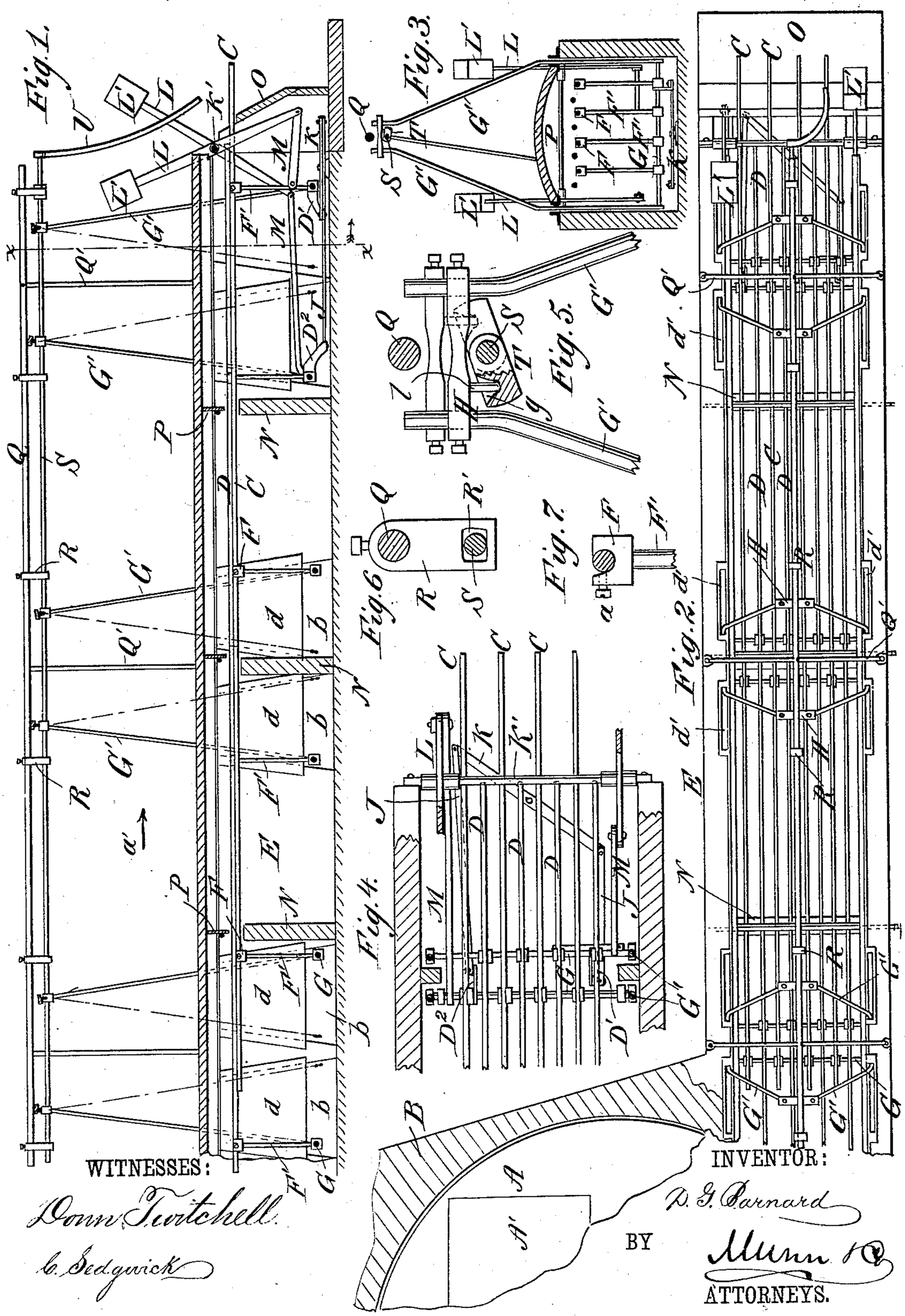
(No Model.)

D. G. BARNARD.

GLASS ANNEALING FURNACE.

No. 285,551. Patented Sept. 25, 1883.



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UNITED STATES PATENT OFFICE.

DANIEL G. BARNARD, OF WINSLOW, NEW JERSEY.

GLASS-ANNEALING FURNACE.

SPECIFICATION forming part of Letters Patent No. 285,551, dated September 25, 1883.

Application filed July 18, 1883. (No model.)

To all whom it may concern:

Be it known that I, DANIEL G. BARNARD, of Winslow, in the county of Camden and State of New Jersey, have invented a new and Improved Glass-Annealing Furnace, of which the following is a full, clear, and exact description.

This invention relates to certain new and useful improvements in annealing-furnaces for glass-manufacture, and has for its object to simplify the machinery for carrying the glass through the annealing-furnace and to prevent breakage.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal sectional elevation of my improved glass-annealing furnace. Fig. 2 is a plan view of the same, showing the roof or arch removed. Fig. 3 is a cross-sectional elevation of the same on the line *x x*, Fig. 1. Fig. 4 is an enlarged plan view of that end at which the glass plates are removed from the tunnel, parts being shown in section. Fig. 5 is an enlarged view of the upper end of the stirrup-frame and the manner of hanging it. Fig. 6 is an enlarged side view of the hanger for the rocking shaft. Fig. 7 is an enlarged side view of the fork for holding the reciprocating bar.

A wheel, A, of the usual construction, and provided with the usual beds, A′, revolves in the furnace B, and from the beds A′ the plates of glass are placed on reciprocating rods C D, located in an arched annealing-tunnel, E, connected with the furnace B. The rods C D are arranged in two series, and all are parallel with each other and are placed equidistant apart. The rods are arranged as near to the top of the tunnel as possible. Each rod is held by a clamping-screw, *a*, or other suitable device in a fork, F, formed on the upper end of a rod, F′, the several rods F′, which are held vertically, being secured at their lower ends to a transverse rod or bar, G, the ends of which are hung in the lower ends of stirrup-bars G′, the upper ends of the stirrup-bars being united by a transverse bar, H.

The stirrup-rods G′ pass down through recesses *b* in the inner surfaces of the sides of the tunnel E, which recesses are covered by plates *d*, forming slots *d′* at the top of the sides of the tunnel, through which slots the rods G′ pass, and the said rods can thus rock in the recesses *b*. The cross-rods G are pivoted in such a manner that the rods F′ can always remain vertical while the stirrup-ring is swinging. The stirrups are arranged in pairs, one stirrup of one pair supporting the rods C and the other stirrup of the same pair supporting the rods D.

The end cross-rod G supporting the rods D is provided with an inwardly-projecting arm, D′, and the end cross-rod G supporting the rods C is provided with an arm, D^2, projecting toward the arm D′, and the said arms D′ D^2 are connected by rods J J with the opposite ends of a centrally-pivoted lever, K, pivoted on the bottom of the tunnel, at the end, so that if the set of rods C or D is drawn in one direction one end of the lever K will be thrown outward and the other inward, and so on alternately, whereby the rods C D will always be reciprocated in opposite directions.

On a rocking shaft, K′, mounted transversely on the end of the tunnel, two upwardly-projecting arms, L, are rigidly mounted, which are provided at their upper ends with counterbalancing-weights L′, the said arms being connected by connecting-rods M M with the cross-rods G G, supporting the ends of the two series of rods C D. The tunnel is provided at its end with a wall, O, in the usual manner, which wall is provided with a slot, through which the ends of the rods C or D can project. The tunnel is provided with a series of transverse partitions, N, which prevent the hot air from rushing through the tunnel too rapidly. Above each partition a transverse plate, P, is pivoted, which acts as a damper, as its upper edge fits closely against the top of the tunnel, also to prevent the current of hot air from rushing through the tunnel too rapidly. The dampers can be turned down in case the draft is not strong enough. A heavy rod, Q, is held by standards Q′ centrally and longitudinally above the tunnel E, and on the said rod Q a series of hangers, R, are held, which are each provided in the lower end with an aperture, R′, through which several apertures of the several hangers a rocking shaft, S, parallel with the rod Q, passes longitudinally. The apertures R′ are

of such size that the shaft S can turn loosely and freely therein, and only one point of the shaft will be in contact with one of the sides of the aperture.

I wish it to be distinctly understood that I do not journal the shaft S in the hangers R, but use anti-friction bearings throughout. The shaft S is provided with a series of laterally-projecting arms, T, the arms projecting alternately in opposite directions. Each arm is provided in its upper surface and near its outer or free end with a funnel-shaped recess, *g*, into which a pin, *l*, passes, which projects downward from the corresponding cross-bar, H, at one side of the center of the said cross-bar. For instance, if the arm T corresponding to one stirrup-frame projects from the left side of the shaft S, the arm supporting the next stirrup-frame will project to the right, and so on alternately. The arms T project in opposite directions, and the pins *l* are at opposite ends of the cross-bars H. The shaft S is provided with a handle, U, for rocking it. As the joint between the cross-bars H and the arms T consists only of the pintle *l*, passing into the funnel-shaped recess *g* in the top of the arm T, the stirrup-frames can swing longitudinally—that is, in the direction of the length of the tunnel E—and can also swing transversely, which is necessary, inasmuch as the stirrup-frames are to be moved vertically by rocking the shaft S, as will be explained and set forth hereinafter.

The operation is as follows: The stirrup-frames carrying the rods C D rest on the arms T of the shaft S, and by rocking the shaft S the stirrup-frames can be raised or lowered—that is to say, half of the stirrup-frames will be raised and the other half lowered. For instance, referring to Fig. 5, one of the bars H is shown lowered, the next arm T projecting upward, and the bar H, resting on the same, will be raised, the arm T following that one will be lowered, and the stirrup-frame will be lowered. The rods C and D are not secured to the rods F′ of all the stirrup-frames, but only to the rods of alternating stirrup-frames, and as the arms T are alternately inclined in opposite directions it is evident that all the corresponding stirrup-frames will be raised together or lowered together, and thus all the rods C or D will either be raised or lowered together, and this raising and lowering of the rods C and D can be accomplished at will by rocking the shaft S by means of the handles U. As described above, the frames supporting the rods C D are connected in such a manner that when the rods C are moved longitudinally in one direction the rods D are moved longitudinally in the reverse direction. The weight of the rods T and their supporting-frames is counterbalanced by the weights L L′. If the workman seizes the ends of the rods D and draws them outward, the ends of the rods C will move inward; or if he draws the rods C outward the rods D will be moved inward, and so on alternately. In the same manner as the ends of the rods C, for instance, project from one end of the tunnel, the ends of the rods D project from the other end of the tunnel into the furnace, and the flattened cylinders or sheets can be taken up by the usual forks and placed on the ends of the reciprocating rods projectng into the furnace, those rods being raised and the other set of rods being lowered. If the raised rods are drawn in the direction of the arrow *a′*, the plate or sheet resting on the furnace end of the said rods will also be moved in the direction of the arrow *a′* until the said rods carrying the glass plate have reached their limit of longitudinal motion. Then the arm U is swung in such a manner as to rotate the shaft S, so that the arms T that were lowered will be raised and the arms T that were raised will be lowered, whereby the rods carrying the plate of glass will be lowered, and the other set of rods which were lowered will be raised and will support the plate of glass; but those rods which now support the plate of glass, which have just been raised, do not project out of that end of the tunnel opposite the furnace, and can be drawn out by the operator, whereby the plate of glass will again be moved in the direction of the arrow *a′*, and that set of rods which before supported the plate of glass will be moved back into the furnace in the inverse direction of the arrow *a′*. Then the shaft S is again rocked, whereby the sheet of glass will again be deposited on those rods which first carried it, and those which last carried it will be lowered, and so on alternately. In brief, the movement is as follows: The shaft S is rocked, and the rods on which the glass rests are drawn outward from that end opposite the one at which the furnace is located. Then the shaft S is rocked in the inverse direction and the second set of rods is drawn outward. Then the shaft S is rocked back again, and the first set of rods is drawn outward, and so on alternately until the plate has passed through the tunnel.

I wish to call attention to the fact that I do not journal any parts, but use ball-and-socket hinges, or hold the shafts loosely, so as to have a rolling movement in the hangers, whereby the friction is reduced to a minimum.

I am aware that movable bars have been used for carrying sheets of glass through an annealing-tunnel; but that I do not claim, broadly.

I do not abandon or dedicate to the public any patentable features set forth herein and not herein claimed, but reserve the right to claim the same, either in a reissue of any patent that may be granted upon this application or in any other applications for Letters Patent that I may make.

I am aware that it is not new to use alternating sets of bars placed side by side, one set supporting the sheets of glass and the other carrying them out through the tunnel; but

What I do claim as new and of my invention is—

1. The combination, with alternating sets

of rods C D, of the vertical forked rods F F′, the pivoted cross-bars G, having arms D′ D², connected by bar H, and the tunnel E, having recesses *b*, covered with plates, forming slots *d*′, said stirrup-bars being arranged in pairs, with one of each pair supporting a rod, C, and the other a rod, D, as shown and described.

2. The combination, with the cross-rods G, supporting the ends of rods C D, of the rocking shaft K′, arranged transversely on the end of the tunnel, the two upwardly-projecting arms L, having counterbalance-weights L′, and the rods M M, as shown and described.

3. The combination, with the tunnel E, of the transverse partitions N and the transverse pivoted plates P, arranged above the partitions, whereby the velocity of the hot-air current may be graduated, as described.

4. The combination, with the stirrup-bars G′, of the rod Q, supported above the tunnel, the hangers R, having apertures R′ at the lower end, the rocking shaft S, passing loosely through said apertures parallel to rod Q, the lateral arms T, arranged alternately in opposite directions, and having near the outer end a funnel-shaped recess, *g*, and the cross-bar H, having the pin *l*, whereby the stirrup-bars may be rocked, as described.

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Witnesses:

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