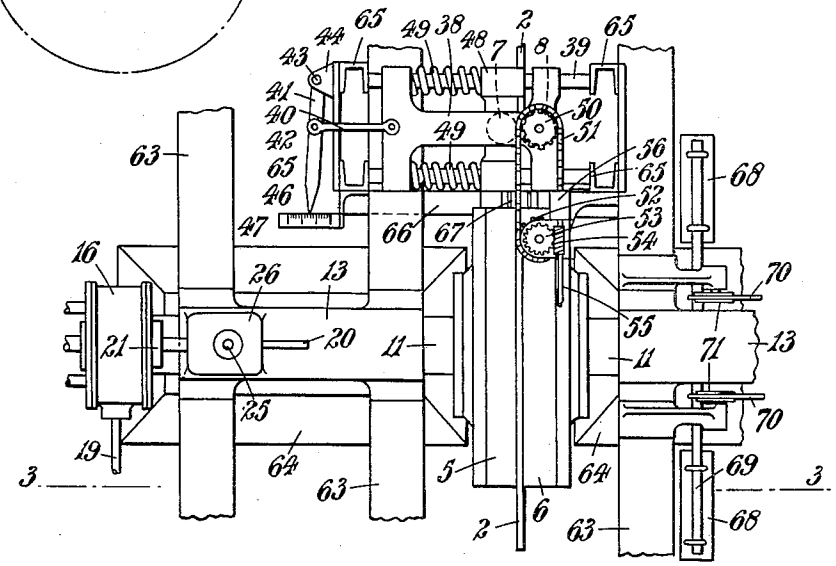


Fig. 4.



Inventor.

F. B. Waldron

By Rogers, Kennedy & Campbell

Attys.

Patented Sept. 24, 1929 1,729,498

UNITED STATES PATENT OFFICE

FREDERIC BARNES WALDRON, OF PRESCOT, ENGLAND, ASSIGNOR TO PILKINGTON BROTHERS LIMITED, OF LIVERPOOL, ENGLAND, A COMPANY REGISTERED UNDER THE LAWS OF GREAT BRITAIN

PRODUCTION OF GROUND AND POLISHED PLATES OF GLASS AND APPARATUS THEREFOR

Original application filed January 5, 1927, Serial No. 159,071, and in Great Britain January 13, 1926. Divided and this application filed March 22, 1928. Serial No. 263,935.

This invention relates to apparatus for producing ground and polished glass in plate or strip form and has for its object an apparatus whereby glass may be ground and polished on both sides without the processes of laying, stripping, turning and re-laying.

This application is a division of my prior application Serial Number 159,071, filed January 5th, 1927.

In the accompanying drawings:—

Figure 1 is a side view, partly in section, of part of a grinding apparatus;

Figure 2 is a diagrammatic view of an automatic adjusting device;

Figure 3 is a vertical transverse section on the line 3—3 of Figure 4, of part of a grinding apparatus differently arranged;

Figure 4 is a plan thereof;

Figure 5 is a side view of the operative end of a polishing runner, and

Figure 6 is a plan of part of one of the grinding runners.

Like reference numerals are used to indicate like or corresponding parts throughout the different figures of the drawings.

Referring to Figure 1, the glass (which for the purpose of this description will be assumed to be in the form of strip) is passed between a pair of rollers 3, 4, of which the lower roller 4 is driven, and then between the pair of runners, of which 5 and 6 represent the grinding nogs of the lower and upper runners respectively. The strip then passes between a second pair of rollers 7 and 8 (shown in dotted lines) of which the lower roller 7 is driven, and then between a second pair of runners similar to the first pair. Of this second pair of runners, only the lower runner, with grinding nogs 5^a, is shown, and in section. Thereafter, the strip passes between, alternately, pairs of rollers and pairs of runners, of which runners, as many are provided as are necessary to perform the operation of grinding, and after these as many as are necessary to perform the operation of smoothing, and, finally, as many as are necessary to perform the operation of polishing. All the lower grinding and smoothing runners are similar and all the upper grinding and smoothing runners are similar. First, the lower grinding and smoothing runners will be described with reference to the two lower runners shown in elevation and section in Figure 1. The nogs 5^a are attached in the usual way to a disc 12 carried by a shaft 9 which turns in bearings 10 in a tube 11. The tube 11 is adapted to slide in a casing 13 which is fixed by lugs 14 to two girders 15. In a casing 16 fixed to the tube 11 is a bevel gear consisting of a wheel 17 fixed to the shaft 9, and driven by a pinion 18 on a shaft 19. The shaft 19 is conveniently driven by belt, so as to permit a slight vertical movement of the tube 11 and shaft 9. The position of the tube 11 in the casing 13, and therewith the height of the operative surface of the runner, is determined by a rod 20, which is attached to the casing 16 at 21, and is screw-threaded to engage with a nut 22. To the nut 22 is attached a bevel gear wheel 23, which engages with a wheel 24 on a shaft 25. The rod 20 is adapted to slide, and the shaft 25 to turn in a side extension 26 of the casing 13, the nut 22 being capable of turning but not vertical movement in the extension casing 26. By turning the shaft 25 therefore, the tube 11 and the runner may be raised or lowered. The weight of the runner and attached parts is counterbalanced by two weights 27 hung on ropes 28 which pass over pulleys 29 and are attached to the casing 16 at 30.

The runner shaft 9 is tubular and at its upper end the hole is open to the glass. At its lower end, the shaft 9 enters a casing 31 through a stuffing box 32. Abrasive and water are fed into two holes 33 in the casing 31 and the mixture passes through the shaft 9 to the glass.

The upper runners are similar to the lower runners with the exceptions hereinafter mentioned. The abrasive and water are fed directly on to the upper surface of the glass and consequently the shafts of the upper runners need not be tubular, and the casing 31 of the lower runners is not required for the upper runners. The weight of the tube 11 with its attached parts tends to cause it to slide downwards in the casing 13 and the nut 22 is adapted to prevent only the downward movement

of the tube 11, the flange 37 of the tube 11 resting on the flange 27 of the screw 20, but being free to move upwards independently of it. The tube 11 can be moved upwards rapidly (for instance, in the event of breakage of the glass) by means of a lever 34, 35, pivoted at 36 to the casing 13; when the arm 34 is depressed, the arm 35 bears against the flange 37, and raises it.

All the pairs of rollers serving to drive the glass between the runners are similar and similarly driven. The devices for carrying and driving the rollers are shown only in respect of the pair of rollers 7, 8. The roller 7 turns in bearings in a pair of frames 38 adapted to slide on vertical guide rods 39 attached to cross bars 39ª supported on the girders 15. Each frame 38 is connected by a link 40 to a lever 41, 42, pivoted at 43 on a bracket 44 attached to a girder 15ª. The long arm 42 of the lever carries a weight 45 serving to balance the weight of the roller 7 and attached parts, and carries also a pointer 46 indicating on a scale 47. This pointer and scale serve to indicate the height of the glass relatively to the girders 15ª.

The roller 8 turns in bearings in a pair of frames 48 also adapted to slide on the guide rods 39. Springs 49 between the frames 38 and 48 press the two rollers 7 and 8 together, to grip the glass between them. The roller 7 is driven by a chain wheel 50 mounted on its shaft, a chain 51, a chain wheel 52 attached to a worm-wheel 53 and a worm 54 on a shaft 55 running the whole length of the apparatus and driven by any convenient means. The shaft 55 and the wheels 52 and 53 are supported in brackets 56 mounted on the girder 15.

To operate the apparatus, the lower runners are adjusted in height by turning their shafts 25 until the operative surfaces of the runners are all on a plane. The upper runners being raised by means of their shafts 25, the glass is introduced between the pair of rollers and, as it passes above the lower runners, the upper runners are let down on to it by turning their shafts 25. The wear of the operative surfaces of the lower runners is shown by the positions of the pointers 46 on the scales 47, due to the actuation of the pointers by the glass pressed against the lower runners and acting to move the rollers 7 bodily downwards, and is compensated by turning the shafts 25 of the lower runners so as to restore the positions of the pointers 46 on the scales 47, and thereby bring the operative surfaces of the lower runners always to the same plane.

The compensation for wear of the operative surface of the lower runners may be made automatic by the device shown diagrammatically in Figure 2, in which, in place of the pointer 46, an electrical contact 57 is attached to the arm 42, and, in place of the scale 47, a second contact 58 is fixed to the girder 15ª. The two contacts 57 and 58 are in an electrical circuit comprising a source of electrical current 59 and an electro-magnet 60. The magnet 60 operates a contactor arm 61 adapted to close two contacts 62 in the circuit of a motor 79 (Figure 1) driving the shaft 25 of the lower runner. When, therefore, the rollers 7 and 8 fall in consequence of wear of the operative surface of the adjacent runners, the contacts 57 and 58 are closed and the magnet 60 operates the arm 61 to close the motor circuit and raise the runner and with it the glass and the rollers 7 and 8 until the contacts 57 and 58 are opened.

The polishing runners are of the same construction as the grinding runners except as regards their operative ends. Figure 5 shows the operative end of a polishing runner. The shaft 9 of the runner, carries a frame 72 on which are mounted a plurality of polishing heads 73 of ordinary type. The tubular shaft 9 is connected with a pipe 74 which has branches 75 of which the mouths lie close to the glass. The polishing medium and water, supplied to the stuffing box at the lower end of the runner shaft, reaches the glass 2 through the tube 74 and its branches 75.

Figures 3 and 4 show the apparatus modified constructionally to take the glass strip in a vertical plane. Runner casings 13 are mounted on girders 63 that stand on raised foundations 64. Vertical girders 65 fixed to the girders 63, carry the guide rods 39 of the frames 38 and 48 in which the rollers 7, 8, are journalled. The lower frames 38 and 48 and their attached parts are omitted, the guide rods 39 appertaining to said frames and parts being shown broken away in the centre in Figure 3. Below the runners and attached to the vertical girders 65 is a cross girder 66 on which is mounted a roller 67 that supports the strip of glass 2.

The runners 5 on one side of the strip of glass are adjusted axially to a definite position, indicated by the pointer 46 and scale 47. Each runner 6 on the other side is pressed against the glass by a pair of counterweights 68 carried on a bar 69 that is hung on cords 70 passing over pulleys 71 and fixed to the casing 16 as are the cords 28 in Figure 1. The runners 6 are allowed to come against the glass as are the runners of Figure 1. Abrasive and water are supplied to the runners through stuffing-boxes similar to the stuffing-boxes 31 of the lower runners of Figure 1.

The runners of each pair preferably rotate in opposite directions so as to annul as far as possible any force they may exert in the plane of the glass. Rollers such as 67 in Figures 3 and 4 may be employed above the glass in the arrangement of Figures 3 and 4 and at the sides of the glass in the arrangement of Figure 1 to prevent transverse movement of the glass.

To prevent abrasive and water being thrown out from the peripheries of the grinding runners, the outer nogs are made in the form of a ring, with radial cuts which do not extend to the outer edge, as shown in Figures 1 and 6, at 77 and 78, the section at 77 and 78 of Figure 1, being respectively through one of the radial cuts and through the ring at a point between the cuts. The uncut edge is always in contact with the glass, wearing down with the rest of the operative surface, and retains the abrasive and water in the centre of the runner in the interstices between the nogs. Alternatively a ring shield outside the nogs may be employed. Such a shield may be employed with the polishing runners, but is generally not necessary.

Either of the two forms of apparatus described and shown may be used for grinding and polishing plates or sheets of glass cut to suitable width and produced in any way. In this case rollers similar to the roller 67 (Figure 3) are preferably mounted above the glass in the apparatus shown in Figures 3 and 4 and on the two sides of the apparatus shown in Figure 1 to prevent undue upward and lateral movement, respectively, of the glass plates or sheets.

The forms of grinding and polishing runners represented, are described and shown by way of examples, and any known form whether stationary or reciprocating, may be employed. The runners of each pair need not be exactly similar but their operative surfaces must face each other, so that one runner acts to support the glass against the pressure of the other.

Instead of employing the driving rollers of the glass to indicate the position thereof, special rollers or bars may be maintained in contact with the glass and employed solely to indicate the position thereof.

The automatic device described in connection with Figure 2, for maintaining constant the position of the operative surface of the runners is useful only in the case of the grinding runners and more particularly in the case of the rough grinding runner, the operative surface of which is subject to rapid wear.

The invention is not confined to the particular forms of apparatus described and shown, and these may be varied in construction without departing from the invention. Moreover, the apparatus may be limited to grinding and smoothing or to polishing.

In the following claims, the term "grinding" is to be understood as including the process sometimes termed "smoothing."

Having described my invention, I declare that what I claim and desire to secure by Letters Patent is:—

1. Apparatus for the continuous abrasive treatment of glass, comprising two pluralities of runners, one operating on one side of the glass and the other on the other side, means operating on the glass to cause it to travel continuously through the apparatus and means adjustable for determining the position of the glass in the apparatus in a direction perpendicular to its surface.

2. Apparatus for the continuous abrasive treatment of glass, comprising two pluralities of runners, one operating on one side of the glass and the other on the other side, means operating on the glass to cause it to travel continuously through the apparatus and means adjustable for determining the positions of the operative surfaces of the runners of one plurality in a direction perpendicular to said surfaces.

3. Apparatus for the continuous abrasive treatment of glass, comprising two pluralities of runners, one operating on one side of the glass and the other on the other side, means operating on the glass to cause it to travel continuously through the apparatus, means adjustable for determining the positions of the operative surfaces of the runners of one plurality in a direction perpendicular to said surfaces and means applying a yielding pressure on the glass by the other plurality of runners.

4. Apparatus for the continuous abrasive treatment of glass, comprising two pluralities of runners, one operating on one side of the glass and the other on the other side, means operating on the glass to cause it to travel continuously through the apparatus, means adjustable for determining the position of the glass in the apparatus in a direction perpendicular to its surface and a plurality of members maintained in contact with the glass and indicating devices connected therewith adapted to indicate the position of the glass.

5. Apparatus for the continuous abrasive treatment of glass, comprising two pluralities of runners, one operating on one side of the glass and the other on the other side, means operating on the glass to cause it to travel continuously through the apparatus, means adjustable for determining the positions of the operative surfaces of the runners of one plurality in a direction perpendicular to said surfaces, and a plurality of members maintained in contact with the glass and indicating devices connected therewith adapted to indicate the position of the glass.

6. Apparatus for the continuous abrasive treatment of glass, comprising two pluralities of runners, one operating on one side of the glass and the other on the other side, means operating on the glass to cause it to travel continuously through the apparatus, means adjustable for determining the positions of the operative surfaces of the runners of one plurality in a direction perpendicular to said surfaces, means applying a yielding pressure on the glass by the other plurality

of runners and a plurality of members maintained in contact with the glass and indicating devices connected therewith adapted to indicate the position of the glass.

7. Apparatus for the continuous abrasive treatment of glass, comprising two pluralities of runners, one operating on one side of the glass and the other on the other side, means operating on the glass to cause it to travel continuously through the apparatus, means adjustable for determining the positions of the operative surfaces of the runners of one plurality in a direction perpendicular to said surfaces, a plurality of members maintained in contact with the glass and means connecting said members with the said adjustable means, adapted to reinstate automatically the operative surfaces of the runners of one plurality in their determined position after departure therefrom.

In witness whereof I have affixed my signature hereto.

FREDERIC BARNES WALDRON.