

(No Model.)

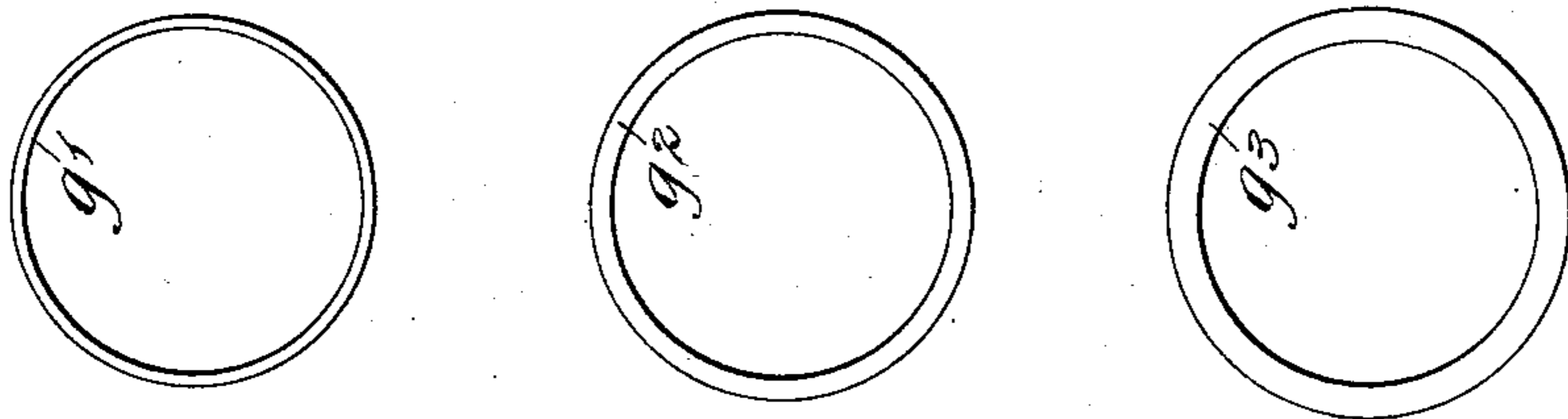
2 Sheets—Sheet 1.

F. P. DAVIDSON.  
APPARATUS FOR ROLLING PLATE GLASS.

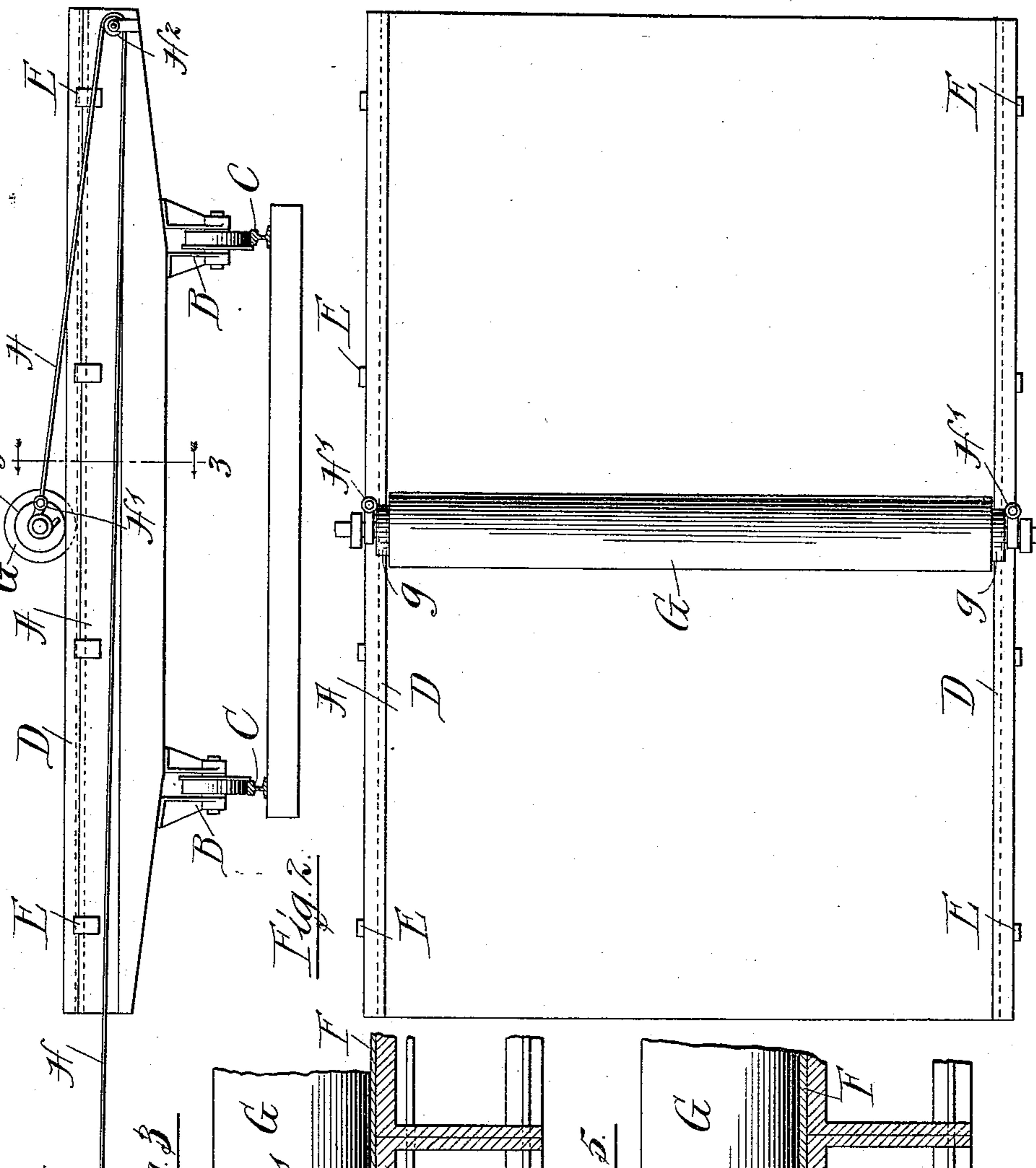
No. 547,630.

Patented Oct. 8, 1895.

*Fig. 4.*

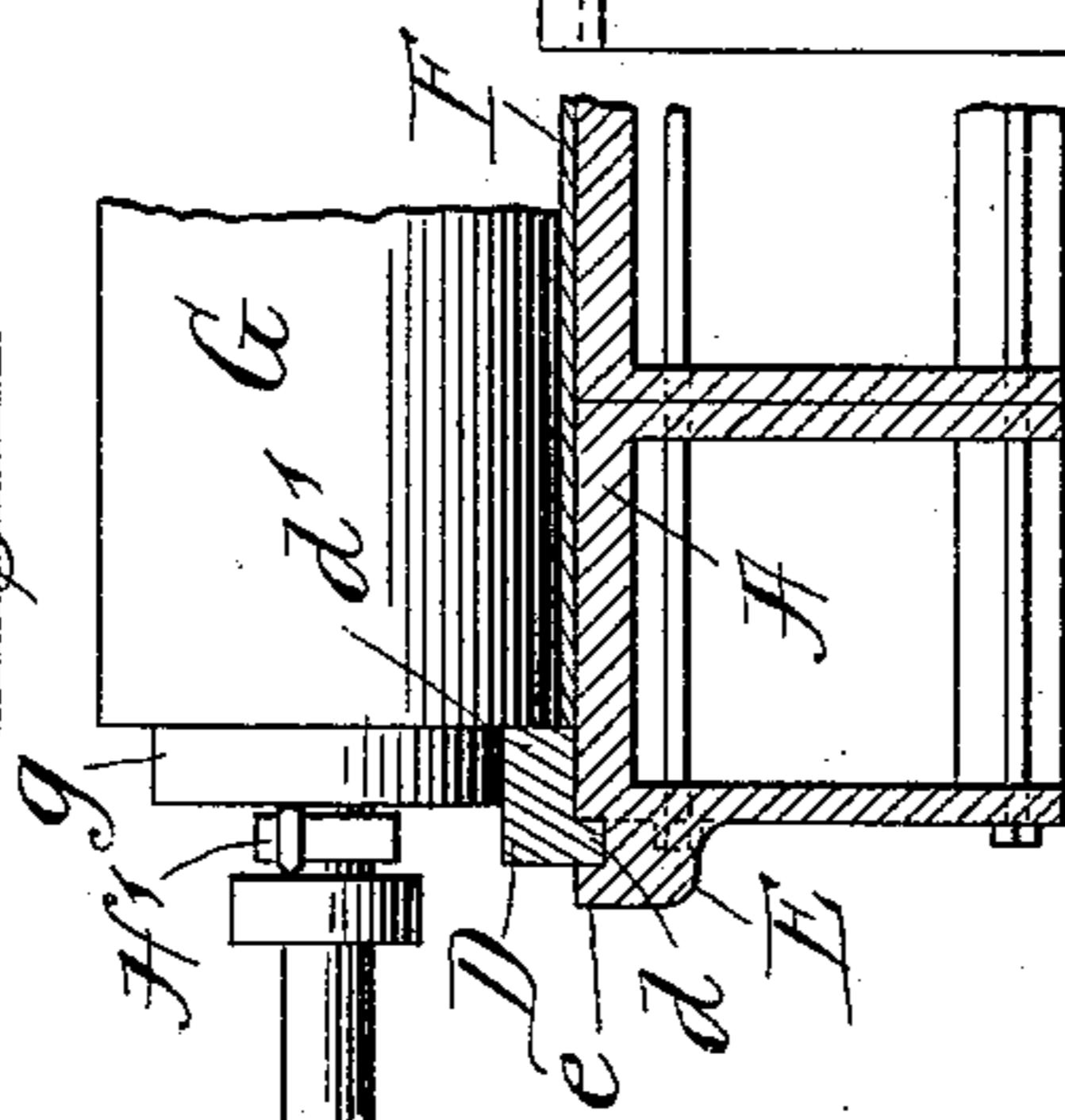


*Fig. 1.*

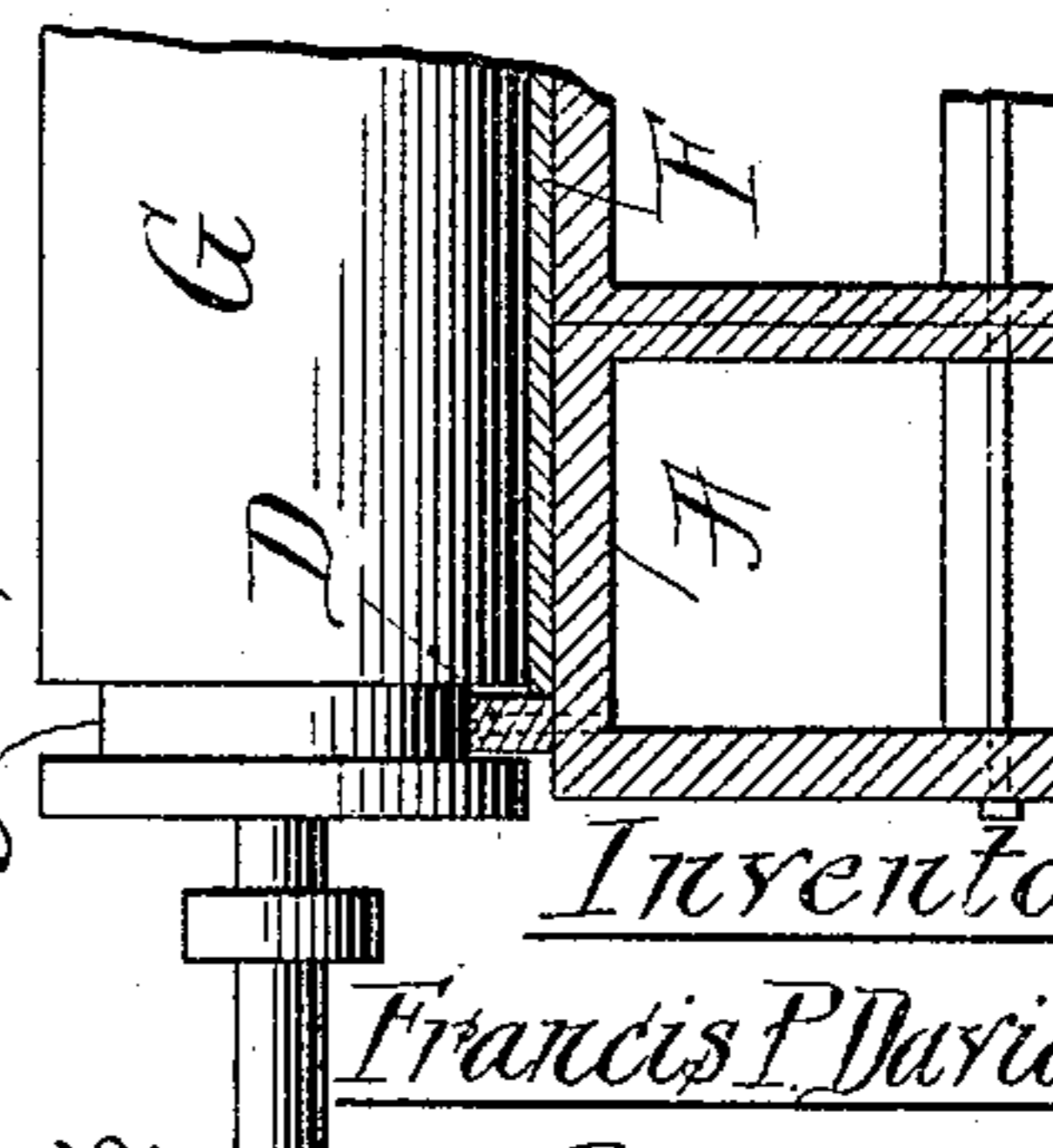


*Fig. 2.*

*Fig. 3.*



*Fig. 5.*



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*Clinton Hamlin*

*Inventor:-*  
*Francis P. Davidson*  
*by:- Dayton, Poole & Brown*  
*his Attys.*

(No Model.)

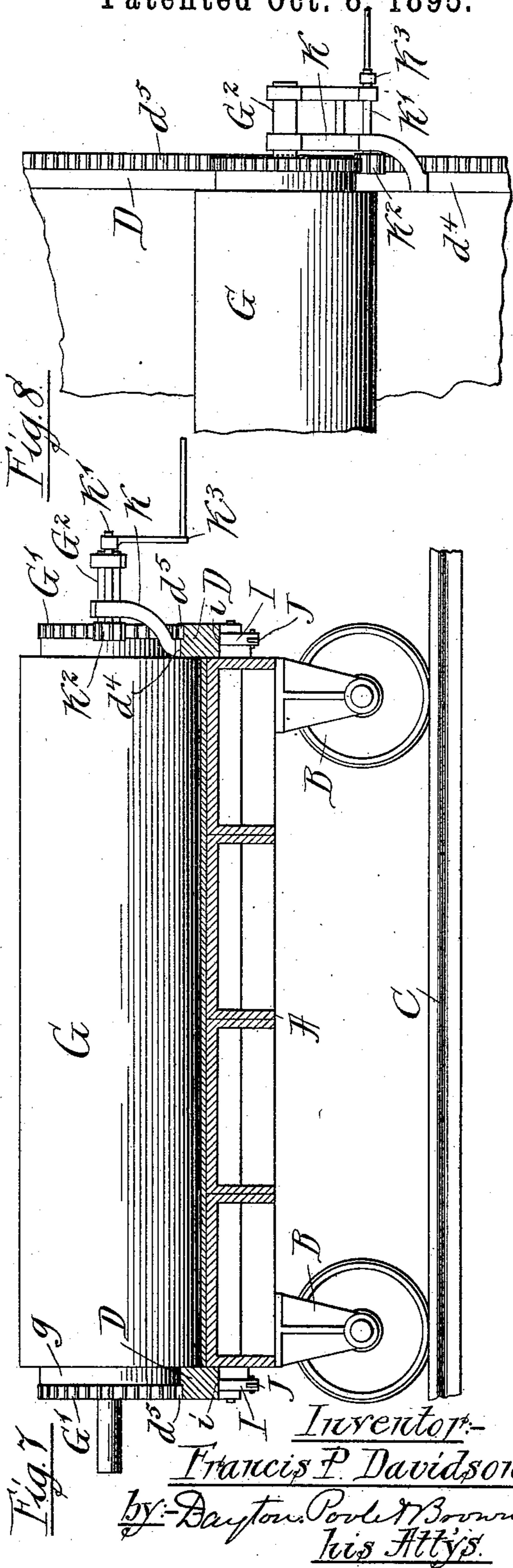
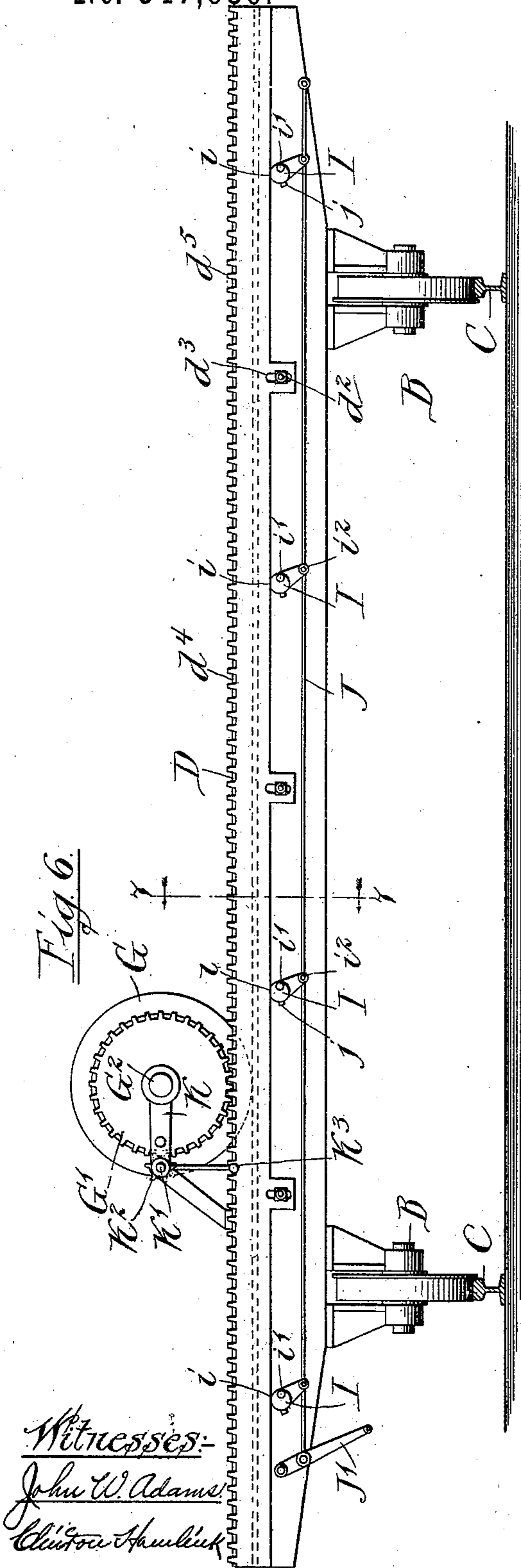
2 Sheets—Sheet 2.

F. P. DAVIDSON.

# APPARATUS FOR ROLLING PLATE GLASS.

No. 547,630.

Patented Oct. 8, 1895.



ANDREW B. GRAHAM, PHOTO-LITHO, WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

FRANCIS P. DAVIDSON, OF EAST CHICAGO, INDIANA.

## APPARATUS FOR ROLLING PLATE-GLASS.

SPECIFICATION forming part of Letters Patent No. 547,630, dated October 8, 1895.

Application filed May 31, 1895. Serial No. 551,143. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS P. DAVIDSON, a resident of East Chicago, in the county of Lake and State of Indiana, have invented certain new and useful Improvements in Apparatus for Rolling Plate-Glass; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to apparatus for the rolling of plate-glass or analogous substances, in which it is the intention to roll the mass to a uniform thickness.

In rolling plate-glass as heretofore practiced metal strips have been laid upon the casting-table for the support of the heavy metal roller which is to be moved over the table from end to end thereof, with the purpose of forming a mass of glass, placed in a molten condition in front of the roller, into a plate having a thickness equal to the height of the strips or rails upon which the roller is supported above the table and between which the glass is confined.

Theoretically there should be no failure of an apparatus having the above-described construction to produce a plate of uniform thickness; but, in fact, it is found, owing to the ductility of the glass and to the forward strain upon the just-formed portion of the plate immediately beneath the roller, due to its integrality with the mass in front of said roller, that the plate produced lacks the desired uniformity, being intermittently drawn to less thickness than the rails supporting the roller, so as to give the plate an unequal thickness and a transversely-corrugated surface. By reason of this defective operation of the apparatus as it has been practiced when rolling plates to be ground to a certain uniform thickness, I use roller-supporting strips of much greater thickness than the plate intended to be produced with the result, of course, of putting an excessive quantity of glass into the plate in order that its thinner parts may be thick enough for the desired product when finished.

It is the primary object of my invention to provide an apparatus for rolling plate-glass in which the plate may rolled to uniform

thickness, or substantially so, in the first instance, thus obviating the necessity of introducing a greatly-excessive quantity of glass into the plate and of grinding away such excess to obtain uniformity.

To this end my invention consists in providing means for giving to the lower surface of the roller, which acts upon the glass, a backward motion relative to the table in connection with its bodily movement over the latter and in this way to prevent or compensate for the drawing action of the roller to which the reduction to the thickness of the plate below that of the roller-supporting strips is due.

In the appended drawings, illustrating my invention, I have shown additional features of construction, which will be described in connection with the description of said drawings.

Figure 1 is a side elevation of a bed or table adapted for use in rolling plate-glass embodying my invention. Fig. 2 is a top plan view of the same. Fig. 3 is a fragmentary transverse vertical view of a portion of the bed, taken on line 3 3 of Fig. 1. Fig. 4 is a view of a series of different-sized rings adapted for use upon the roller. Fig. 5 is a view similar to that of Fig. 3, showing a modification. Fig. 6 is a view similar to that of Fig. 1, illustrating a modification. Fig. 7 is a transverse vertical sectional view taken on line 7 7 of Fig. 6. Fig. 8 is a fragmentary plan view showing one end of the roller and driving mechanism.

As shown in Figs. 1 to 3, inclusive, A designates the casting table or bed, which is of a rectangular form and is supported upon trucks B B, that rest upon the track-rails C C. The table may be formed in any suitable manner to afford the desired smooth, level, and perfectly-rigid upper surface. At each side of the bed A is secured a rib or rail D, shown in these figures of L shape in cross-section and arranged to lie with one of its flanges *d'* upon the top surface of the table and the other flange *d* resting against the side edge of the table.

E E designate brackets secured to the sides of the table beneath the downturned flanges *d* of the rails, said brackets being provided with upturned flanges *e*, which serve to hold

the ribs D in place, but permit them to be lifted off and removed or exchanged when desired. The height of the ribs D or the vertical thickness of the upper flanges  $d'$  thereof is greater than the proposed thickness of the plate of glass, (indicated at F in the drawings.)

G designates the roller, which is of any approved material, size, and form. It has its ends  $g$  reduced where it rests and rolls upon the ribs D; but such reduction of the diameter at  $g$  is less than the height of the ribs D, so that suitable space is afforded between the table and the body of the roller for the formation of the desired glass plate.

Obviously when the roller G is rolled over the table upon its trunnions or reduced portions  $g$  the peripheral speed of the roller is greater than the rate of bodily movement, and as a consequence the surface of the roller adjacent to the table has a backward movement relative to the latter. This has the effect of not only rolling down the plate of glass to proper thickness, but at the same time of giving a pushing action upon the "metal" backward beneath the roller, thus neutralizing the tensile strain upon the subjacent and just-formed portion of the plate, which strain is due to the causes hereinbefore referred to. As a result, the plate is left of substantially uniform thickness.

In order that the size of the trunnions  $g$  may be changed and the peripheral backward speed of the roller regulated to suit varying conditions, I may provide a series of rings  $g'$ ,  $g^2$ ,  $g^3$ , of different thicknesses, which may be placed upon the reduced ends or spindles of the roller. Ribs D, of different thicknesses, are also provided to compensate for the changed size of the bearings of the roller, and also to give the desired thickness to the product.

Any suitable means may be employed to draw or drive the roller across the bed, the means shown in this instance, Figs. 1 to 4, inclusive, consisting of the usual cables H, connected with the ends of the roller by means of hooks H', trained thence around guide-sheaves H<sup>2</sup> and to any suitably-driven winding-drum, in the usual manner.

In Fig. 5 is shown a slight modification of the apparatus, in which the ribs or rails D rest upon the bed and the roller is provided with reduced bearings for engagement with said rails in the form of circumferential grooves  $e'$ , the bottoms of which form the supporting-surfaces of the roller.

In Figs. 6, 7, and 8 is shown an embodiment of the invention, in which the roller is propelled by a rack-and-pinion mechanism. As shown in said figures, D D designate the roller-supporting ribs, said ribs being in this instance secured to the vertical sides of the table by means of bolts or studs  $d^2$ , passing through vertical slots  $d^3$  and into the body of the table, thereby affording such a connection as will permit the rails to be raised or lowered bodily. I I designate a plurality of supporting-cams, upon the ends  $i$  of which the racks

rest, said cams being pivotally secured to the sides of the table beneath said rails D by means of studs  $i'$ , which extend through said cams into the body of the table. Each cam I is provided with an arm  $i^2$ , and all of said arms on the same side of the table are connected by a rod J, by means of which the cams may be oscillated simultaneously and to the same extent. A suitable lever J' is shown as attached to the end of said rod J, whereby it may be actuated, and a stop, as  $j$ , may retain the cams at their limit of movement under pressure. The upper surface of each of the ribs D, as here shown, is divided longitudinally to give, first, a smooth inner surface  $d^4$ , upon which rests the trunnion or reduced part  $g$  of the roller, and, second, a toothed outer part or rack  $d^5$ , the pitch-line of the rack being in the plane of the roller-supporting surface  $d^4$ . With this rack engages the teeth of a gear-wheel G', fixed upon the roller G and having its pitch-line tangent to the plane of the rail-surface  $d^4$ . Preferably two such racks and gear-wheels are provided at opposite sides of the machine, as illustrated in Figs. 6, 7, and 8.

As an improved means of driving the roller over the bed, a shaft G<sup>2</sup>, Figs. 6, 7, and 8, is fixed in the roller and arranged to extend axially outward therefrom, upon which is rotatably mounted a pinion-supporting arm or frame K, which extends radially outward to the periphery of the roller and is then deflected inward and downward behind the roller, so that its end may rest and slide upon the smooth part  $d^4$  of the upper surface of the rib D. K' designates a shaft mounted in the frame K and carrying a pinion K<sup>2</sup>, which intermeshes with the gear G' of the roller. A crank K<sup>3</sup> is provided upon the outer end of the shaft K', by means of which the pinion may be turned. The turning of the crank K<sup>3</sup> will drive the roller, the bracket-support being drawn along by the roller, and the operators walking along at its side as the roller advances.

I claim as my invention—

1. An apparatus for rolling plate glass comprising a bed, roller supporting rails having their supporting surfaces above the level of the bed, and a roller having reduced portions resting upon the rails, whereby the lower surface of the roller which acts upon the glass has a backward movement relative to the bed, while the reduced supporting surfaces of the roller which are in contact with the rails merely roll, without slipping upon said rails.

2. An apparatus for rolling plate glass comprising a bed, roller supporting rails arranged with their supporting surfaces above the level of the bed, a roller having portions or trunnions of less diameter than the body of the roller and resting upon said rails, a rack connected with the bed and having its pitch line in the horizontal plane of the roller supporting rails, and gear wheels upon the roller

adapted to engage the rack, the pitch circle of the said wheels being of the same diameter as the trunnions.

5 3. The combination, with the bed provided with a rack, and a roller provided with a toothed wheel engaged with the rack, of a frame mounted on the axis of the roller and arranged to bear and move at its opposite end upon a surface belonging to the bed, a pinion  
10 mounted in said frame and engaged with the toothed wheel, and means for rotating said

pinion to give rolling motion therethrough to the roller, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature, in presence 15 of two witnesses, this 10th day of May, A. D. 1895.

FRANCIS P. DAVIDSON.

Witnesses:

M. E. DAYTON,  
WILLIAM L. HALL.