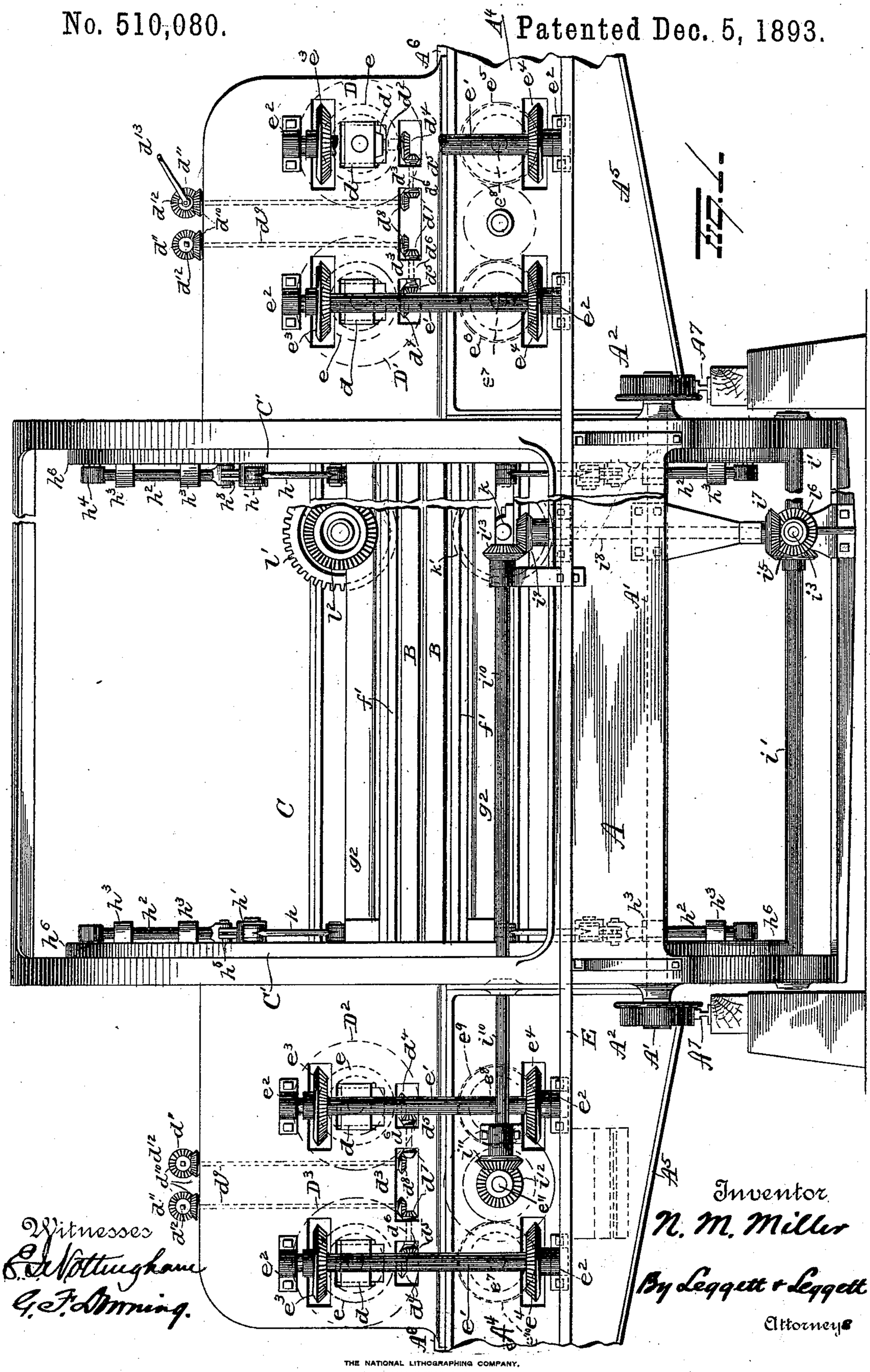
(No Model.) 7 Sheets—Sheet 1.

N. M. MILLER.

APPARATUS FOR ROLLING GLASS.

No. 510,080. Patented Dec. 5, 1893.



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THE NATIONAL LITHOGRAPHING COMPANY,
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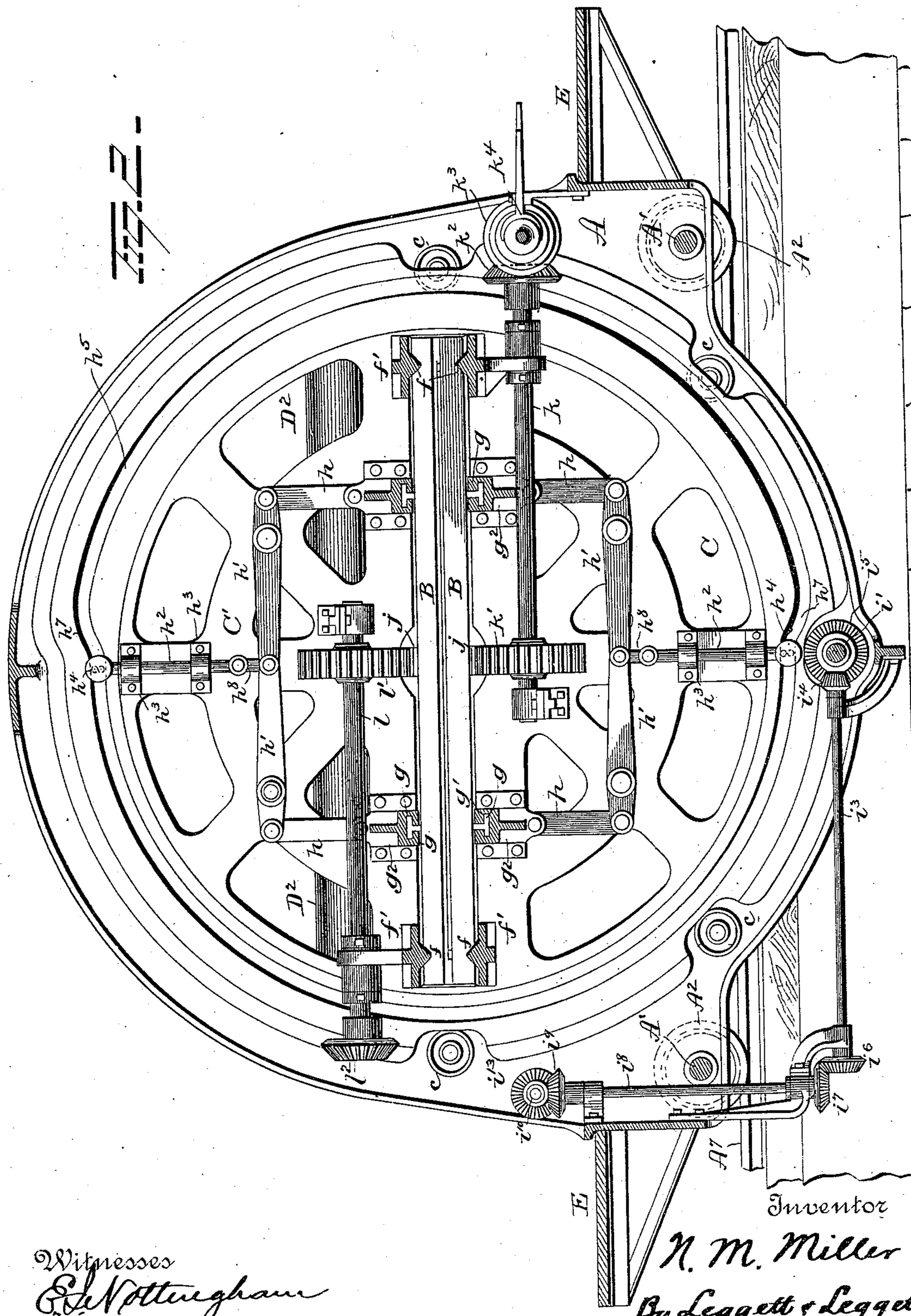
(No Model.) 7 Sheets—Sheet 2.

N. M. MILLER.

APPARATUS FOR ROLLING GLASS.

No. 510,080. Patented Dec. 5, 1893.



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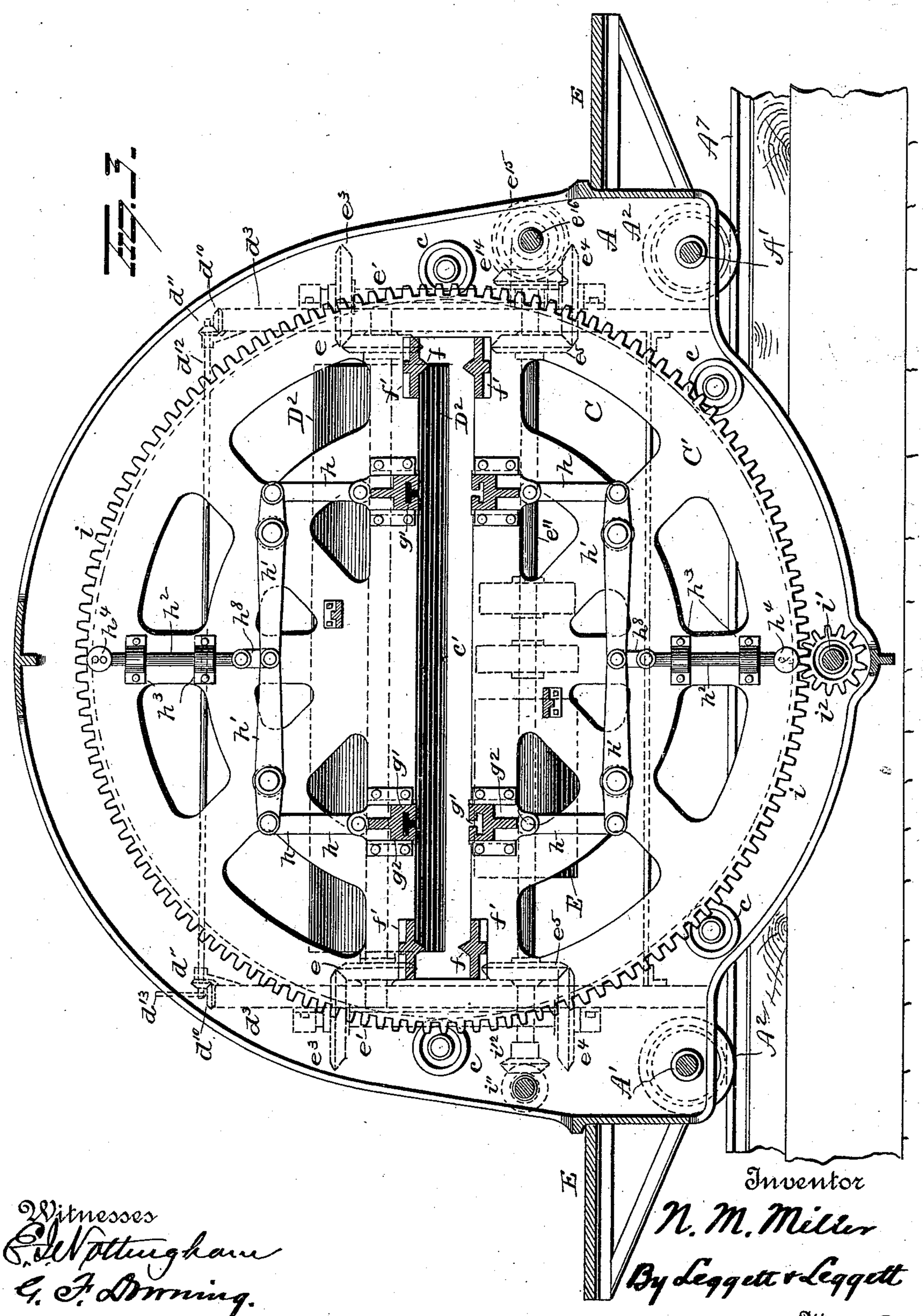
(No Model.)

7 Sheets—Sheet 3.

N. M. MILLER.

APPARATUS FOR ROLLING GLASS.

No. 510,080. Patented Dec. 5, 1893.



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(No Model.) 7 Sheets—Sheet 4.

N. M. MILLER.

APPARATUS FOR ROLLING GLASS.

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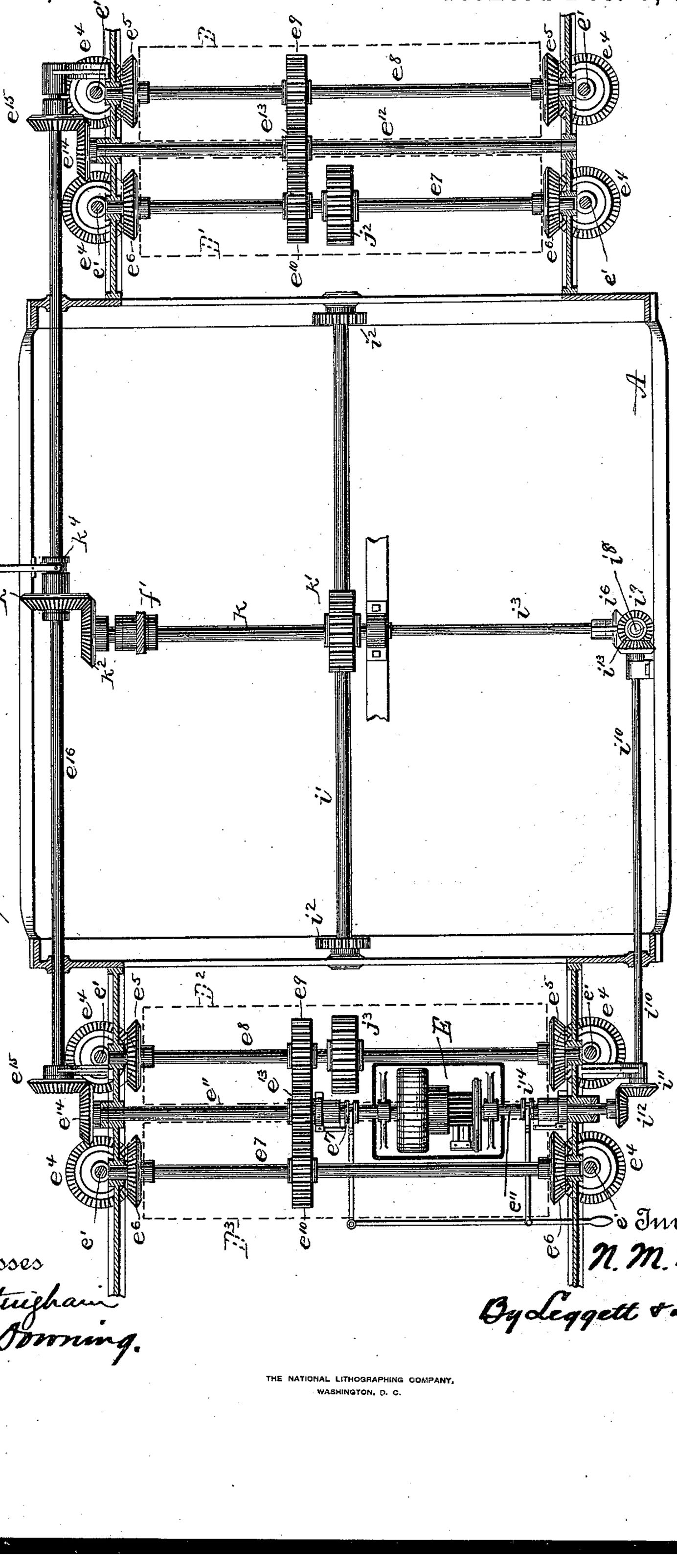

FIG. 2.

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(No Model.) 7 Sheets—Sheet 5.

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APPARATUS FOR ROLLING GLASS.

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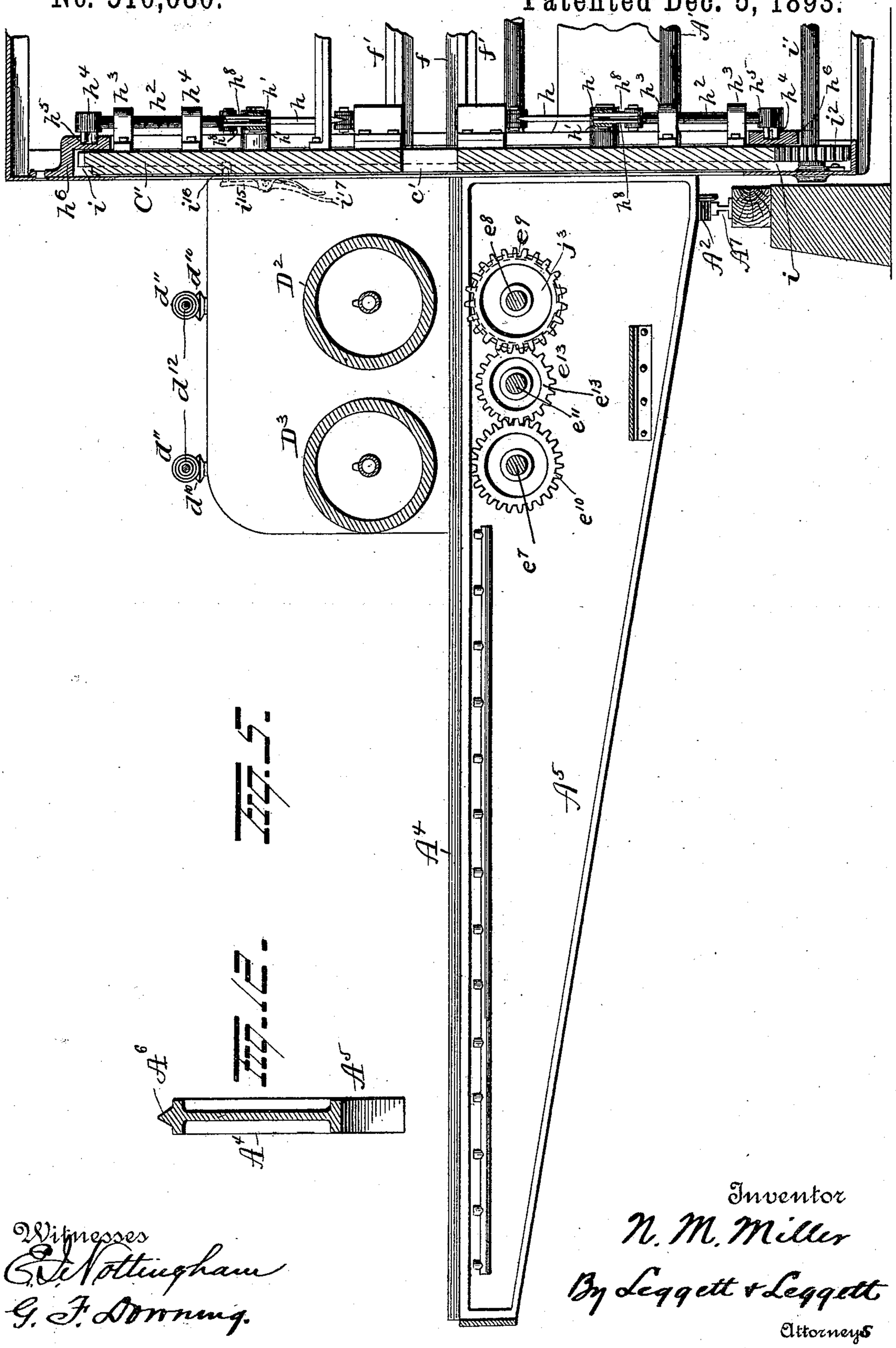

Fig. 5.

Fig. 6.

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7 Sheets—Sheet 6.

N. M. MILLER.

APPARATUS FOR ROLLING GLASS.

No. 510,080. Patented Dec. 5, 1893.

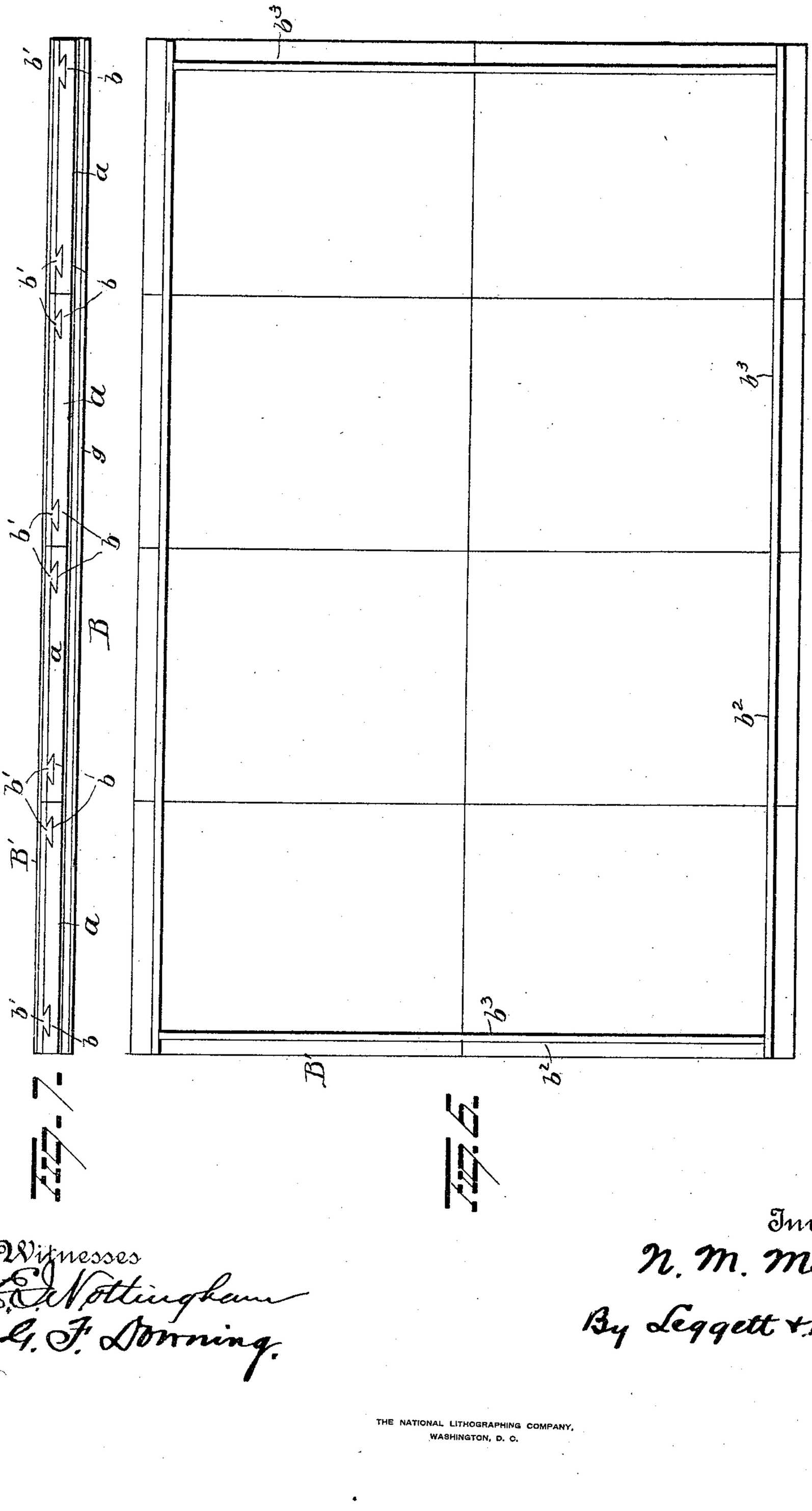

Fig. 7.

Fig. 6.

Fig. 8.

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APPARATUS FOR ROLLING GLASS.

No. 510,080. Patented Dec. 5, 1893.

Fig. 9.

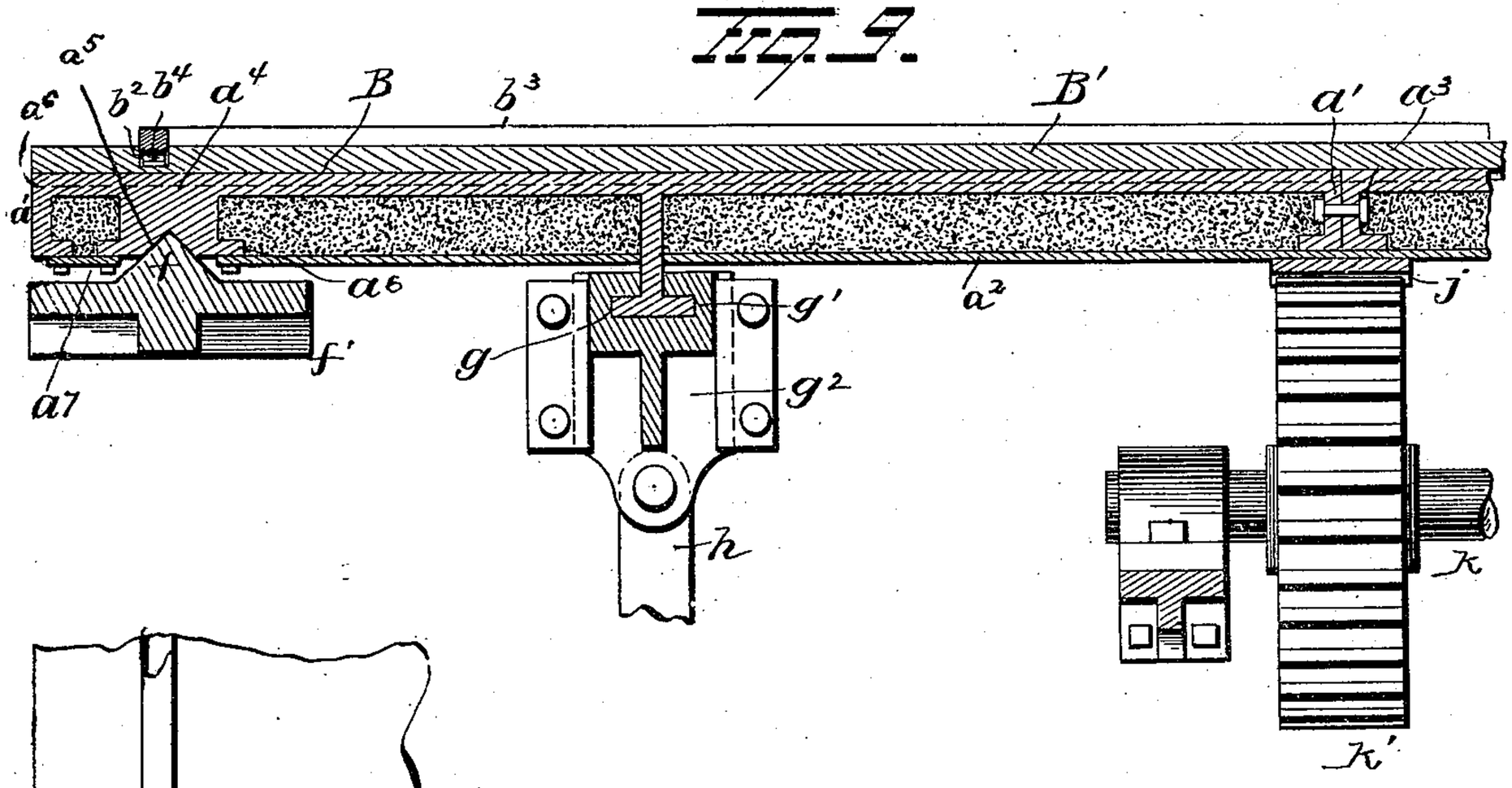


Fig. 10.

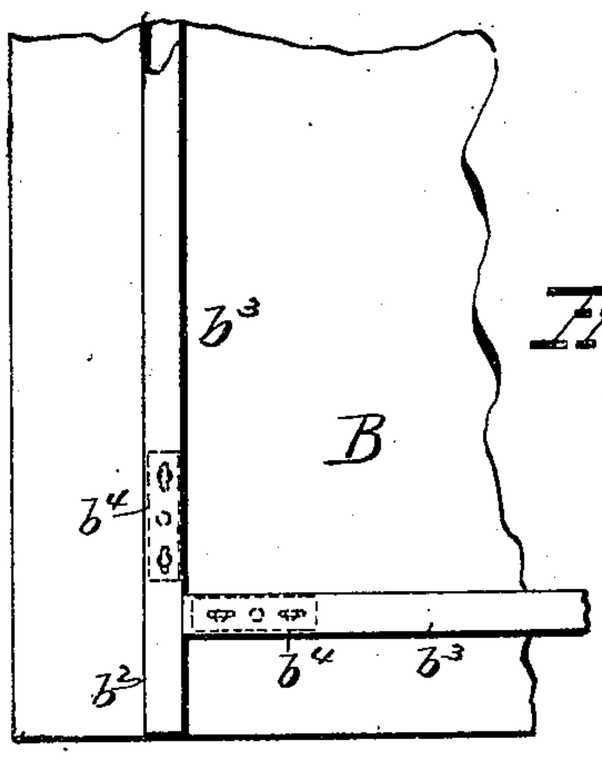
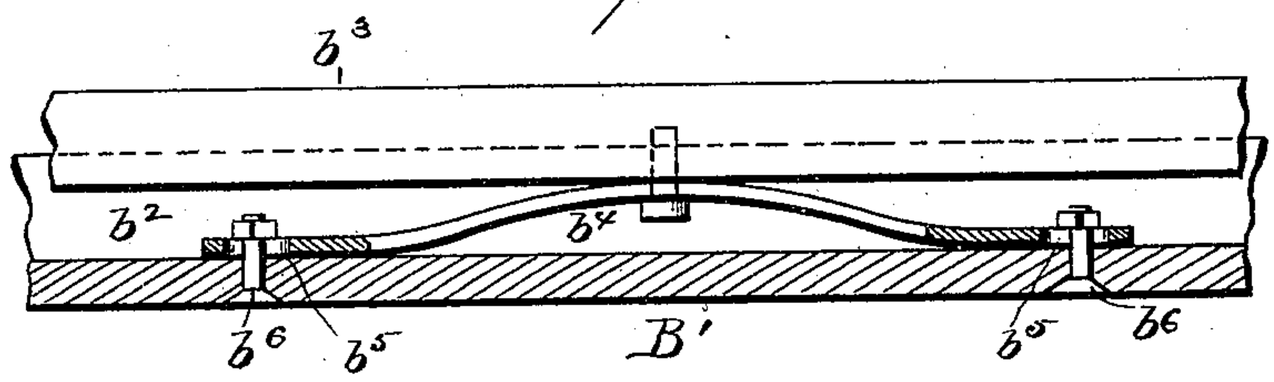


Fig. 11.



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UNITED STATES PATENT OFFICE.

NILES M. MILLER, OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR ROLLING GLASS.

SPECIFICATION forming part of Letters Patent No. 510,080, dated December 5, 1893.

Application filed January 4, 1893. Serial No. 457,271. (No model.)

To all whom it may concern:

Be it known that I, NILES M. MILLER, a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Rolling Glass; 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.

My invention relates to an improvement in machines for rolling glass.

Heretofore in the manufacture of plate glass it has been customary to roll the surface of the same for the purpose of flattening it. In such prior machines the glass was rolled on one side by passing it under a roll and then turned and again passed under the same roll in the reverse direction. With such a machine, when the plate of glass is subjected to the second rolling, the warmer end of the plate or that end which passed under the roll last, is presented to the roll first, so that that portion of the plate which was first subjected to the action of the roll, is the last to be pressed at the second passage of the plate under the roller. By thus treating the glass plate, it will be seen that the end of the plate which first reaches the roller will become chilled before it reaches said roller at the second passage under the same, and is therefore liable to be broken. This liability of breakage of the glass plate renders machines as heretofore constructed, defective and their employment very expensive.

It is the object of my present invention to obviate these defects of machines for rolling glass as previously constructed and to construct and arrange such a machine that a plate of glass can be rolled on both sides at a single passage thereof through the machine.

A further object is to construct a machine for rolling glass in such manner that both faces of the plate can be subjected successively to varying pressures.

A further object is to provide simple and efficient means for turning the glass plate under treatment.

A further object is to produce simple and efficient devices whereby to automatically lock the glass plate during the turning of the same and automatically unlocking it when it shall have been turned.

A further object is to construct the machine in such manner that the glass plate or sheet to be treated, can be introduced into the machine from either end thereof, and so that it can be ejected from either end thereof, from which it can be introduced into the annealing furnace without the necessity of turning the machine.

A further object is to provide a glass rolling machine with an improved table for supporting the plate or sheet of glass to be treated.

A further object is to construct the table of a glass rolling machine in such manner that it will retain heat a requisite length of time to prevent the too rapid cooling of the glass plate or sheet supported thereon.

A further object is to so construct a table for a glass rolling machine that it may be adapted for smooth or a figured surface on the glass plate to be treated.

A further object is to produce a table which shall be of simple construction, easy to assemble and manipulate and which shall be effectual in the performance of its functions.

A further object is to provide said table with simple and efficient devices for preventing the glass from spreading and running over the sides of the table, said devices being constructed and arranged in such manner that they will not interfere with the passage of the table and its contents under the pressing rollers.

A further object is to construct a glass rolling machine with mechanism so constructed and arranged that the table and its contents will be effectually and automatically introduced into the machine and the glass plate rolled on one side; so that, after being rolled on one side the plate of glass will be automatically turned over and so that after being thus turned over, it will be automatically carried forward and passed under other rollers to press the other side of said plate of glass.

A further object is to provide a simple gearing for a glass rolling machine, whereby the various operations thereof can be efficiently accomplished and whereby power will be applied to both ends of the rollers, and thus

cause said rollers to revolve freely and without liability of binding.

A further object is to produce a machine for rolling plates or sheets of glass, which shall be automatic in its operation and effectual in the performance of its functions.

With these objects in view the invention consists in the combination in a glass rolling machine, of rollers constructed and arranged in such manner as to successively roll a plate of glass on both sides.

It also consists in the combination in a glass rolling machine, of devices constructed and arranged to turn a plate or sheet of glass, and rolls arranged at opposite ends of said turning devices, whereby to roll both faces of a sheet or plate of glass at a single and continuous passage thereof through the machine.

It also consists in the combination in a glass rolling machine, of a series of rolls constructed and adapted to successively roll a plate of glass with increasing pressures.

It also consists in the combination in a glass rolling machine, of a table constructed in such manner as to receive and retain heat-containing material.

It also consists in the combination, in a glass rolling machine, of a table made of sections united together.

It also consists in the combination in a glass rolling machine, of a movable table made of sections, each section having a receptacle for heat retaining material, and a removable surface plate.

The invention also consists in certain novel features of construction and combinations and arrangements of parts as hereinafter set forth and pointed out in the claims.

In the accompanying drawings: Figure 1 is a side elevation. Figs. 2 and 3 are transverse sectional views. Fig. 4 is a plan view illustrating the gearing. Figs. 5, 6, 7, 8, 9, 10, 11 and 12 are detail views.

A represents the main frame of the machine.

A′ A′ are axles and A^2 wheels, adapted to run on a suitable track A^7, whereby the machine will be rendered portable.

From each end or side of the machine, platforms A^4 project and are suitably braced by means of braces A^5,—each of said platforms comprising **A**-shaped ways A^6, for the reception of similar grooves in a table hereinafter described. On one or the other of the platforms the table B, which supports the molten glass to be rolled, is placed, and the other platform serves to support the table and glass after they shall have passed through the machine, and the glass shall have been rolled.

The table B is composed of a number of sections a, as shown in Figs. 6 and 7. Each section a of the table B is provided at its edges with depending flanges a', thus producing a chamber or receptacle for the reception of soap-stone or other heat retaining material, which latter is retained in place in the chamber or receptacle by means of plates a^2, and the several sections or blocks a are secured together by means of bolts a^3. The sections a at the sides of the table are provided with depending lugs a^4 having **V**-shaped grooves a^5 therein for a purpose hereinafter explained. The lugs a^4 are provided with laterally projecting ears a^6, to which one edge of the bottom plates a^2, a^7 are secured, the other edge of the plates a^7 being secured to an inwardly projecting portion of the depending flanges a'.

On top of the table B is a face plate B′, which may be made in sections the same as the table itself if desired,—said face plate being removable, so that a smooth or figured plate may be employed, according to the kind of surface it is desired to produce on the glass plate to be treated. That is to say, when it is desired that the glass plate, after it shall have been rolled, shall have a smooth surface, a smooth face plate B′ will be employed and if it be desired that the glass shall have a decorated or figured surface, a face plate B′ having such a surface will be accordingly employed. In the upper face of the table, dovetailed grooves b are made, for the reception of similarly shaped tongues b' made on the bottom of the face plate B′. By this means the face plate B′ will be securely but removably held by the table B.

In proximity to the edges of the face plate B′, grooves b^2 are made and in these grooves, strips b^3 are loosely fitted and adapted to project above the surface of said face plate, as most clearly shown in Figs. 10 and 11. The purpose of the strips b^3 is to prevent the molten glass when it is placed on the face plate, from spreading and running off the same. Located in the grooves b^2 under the strips b^3, are springs b^4 adapted to retain the strips above the surface of the face plate, but permit the tops of said strips to be depressed when the table B and its contents pass under the rolls to press the glass, as presently explained. Each spring b^4 is preferably made semi-elliptical in form and secured at its center to the bottom of the strip b^3 and its ends bear in the bottom of the groove b^2. The ends of the springs are made with elongated slots b^5 for the accommodation of headed pins b^6 secured to the face plate B′.

At each end of the frame A, a semi-circular series of rollers c are mounted and support a cylinder or frame C, on which rollers said cylinder is adapted to turn, as explained further on,—the heads C′ of said cylinder having openings c' to permit the table B and its contents to enter said cylinder. In proximity to the ends of the cylinder C, and over the platforms A^4, rolls, D, D′, D^2, D^3, are mounted in sliding boxes d, under which rolls the table B is passed and by means of which the glass plate or sheet on said table, is pressed. Each journal box d is provided with an internally screwthreaded enlargement d' for the reception of a screwthreaded shaft d^2 mounted in the housing or framework d^3. To the lower end of each shaft d^2, a bevel pinion d^4 is fixed

and adapted to mesh with a bevel pinion d^5 carried by a horizontal shaft d^6 mounted in the housing d^3. At the inner end of each horizontal shaft d^6, a bevel pinion d^7 is secured and adapted to mesh with a bevel pinion d^8 at the lower ends of vertical shafts d^9, there being, of course, two such horizontal and vertical shafts and pinions for each roll. At the upper ends of the vertical shafts d^9, bevel pinions d^{10} are fixed, and adapted to mesh with bevel pinions d^{11}, carried by horizontal shafts d^{12}, each horizontal shaft being adapted to receive a crank arm d^{13}, by means of which it is turned. From this construction and arrangement of parts it will be seen that by operating the crank arms d^{13} the journal boxes d and consequently the rolls D, D′, D², D³, which they carry, can be raised or lowered and said rolls made to approach or recede from the platforms, as desired, according to the thickness of the glass plate or sheet to be operated upon. In practice I propose to arrange said rolls at successively varying distances from the platforms, or, more properly speaking, from the tables B,—so that the glass plate will be continuously pressed to a greater extent as it passes through the machine. For instance, supposing that the table containing the glass be inserted at the right hand end of the machine,—the glass will first be subjected to pressure by the roll D, and then to greater pressure by the roll D′, and after passing through the cylinder C, it will be subjected to a greater pressure under the roll D² than when it passed under the roll D′, and when it passes under the roll D³, it will be subjected to a still greater pressure. The shaft of each roll carries a bevel gear e, at each end, so that power can be applied to both ends of each roll and thus cause them to rotate freely and without binding. In proximity to each end of each roll, vertical shafts e' are mounted in suitable bearings e^2 and on the upper end of each shaft e', a bevel gear e^3 is mounted and adapted to mesh with the bevel gears e, carried by the shafts of the rolls. The gears e^3, of course, revolve with the shafts e', but are adapted to have a sliding movement thereon, so as to permit of the vertical adjustment of the rolls above described. The lower end of each shaft e' has a bevel gear e^4 fixed to it, with each of which, bevel gears e^5, e^6 mesh. The bevel gears e^5, e^6 are carried at the ends of horizontal shafts e^7, e^8, under the various rolls D, D′, D², D³. The shafts e^7, e^8 at each end of the machine, are provided, respectively, with gears e^9, e^{10}, and between the pairs of shafts e^7, e^8, shafts e^{11}, e^{12}, are respectively located and carry gears e^{13} adapted to mesh with the gears e^9, e^{10}, whereby to transmit motion in the same direction to both shafts e^7, e^8, and ultimately, through the gearing above described, to the rolls D, D′, D², D³. On one end of each shaft e^{11}, e^{12}, a bevel pinion e^{14} is fixed and adapted to mesh with bevel gears e^{15}, carried by a long horizontal shaft e^{16}, whereby to transmit motion from the shaft e^{11} to the shaft e^{12}. Motion is imparted to the shaft e^{11} by means of a motor, preferably an electric motor E,—the armature of which is carried by the shaft e^{11}. A clutch e^{17} is preferably located on the shaft e^{11}, whereby to throw the motor into and out of gear with the gearing which drives the rolls. At each end of the openings c' in the heads O′ of the cylinder C, are V-shaped ribs f projecting from bars or brackets f' secured at their ends to the cylinder heads, said ribs f being adapted to enter the A-shaped grooves a^5 and thus guide the table when in the cylinder C.

The under side of the table is provided with T-shaped brackets g, which are adapted to enter similarly shaped ways g' in vertically movable bars or brackets g^2 in the cylinder C, there being four such bars or brackets g^2,—two above and two below the openings c' in the cylinder heads C′. At each end of each bar or bracket g^2, a link h is pivotally connected, and the other ends of said links are pivotally connected to the shorter arms of the horizontal levers h',—which latter are pivoted at points between their ends to the cylinder heads C′. The levers h' of each pair project toward each other and at their inner ends are pivotally connected by links h^8 to bars h^2 mounted to slide in bearings h^3, secured to the heads C′. The free ends of the bars h^2 carry rollers h^4 adapted to run in a cam groove h^5 made in a plate h^6 secured to the cylinder heads C′. At diametrically opposite points the groove h^5 is curved to produce cams h^7, h^7,—and thus each half of the grooves mark a semi-circle, one of which semi-circles has a shorter diameter than the other.

From the above description it will be seen that the cylinder is adapted for the reception of two tables, one above and facing the other and that each table is supported by movable brackets. When two tables are in the cylinder and separate, there should not be more than two inches between them. When the cylinder containing the two tables and a plate of glass between them, is given a half revolution, the roller h^4 of the upper bar h^2 passes through the cam portion h^6 of the groove h^5 and, acting through the levers h' and links h connected therewith, causes the upper table to move down upon the glass plate on the lower table and thus clamp the glass plate between the two tables. When the cylinder shall have made a half revolution, it will be seen that the tables will have been transposed,—the table which was before uppermost being then the lower one, and vice versa. During this transposition of the tables, the plate or glass being treated will be turned over, and the previously upper face, which had been pressed by the rolls D, D′, is now the under face, and the previously unpressed face, is now uppermost and ready to be passed under the rolls D², D³. It will also be seen that just as the cylinder completes its half

revolution, the previously upper sliding bar h^2 will pass through the cam portion h^7 of the groove h^5 and thus the two tables will be separated, through the medium of the links and levers above described.

In order to properly and effectually turn the cylinder C and its contents, the gearing now to be described will be employed. The periphery of each head C′ of the cylinder C is made with gear teeth i and beneath said cylinder a shaft i' is mounted and carries at opposite ends gear wheels i^2, adapted to mesh with said gear teeth on the cylinder heads. Mounted at right angles to the shaft i', preferably at a point between the ends thereof, is a shaft i^3, which carries a bevel gear i^4 at one end, adapted to mesh with a bevel pinion i^5 carried by the shaft i'. At the other end of the shaft i^3 a bevel pinion i^6 is secured and meshes with a bevel pinion i^7 carried by the lower end of a vertical shaft i^8. The upper end of the shaft i^8 carries a bevel pinion i^9 adapted to mesh with a bevel pinion i^{13} carried by the inner end of a horizontal shaft i^{10}. At the other end of the shaft i^{10}, a bevel pinion i^{11} is fixed and receives motion from a bevel pinion i^{12} carried by the motor shaft e^{11}. A positive clutch i^{14} is located on the shaft e^{11}, for throwing into and out of gear, the gearing for turning the cylinder.

In order to lock the cylinder C when it shall have made its half revolution, a spring actuated lever i^{15} is mounted on the framework and carries a latch pin i^{16} adapted to enter a perforation in one of the cylinder heads C′, said lever being made with a handle portion i^{17}, by means of which to manipulate it.

A friction clutch will preferably be arranged between the ends of the shaft i^3, so that in case the latch pin i^{16}, should stop the cylinder before the clutch i^{14} is operated, the friction clutch will prevent the breaking of the gearing.

The under side of the table has a rack bar j secured thereto, and a series of pinions, which will now be described, are adapted to mesh with said rack bar to move the table.

The shafts e^7 under the rolls, D′, D³, have pinions j^2, j^3 fixed thereon, respectively, at opposite ends of the machine, said pinions being adapted to mesh with the rack bars secured to the tables. A short shaft k is mounted in suitable bearings in the cylinder C under the lower table and has a pinion k' secured thereto, in alignment with the pinions j^2, j^3. The other end of the shaft k carries a bevel gear k^2 which meshes with a bevel gear k^3 mounted loosely on the long shaft e^{16}, a clutch k^4 being mounted on said shaft e^{16} to cause the gear k^2 to rotate with it, and thus transmit motion to the pinion k', whereby to transmit motion to the table carrying the glass plate, after the latter shall have been turned, as above explained. A shaft l is mounted in the cylinder C above the upper table and projects in the reverse direction to the shaft k, and carries a pinion l' and a bevel gear l^2. From this construction it will be seen that the pinion k' will move the lower table which is first moved into the cylinder, carrying the glass plate, and when the tables shall have been transposed, the bevel gear k^2 will have moved out of mesh with the gear k^3 and the bevel gear l^2 will move into mesh with said gear k^3.

In order to properly heat the rolls D, D′, D², D³, a series of gas burners are arranged therein, and in order to heat the tables, gas burners are arranged under the same.

Before beginning the operation of rolling the glass, a table is run into the cylinder and inverted. Another table B with the desired face plate thereon, is placed on one of the platforms A⁴ and the molten glass deposited thereon. The mechanism is then started and the table with the glass thereon is fed, first under the roll D, by which the glass will be partially compressed, and then under the roll D′, by which it will be compressed to a greater extent. The table carrying the glass will continue its movement into the cylinder C, in the manner and by the means hereinbefore described. When the table carrying the plate of glass shall have entered the cylinder and become disposed directly under the upper table previously run into the cylinder, said cylinder will begin to make its half revolution,—during which the glass plate will be clamped between the two tables and when the cylinder completes its half revolution, the tables will separate and leave the glass supported on the table which will then be the under one, and thus the glass will be turned over ready to have its unpressed surface, pressed. The table carrying the glass will now be made to continue its journey through the cylinder by the means hereinbefore explained, and will leave the cylinder from the end opposite to that at which it entered, and passing under the roll D², will be pressed to a greater extent than it was pressed by the roll D′, and then passing under the roll D³, the glass will be pressed to a still greater extent. After passing under the last roll, D³, the table containing the glass will be carried forward on the platform A⁴ at the opposite end of the machine from which it started,—and the glass plate will be ready for the annealing furnace,—having had both its faces pressed by a single passage through the machine.

By providing the depressible strips b^3 in proximity to all the edges of the face plate B′, more pressure can be applied when the plate is between the two tables than is just sufficient to clamp the glass plate between them, the strips b^3 keeping the glass in place like a mold. By the additional pressure given to the glass (after rolling) the latter will be made more compact and dense and will take a finer polish and produce a better quality of glass. By employing strips at all sides of the face plate B′, the plates or sheets of glass can be rolled and compressed at the same time.

The machine is provided with platforms E, for the accommodation of the operators.

It is evident that it is immaterial from which end of the machine the glass is inserted into the same, the action being the same either way. It is also evident that slight changes might be made in the details of construction of the machine without departing from the spirit of my invention or limiting its scope, and hence I do not wish to restrict myself to the precise details of construction herein set forth, but,

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

1. A machine for rolling glass having rolls, and a turning device interposed between the rolls, said turning device operating in a plane at right angles to the travel of the glass when moving in contact with the rolls, whereby the rolling is from the same edge in every instance, substantially as set forth.

2. The combination with two rolls, and a turning device interposed between the rolls, the rolls and turning device operating in planes at right angles to each other whereby a plate of glass is rolled successively on opposite sides beginning in each instance at the same edge, substantially as set forth.

3. The combination with mechanism for turning a plate of glass, and means for automatically operating said devices, of a series of rolls located forward and rearward of the turning mechanism, one series adapted to roll one side of the glass and the other series the other side of the glass, the turning mechanism revolving in a plane at right angles to the plane in which the rolls turn whereby the glass is rolled from the same edge first by each series of rolls, substantially as set forth.

4. The combination with devices for turning a plate of glass, of rolls at each side of the turning devices operating in planes at right angles to the plane of movement of the turning devices whereby the same edge is operated upon first by each series of rolls, and means for varying the pressure of the rolls, substantially as set forth.

5. The combination with two series of rolls of varying pressure, of a turning device located between the two series of rolls, said turning device operating in a plane at right angles to the plane in which the rolls turn, substantially as set forth.

6. The combination with two series of rolls adapted to roll a plate of glass successively and at varying pressures, and devices for raising and lowering the rolls, of a turning device located between the two series of rolls, said turning device operating in a plane at right angles to the planes in which the rolls turn whereby the plate of glass operated upon is operated upon from the same edge first by each series of rolls, substantially as set forth.

7. In a glass rolling machine, the combination with suitable framework, of rolls mounted therein in sliding bearings, screwthreaded shafts adapted to enter similarly threaded sockets in said bearings, pinions carried by said shafts, shafts carrying pinions at one end adapted to mesh with said first mentioned pinions and carrying pinions at the other end adapted to mesh with pinions on other shafts, and means adapted to be attached to said last mentioned shafts whereby to turn the same to raise or lower the bearings of the rolls, substantially as set forth.

8. A table for a glass rolling machine having chambers or compartments for the reception of heat retaining material, substantially as set forth.

9. A table for a glass rolling machine comprising a series of sections, each having a compartment or chamber for the reception of heat-retaining material, and plates for retaining said heat-retaining material in said compartments or chambers, substantially as set forth.

10. In a glass rolling machine, the combination with a table made in sections secured together and adapted to receive heat-retaining material, of a face plate removably secured thereto, substantially as set forth.

11. In a glass rolling machine, the combination with a table having dove-tailed grooves in its face, of a face plate having dove-tailed ribs or flanges adapted to enter said dove-tailed grooves in the face of the table, substantially as set forth.

12. In a glass rolling machine, the combination with a table and a face plate thereon, of yielding devices projecting from said face plate to prevent the glass from running over the edges of the table or face plate, substantially as set forth.

13. In a glass rolling machine, the combination with a table and a face plate thereon, said face plate having grooves in proximity to its edges, of a strip in said grooves, and springs in said grooves under said strips to maintain the latter normally beyond the face of the face plate, substantially as set forth.

14. In a glass rolling machine, the combination with a table and a face plate thereon having grooves in proximity to its edges, of strips loosely located in said grooves, springs under said strips and having elongated slots in their ends and pins passing through said elongated slots, substantially as set forth.

15. In a glass rolling machine, the combination with a frame, and T-shaped ways therein, of a table and T-shaped brackets projecting from said table and adapted to enter the T-shaped ways in the frame, substantially as set forth.

16. In a glass rolling machine, the combination with a revoluble frame or cylinder having elongated openings in the heads thereof, and two sets of T-shaped ways in said frame or cylinder, one set above and the other below the said elongated openings, of a table, and T-shaped brackets adapted to enter and be sustained in either set of said ways, substantially as set forth.

17. In a machine for rolling glass, the combination with the main frame, and a semi-cir-

cular series of wheels carried thereby, of a frame or cylinder mounted to turn on said wheels, and devices carried by said frame or cylinder for holding two tables and a plate of glass between them, while the frame or cylinder is turning, substantially as set forth.

18. In a machine for rolling glass, the combination with the main frame and platforms projecting therefrom in opposite directions, of a revoluble frame or cylinder adapted to receive two tables and a plate of glass between them, and rolls at each end of said revoluble frame or cylinder, substantially as set forth.

19. In a glass rolling machine, the combination with the main frame, and platforms projecting in opposite directions therefrom, of a revoluble frame or cylinder mounted on said main frame, a table for supporting the glass to be rolled, a rack bar carried by said table, rolls at each end of said revoluble frame or cylinder, a shaft in proximity to each end of said revoluble frame or cylinder, a pinion carried by each of said shafts and adapted to mesh with the rack bars on the table, and a shaft mounted in the revoluble frame or cylinder and carrying a pinion to mesh with said rack bar, and means for transmitting motion to said pinions to cause the table and its contents to be passed under said rolls and through the revoluble frame or cylinder, substantially as set forth.

20. In a glass rolling machine, the combination with the main frame, platforms projecting therefrom in opposite directions, and a revoluble frame or cylinder, of rolls mounted in suitable housings in proximity to the ends of said revoluble frame or cylinder, tables having brackets whereby to support two of them in the revoluble frame or cylinder in position to face each other, a rack bar on the bottom of each table, pinions in proximity to the ends of the revoluble frame or cylinder and adapted to mesh with said rack bars to feed the table and contents under the rolls, two shafts carried by the revoluble frame or cylinder, a pinion on each shaft to mesh with the rack bars of the respective tables, a gear on each of said shafts, a shaft carried by the main frame of the machine, and a gear carried by said shaft, with which the gears carried by the shafts mounted in the revoluble frame or cylinder, are adapted to alternately mesh, substantially as and for the purpose set forth.

21. In a machine for rolling glass, the combination with a main frame, of a revoluble frame or cylinder mounted thereon, and having elongated openings in its heads, movable guides or ways supported in said frame or cylinder above and below the elongated openings, links connected with said sliding guides or ways, levers pivoted between their ends and connected at their outer ends to said links, sliding bars to which the inner ends of each pair of levers are connected, and a cam plate, with which the free ends of said sliding bars engage, whereby when the revoluble frame or cylinder carrying the two tables and a plate of glass between them begins to turn, one of said tables will be moved toward the other and clamp the glass plate between them, and when said frame or cylinder shall have made a half revolution, said tables will be separated and the glass plate thus turned left on the lower table, substantially as set forth.

22. In a machine for rolling glass, the combination with a main frame, of a revoluble frame or cylinder mounted thereon, and having elongated openings in its heads for the accommodation of tables carrying glass, movable guides supported in said frame or cylinder above and below said elongated openings, links connected to said sliding guides or ways, levers pivoted between their outer ends and connected at their ends to said links, sliding bars to which the inner ends of each pair of levers are connected, a plate secured to the main frame, said plate having a groove therein, a cam at diametrically opposite points of the groove, and rollers carried by the sliding bars and adapted to run in said cam groove, substantially as set forth.

23. The combination with a revoluble cylinder constructed to receive a pair of platens between which a plate of glass is held, of sliding devices and toggle joint mechanism for operating the slides and force the platens toward each other, substantially as set forth.

24. The combination with a revoluble cylinder, constructed to receive a pair of platens between which glass is adapted to be held, of clamp mechanism, and cams for operating the clamp to force the platens toward each other, substantially as set forth.

25. The combination with a revoluble cylinder, a pair of platens adapted to enter the cylinder, and means for turning the cylinder, of sides adapted to be connected with the platens, toggle joint mechanism, and cams for operating the toggle joint mechanism to force the platens toward each other and hold them there, substantially as set forth.

26. In a machine for rolling glass, the combination with a main frame, of a revoluble frame or cylinder mounted thereon, movable guides in said revoluble frame or cylinder, tables having brackets to enter and be supported by said movable guides, and means for moving said guides whereby to cause said tables to clamp a plate of glass between them while said frame or cylinder is turning, substantially as and for the purpose set forth.

27. In a machine for rolling glass, the combination with a main frame and pressing rolls, of a revoluble cylinder or frame, gear teeth on the periphery of each head of said cylinder or frame a shaft carrying gear wheels to mesh with said gear teeth whereby to positively propel said cylinder or frame at each end thereof, and bearing for imparting motion to said shaft, substantially as set forth.

28. In a machine for rolling glass, the combination with a main frame, and platforms

projecting therefrom in opposite directions, of a revoluble frame or cylinder, tables for supporting the glass to be rolled, rack bars carried by said tables, pinions for engaging said rack bars to propel the tables, rolls for pressing the glass supported by said tables, gearing for imparting positive motion to each end of said roll, a shaft from which motion is imparted to all of said devices to feed the tables through the machine, to rotate the rolls and to turn the frame or cylinder and an electric motor adapted to transmit motion to said shaft, substantially as set forth.

29. In a machine for rolling glass, the combination with a table and rolls, of a face plate made in sections and having a figured surface, substantially as set forth.

30. In a glass rolling machine, the combination with rolls and a table, of a face plate on the table, and yielding strips or guards in proximity to all the edges thereof, substantially as set forth.

31. In a machine for rolling glass, the combination with two tables, of a face plate, yielding strips in proximity to all the edges of said face plate, and devices for forcing said tables together to compress a sheet of glass between them, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

NILES M. MILLER.

Witnesses:
D. S. LINDSAY,
CLARENCE ELSEY.