

March 6, 1951

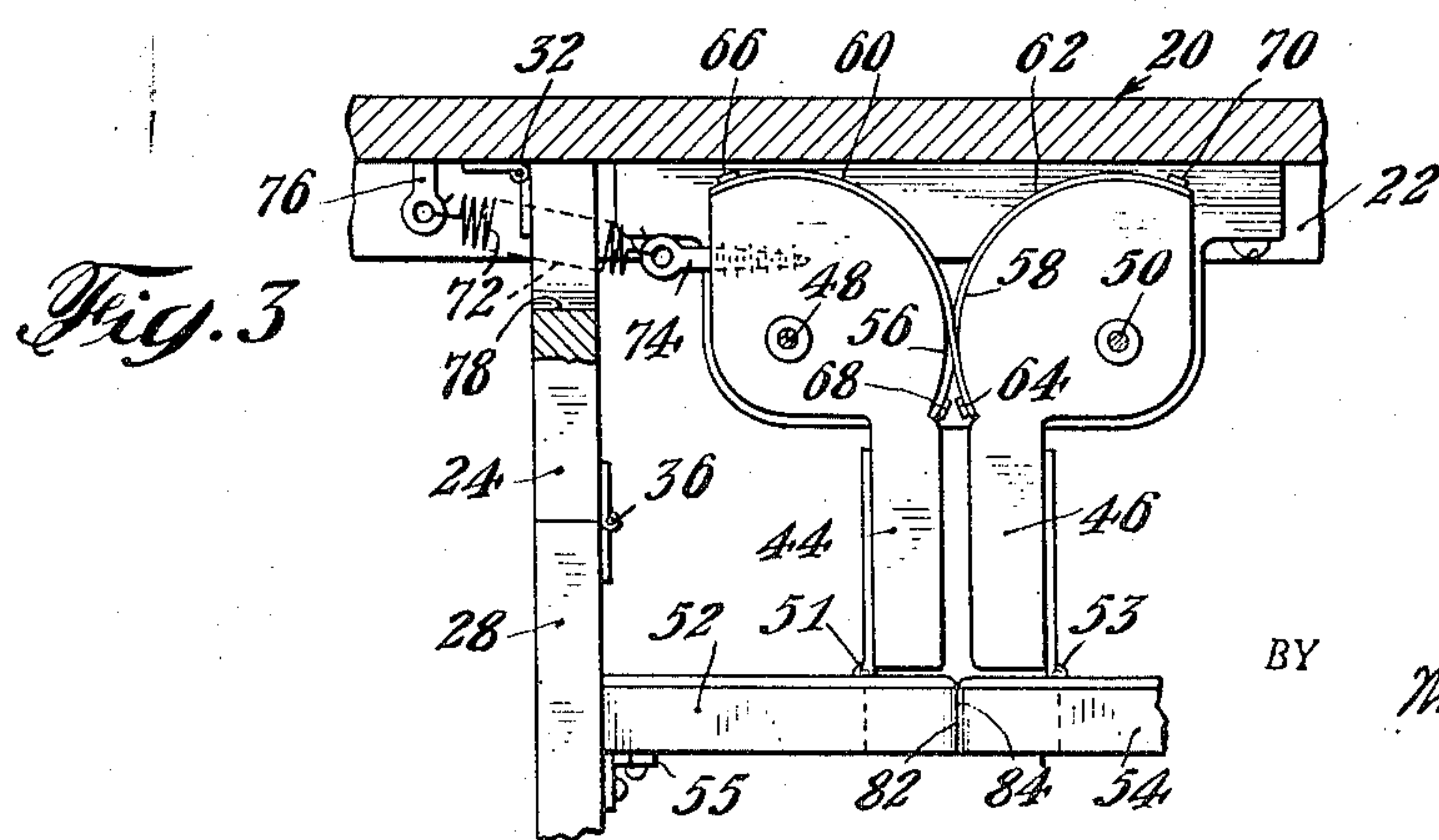
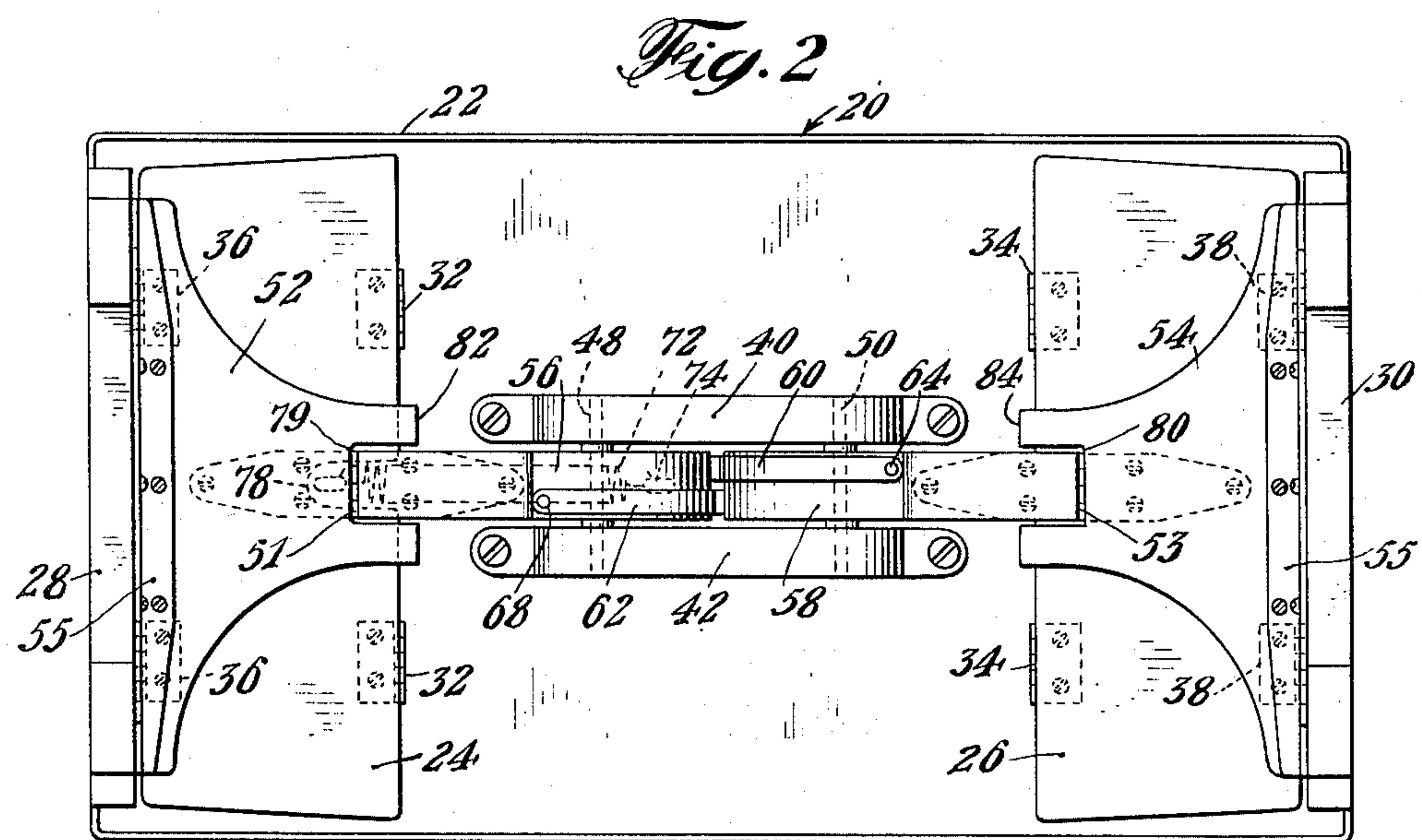
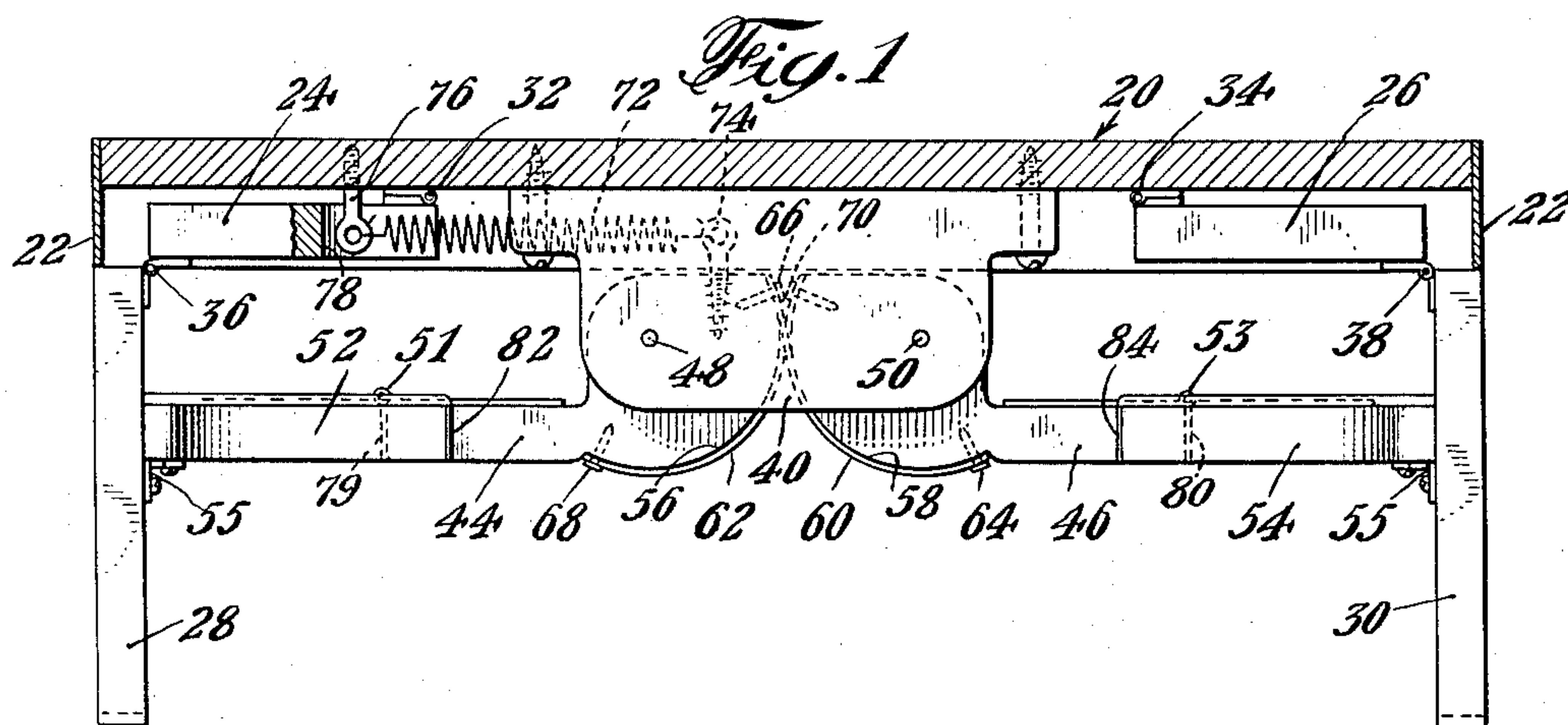
B. HOPPE

2,544,228

VERTICALLY ADJUSTABLE TABLE CONSTRUCTION

Filed July 17, 1947

6 Sheets-Sheet 1



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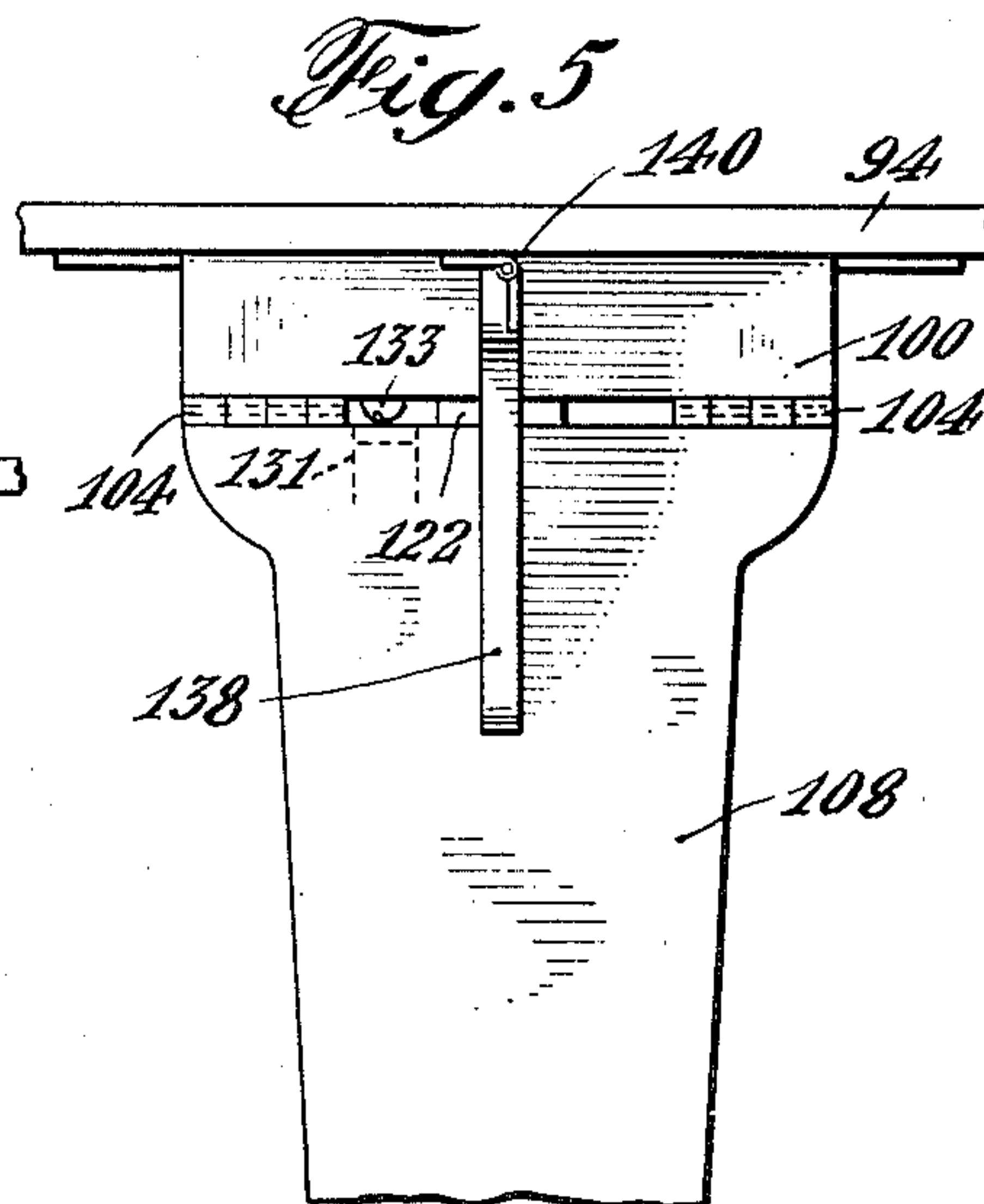
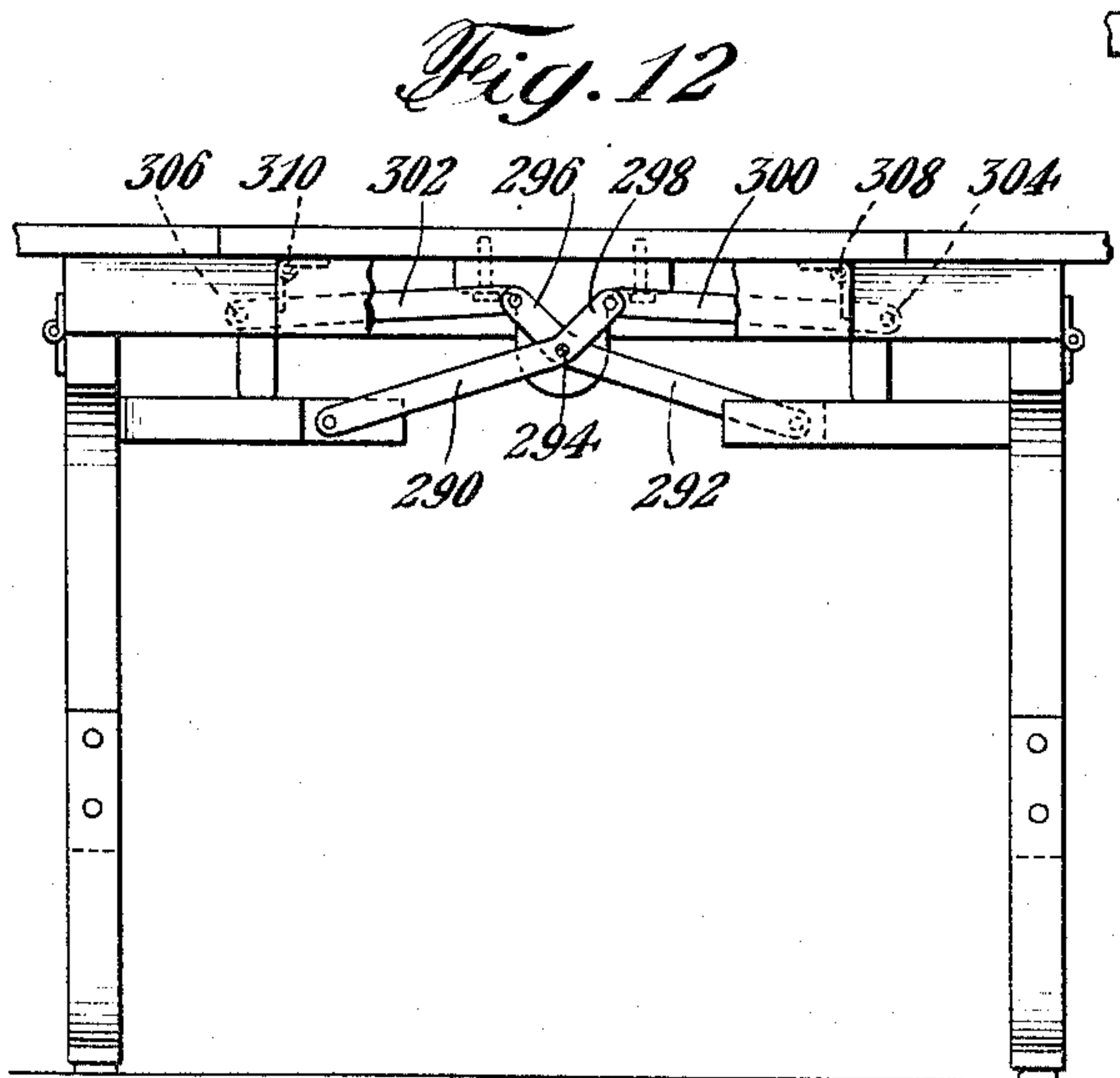
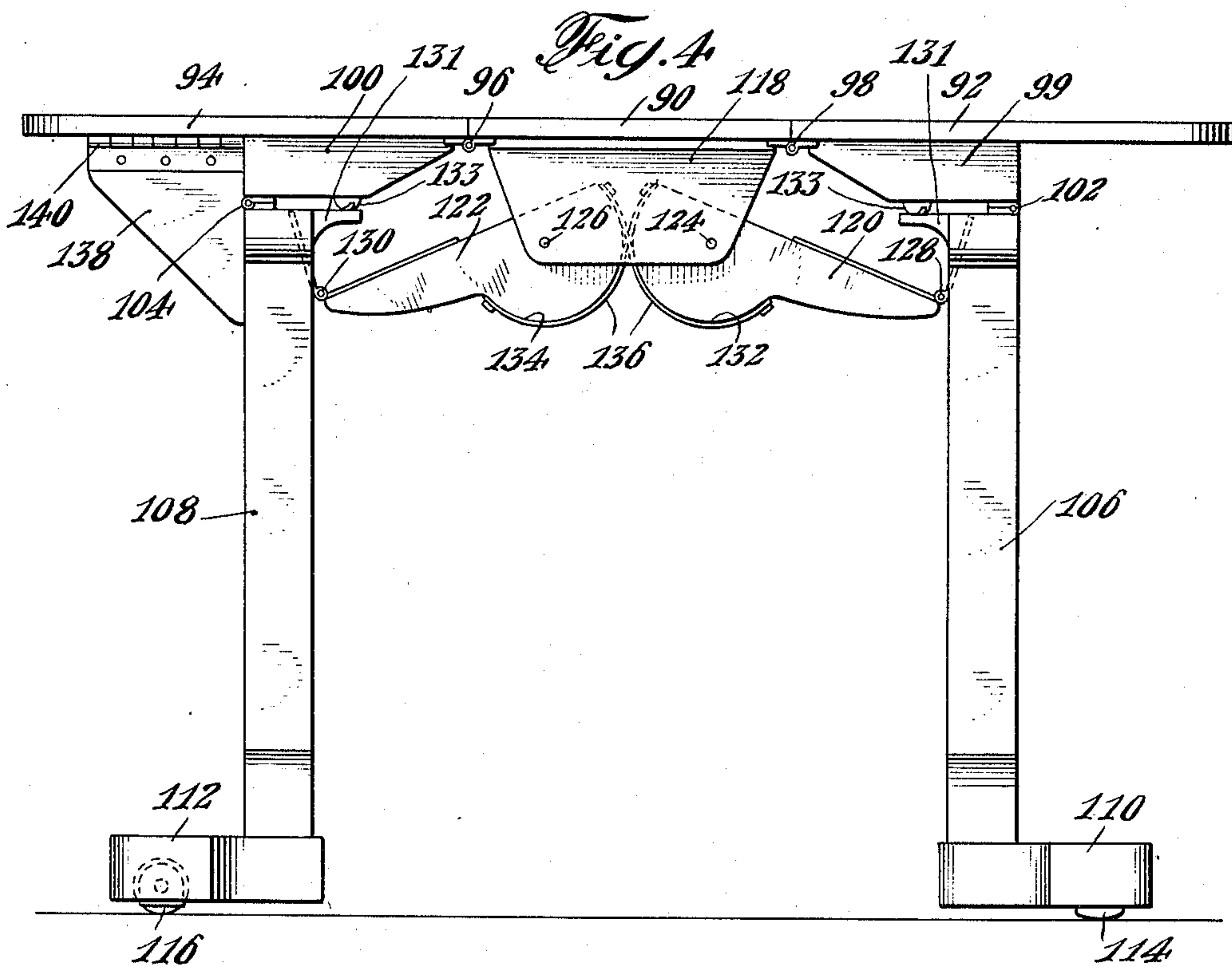
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VERTICALLY ADJUSTABLE TABLE CONSTRUCTION

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6 Sheets-Sheet 2



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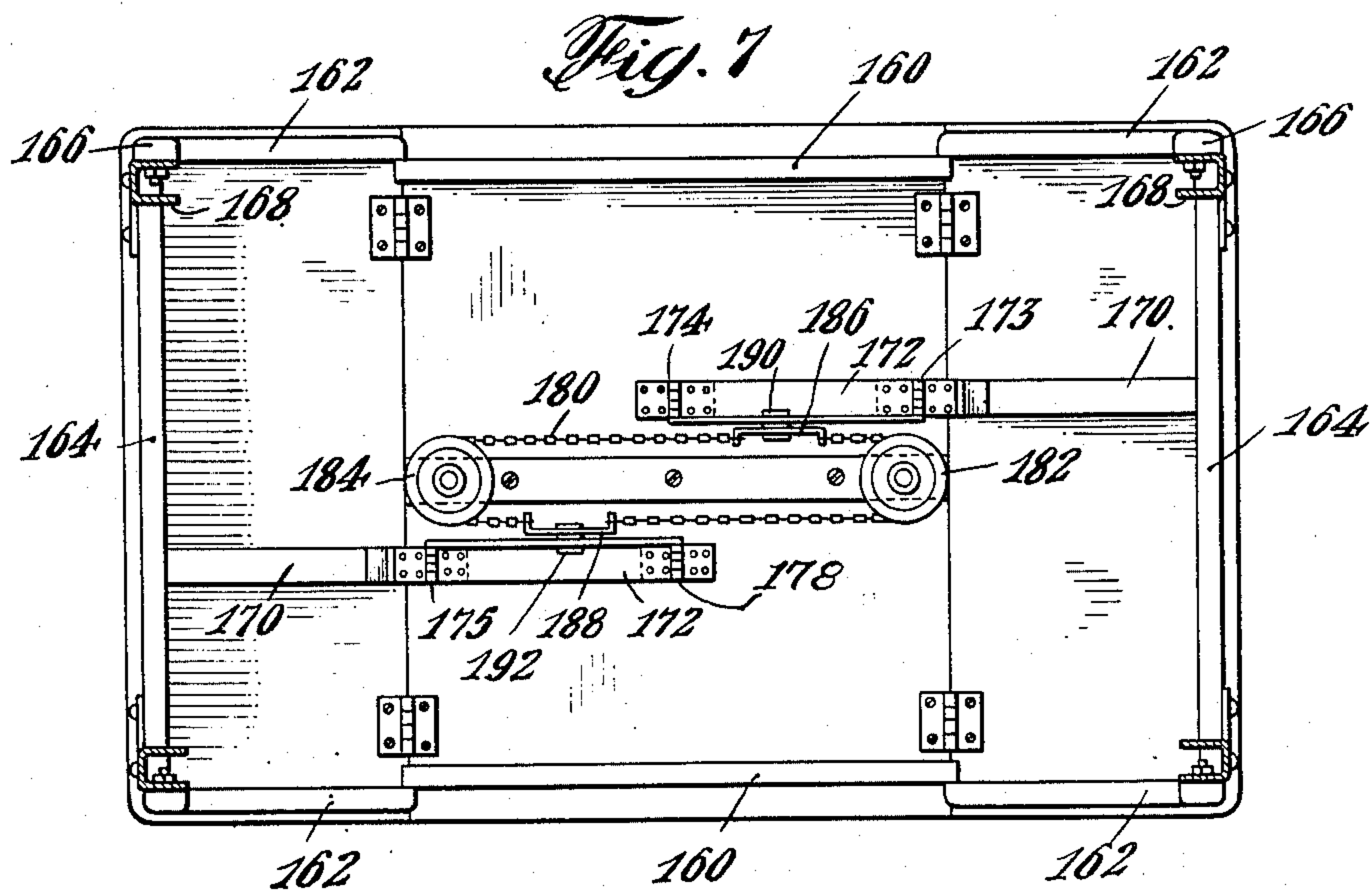
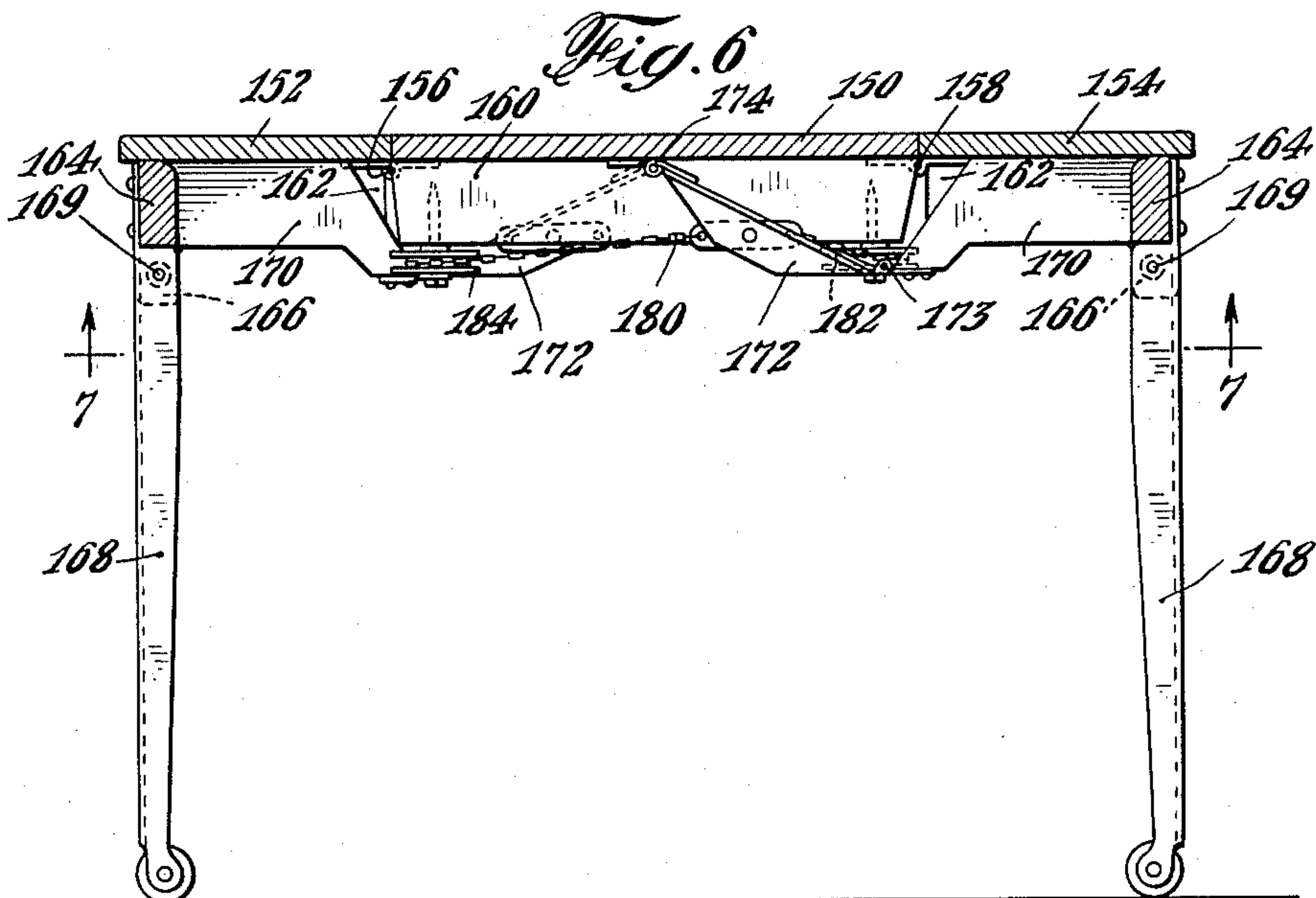
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VERTICALLY ADJUSTABLE TABLE CONSTRUCTION

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6 Sheets-Sheet 3



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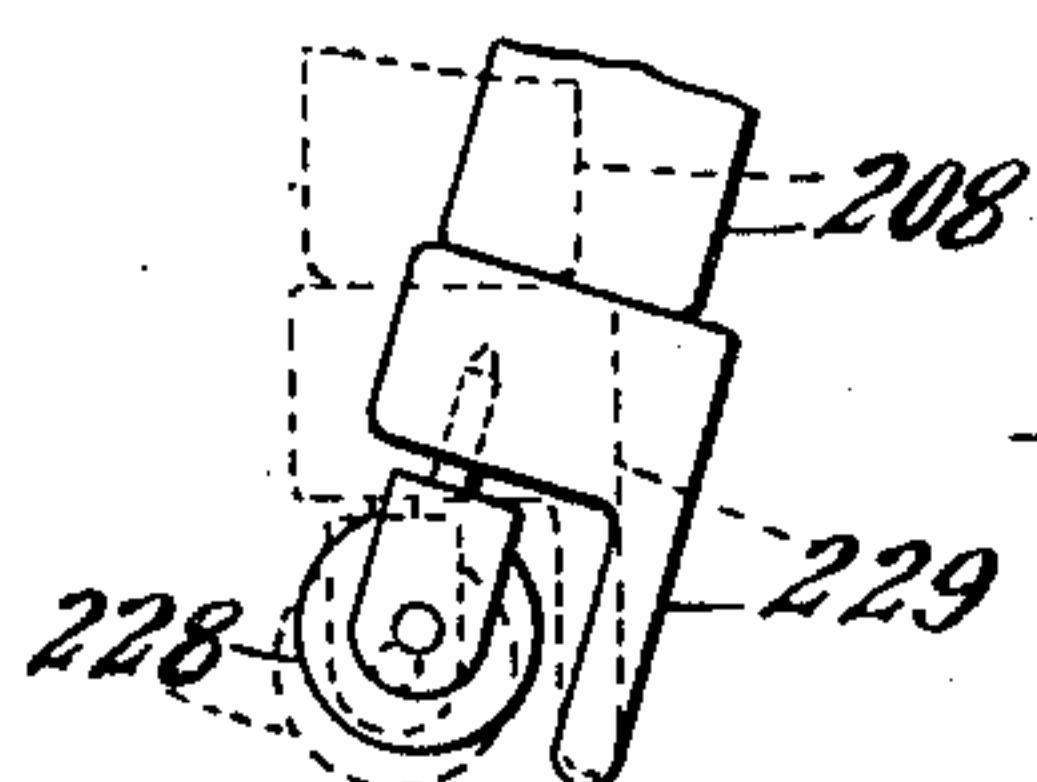
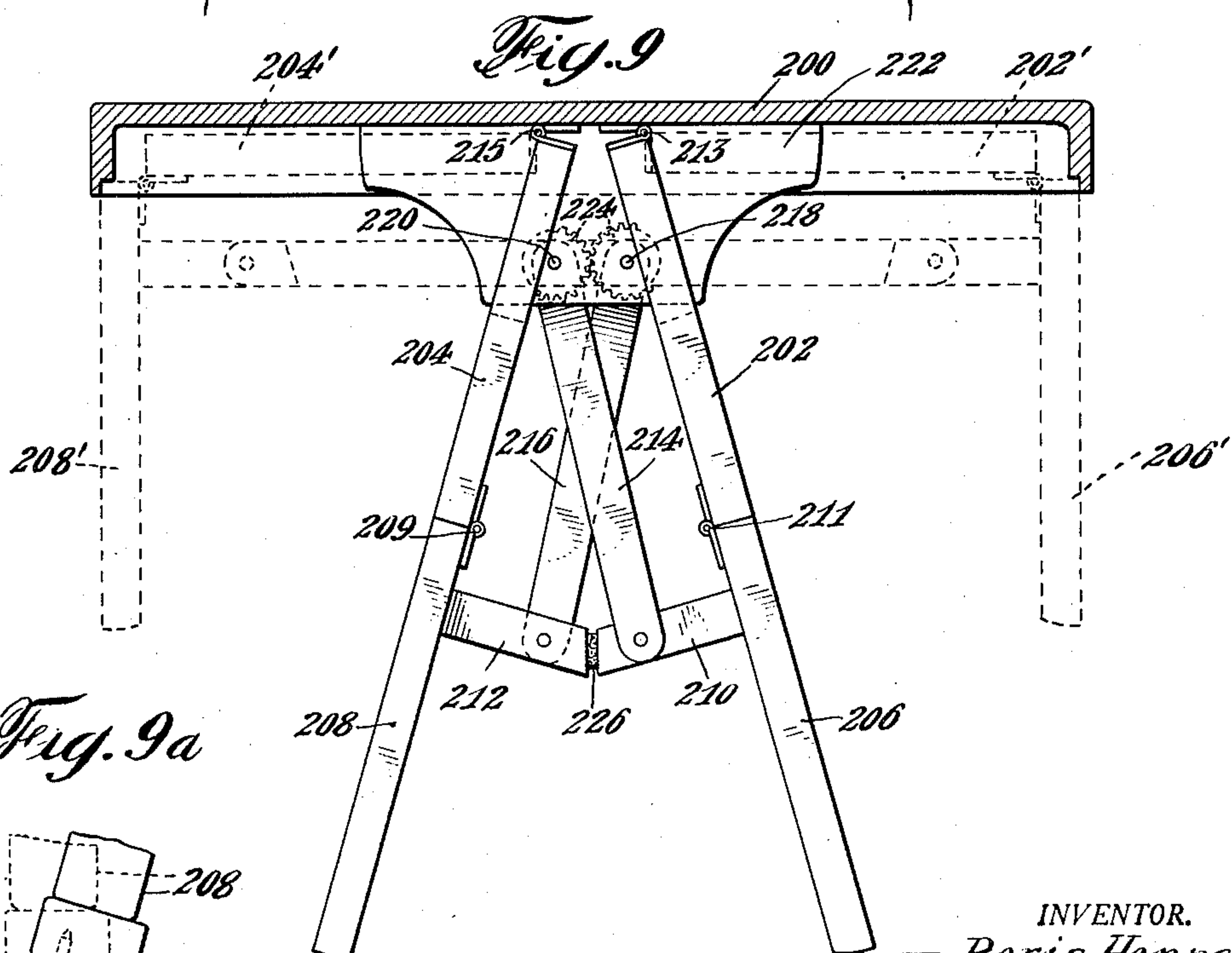
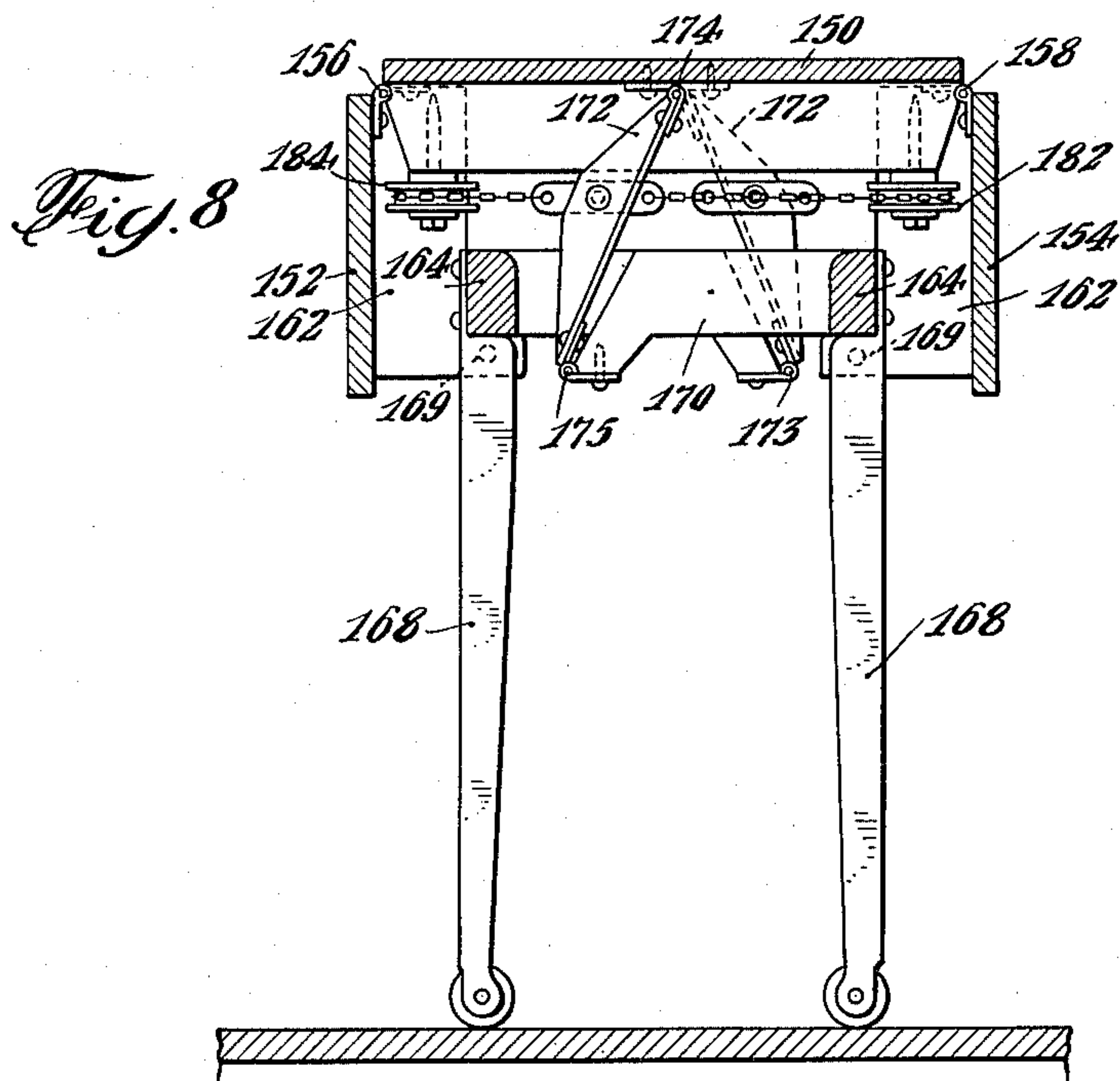
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VERTICALLY ADJUSTABLE TABLE CONSTRUCTION

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6 Sheets-Sheet 4



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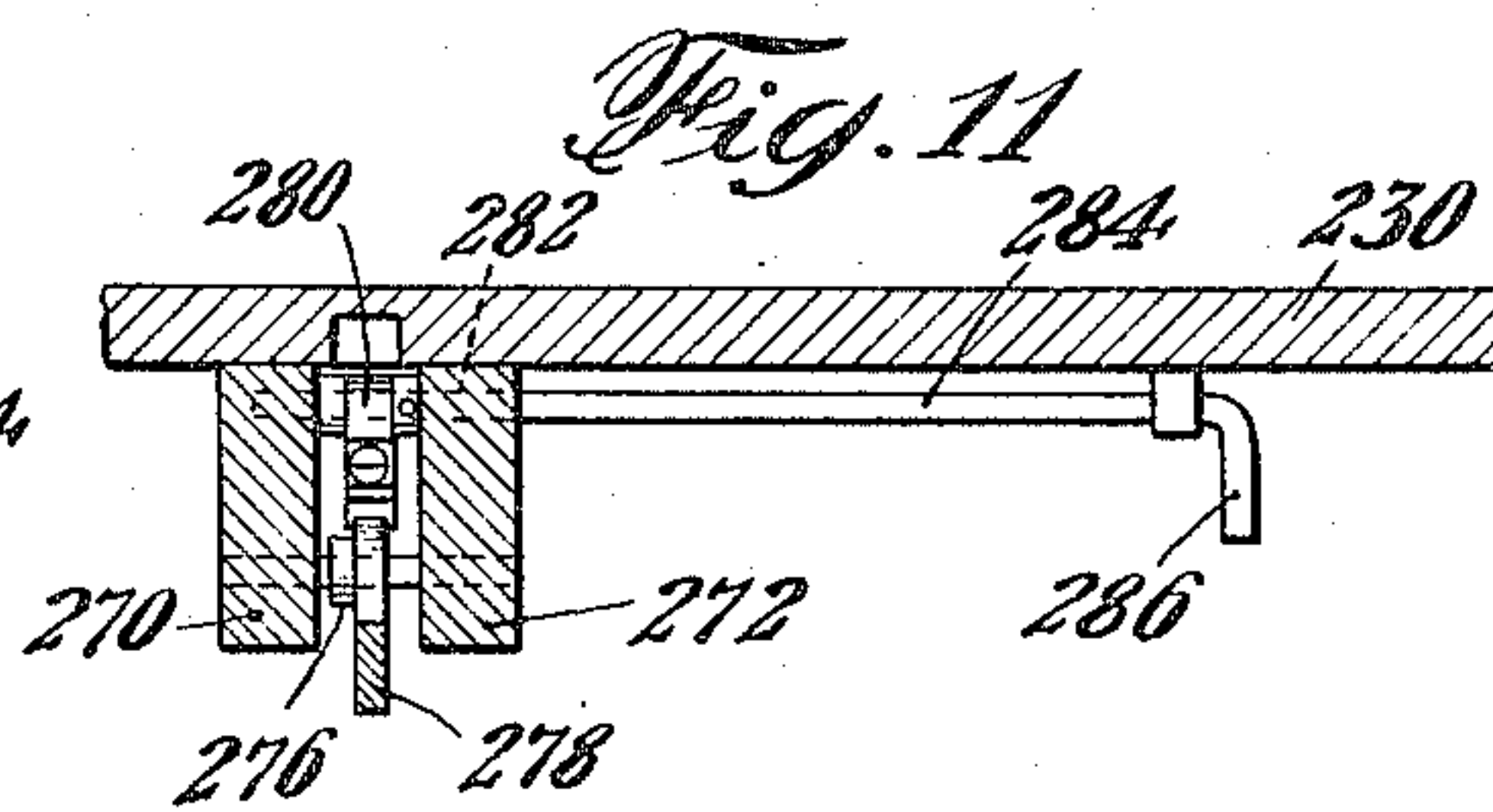
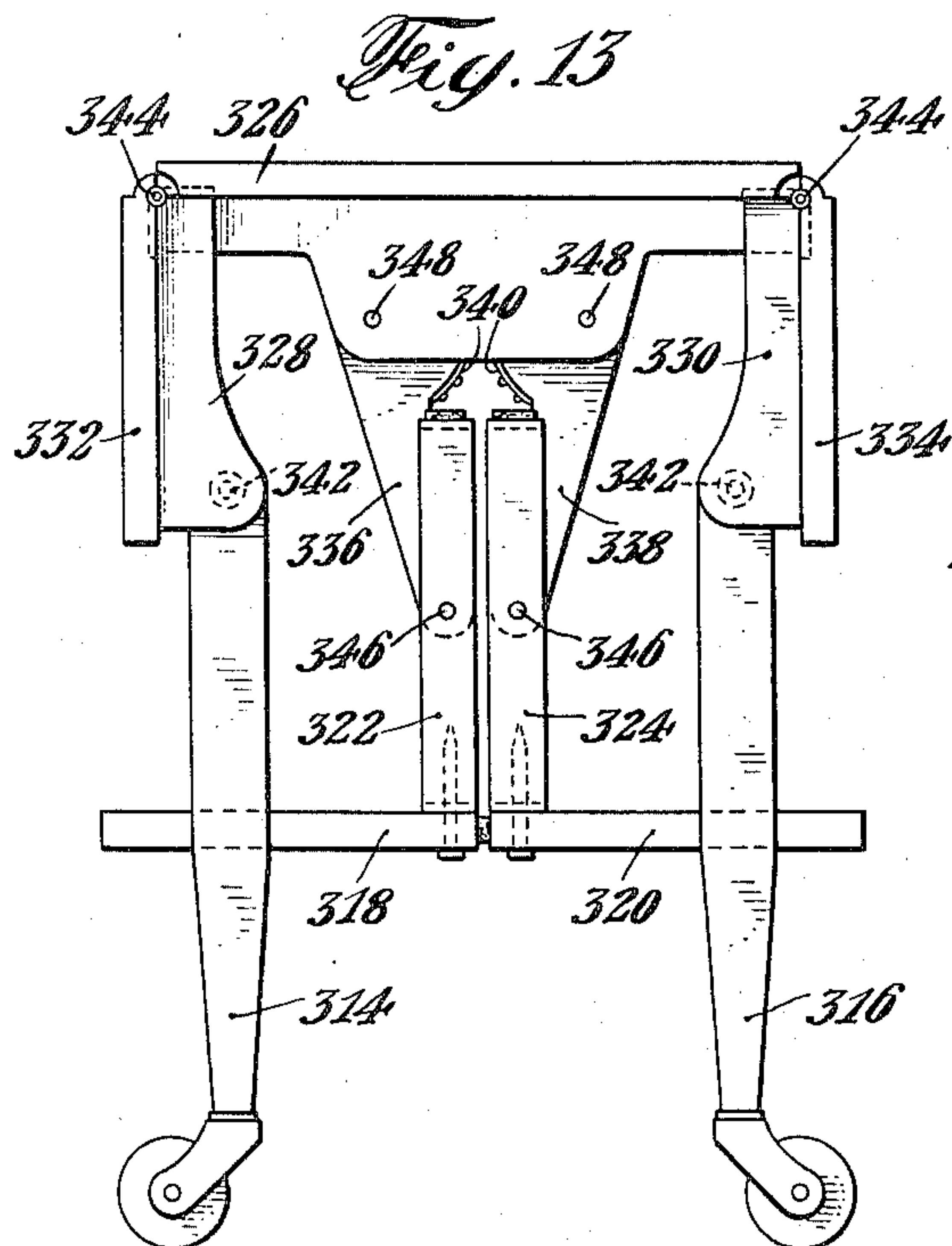
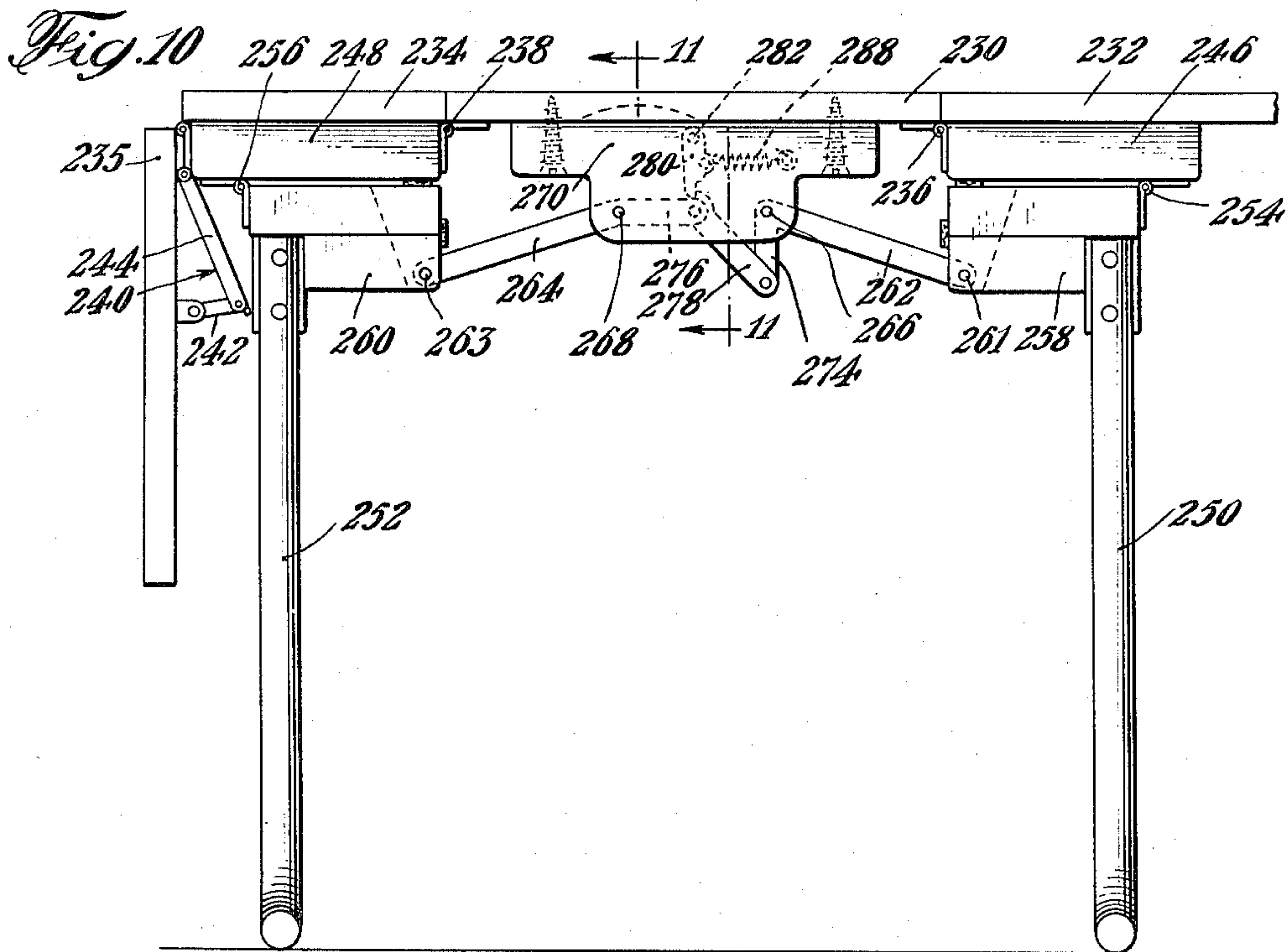
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VERTICALLY ADJUSTABLE TABLE CONSTRUCTION

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6 Sheets-Sheet 5



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VERTICALLY ADJUSTABLE TABLE CONSTRUCTION

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6 Sheets-Sheet 6

Fig. 12a.

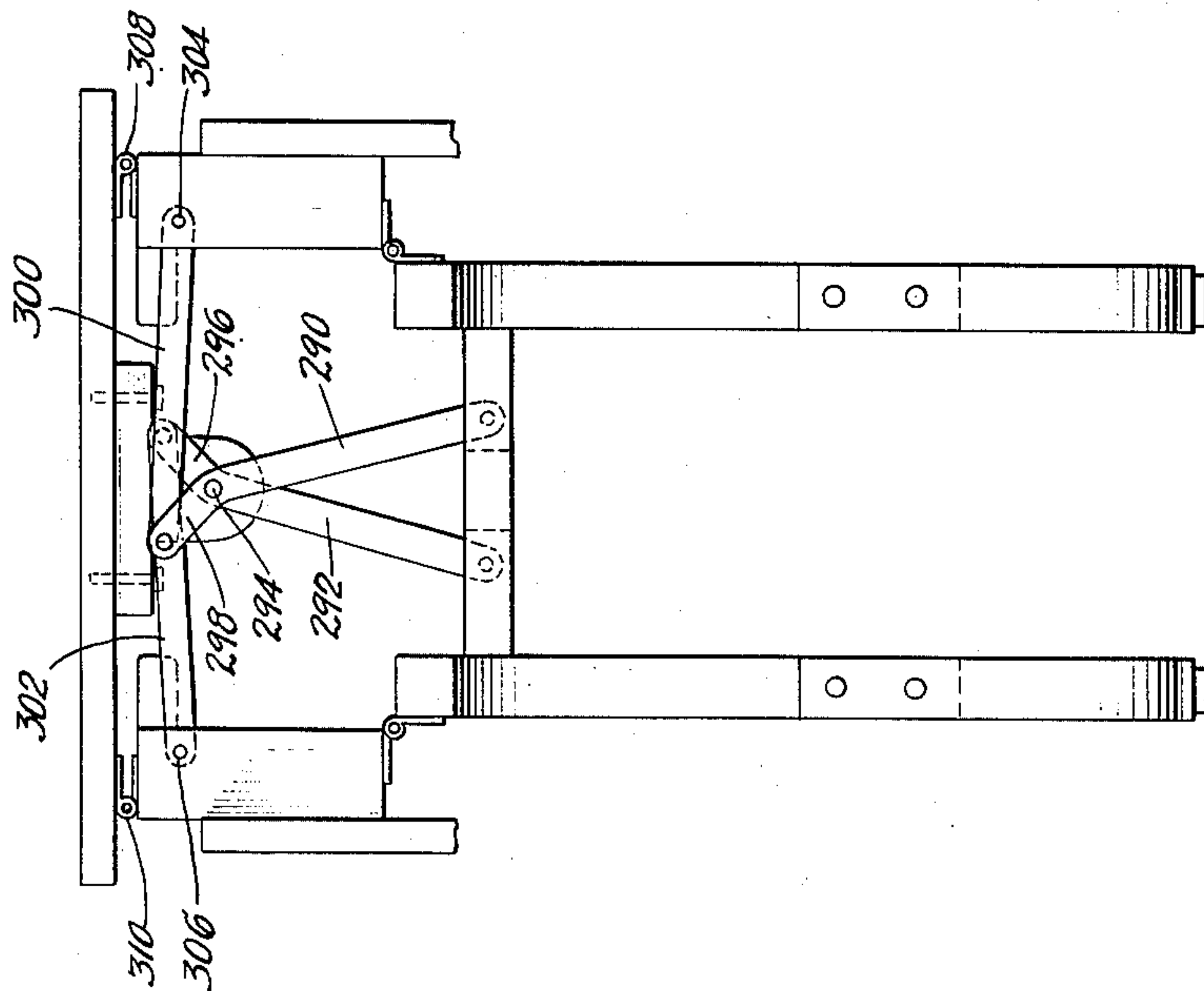
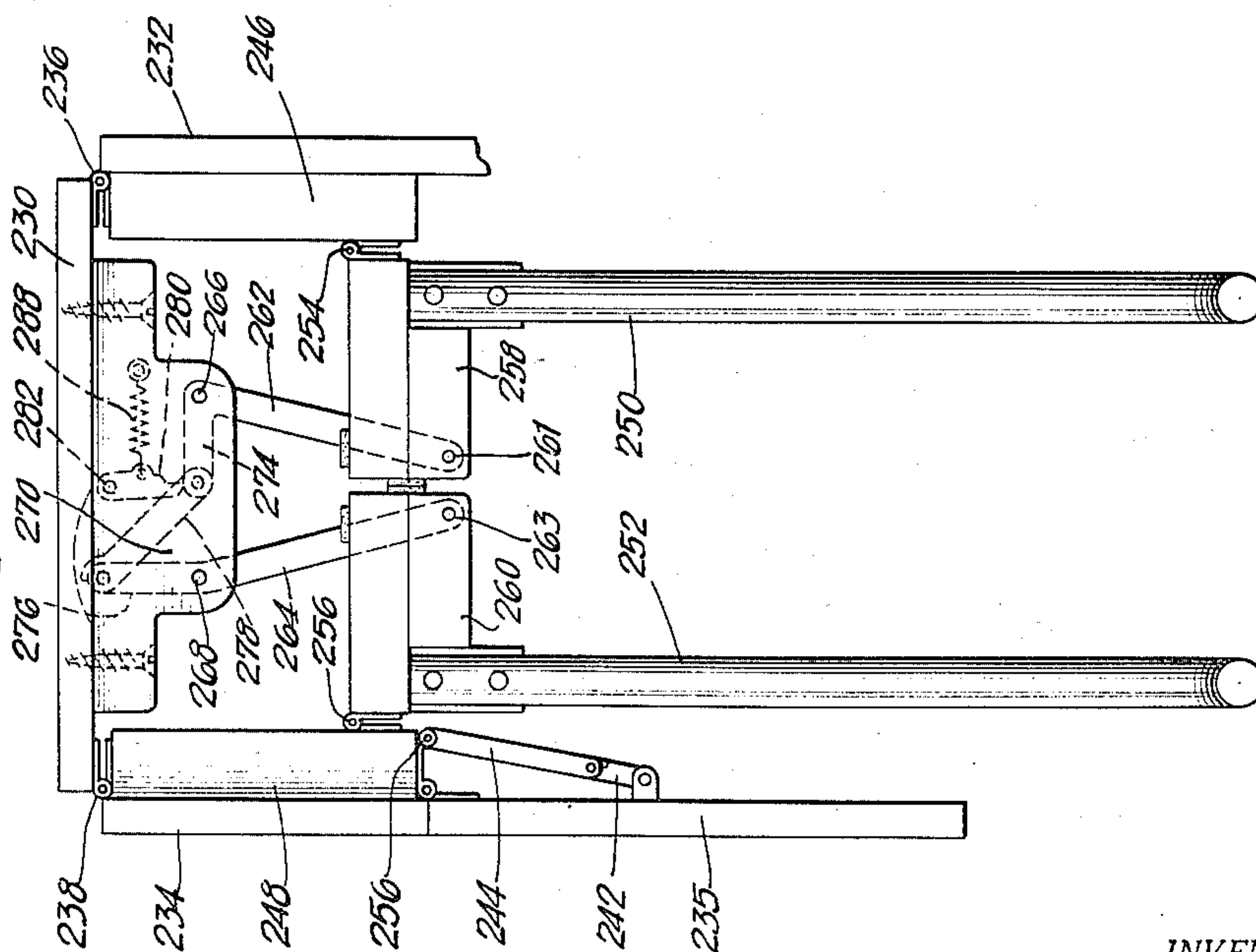


Fig. 10a.



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## UNITED STATES PATENT OFFICE

2,544,228

VERTICALLY ADJUSTABLE TABLE  
CONSTRUCTION

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Application July 17, 1947, Serial No. 761,690

4 Claims. (Cl. 311—62)

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This invention relates to tables, and more particularly tables adapted for dual use at different table top heights. The application is a continuation in part of a copending application Serial No. 641,739, filed January 17, 1946.

The invention has to do with a novel leg construction so constituted as to permit a table to be quickly changed from one having a top of low elevation to one of a high elevation, as for example a table having a table top height corresponding to the well known cocktail table height, and a table having a height suitable for dining purposes, or a table having a slightly higher table top height suitable for work purposes.

The leg construction in its extensible features may be so constructed as to cooperate with table extending leaves, to extend the top area thereof, or, on the other hand, carry shelving at a handy level beneath the table or body as may be found desirable. Other advantages of the construction provide counterbalancing of the table elevating mechanism so as to ease the shifting of table top levels, as well as to coordinate the leg motions to minimize the effort and attention required in shifting the dual purpose table from one level to another.

The above and other novel features of the invention will appear more fully from the following detailed description of several representative modifications when taken in conjunction with the accompanying drawings. It is to be understood, however, that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawings, wherein like reference characters indicate like parts,

Fig. 1 is a side elevation of one form of the table, with certain parts in section and the side skirt removed;

Fig. 2 is a bottom plan view of the modification of Fig. 1;

Fig. 3 is a fragmentary detail view, partly in section, showing the relation of the parts of the modification in Fig. 1 when elevated;

Fig. 4 is a side elevation of another form of the invention;

Fig. 5 is a fragmentary end view of the modification of Fig. 4;

Fig. 6 is a longitudinal vertical sectional view, partly in elevation, showing another modification of the invention;

Fig. 7 is a bottom plan view of the modification of Fig. 6;

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Fig. 8 is a longitudinal vertical sectional view, partly in elevation, of the modification of Fig. 7, showing the table in elevated position;

Fig. 9 is a side elevation of another modification of the invention with the table skirt removed;

Fig. 9a is a caster detail especially applicable to the modification of Fig. 9;

Fig. 10 is a side elevation of a still further modification of the invention;

Fig. 11 is a sectional detail of the modification of Fig. 10 taken substantially on the line II—II of Fig. 10;

Fig. 12 is a modified elevational view, partly in section, of a form of that shown in Fig. 10;

Fig. 13 is a further modification of the invention;

Fig. 10a is a view of the embodiment of Fig. 10 in elevated position; and

Fig. 12a is a view of the embodiment of Fig. 12 in elevated position.

Referring to Figs. 1—3, there is shown a table in its lowered position, in which position it would serve as what is known as a cocktail table. The table comprises a top 20, having surrounding skirt 22. Secured to the under side of the top are a pair of jointed leg panels, comprising upper members 24 and 26, and lower members 28 and 30. The upper members are hinged or otherwise pivotally connected to the table top as at 32 and 34, and hingedly or pivotally connected to the lower members as at 36 and 38. In the position shown, the upper members 24 and 26 are horizontally disposed, and the lower members support the table top through engagement with the side skirt 22 of the top.

Secured to the under side of the table top, and centrally thereof, are a pair of depending spaced brackets 40 and 42 forming a housing and support for the coordinating arms or links 44 and 46 pivoted at 48 and 50 on the brackets 40 and 42, the arms also being pivotally connected as at 51 and 53 to brackets 52 and 54 extending horizontally inward from the lower leg members 28 and 30, the same being rigidly secured by angle members 55 or the equivalent.

The pivotally connected members in the modification of the invention just described, are of such a length, and their pivots so located that the pivots 32, 36, 51 and 48, and 34, 38, 53 and 50 are the corners of true parallelograms. Thus when the upper leg members 24 and 26 are swung to a vertical position (see Fig. 3) the lower leg members remain vertical, although they become more closely spaced with respect to each other, being in alignment with the upper leg members



24 and 26. Through such an arrangement the table height is raised substantially by the length of the upper leg members 24 and 26, less the distance the skirt 22 depends below the under side of the table top.

In order to coordinate the movement of both pairs of legs, in changing the height of the table, the arms 44 and 46 are provided with drum portions 56 and 58, to the peripheries of which are secured flexible straps 60 and 62, the drums being substantially in rolling engagement with one another save for the thickness of either strap 60 and 62. The straps are cross connected, that is, one end of strap 60 is secured as at 64 to drum 58 and its other end secured as at 66 to drum 56, and strap 62 is secured as at 68 to drum 56 and as at 70 to drum 58. Thus the arms 44 and 46 are constrained to rotate oppositely in unison so that the movement of the legs at one end automatically effects movement of the legs at the other end.

To counterbalance the weight of the top, and thus facilitate raising the top to the elevated position, and at the same time to prevent its weight from tending to fall when lowering to the position shown, one or more counterbalance springs 72 may be employed. As shown, the spring is tensioned between an eye 74 in the arm 56, and an eye 76 in the table top 20. The upper leg member 24 is notched as at 78 to clear the eyes 76 in the position shown.

The pivots 51 and 53 upon the brackets 52 and 54 are placed in notches 79 and 80, and the brackets extend to provide interengaging bumper surfaces 82 and 84 which engage one another when the table is elevated, to provide in a measure a bracing action.

In the modified form of the invention shown in Figs. 4 and 5, the upper leg elements which are adapted to take a horizontal position or a vertical position, are secured to drop leaves of a drop leaf type of table, so as to provide a relatively small area table of more than usual height, such as a height suitable for work, and an expanded drop leaf table, that is, with the leaves extended of a height suitable for dining.

Referring to Fig. 4, the center section of the table top 90 has hinged thereto drop leaves 92, 94, the hinges appearing at 96, 98. Beneath each of the drop leaves 92, 94 are sills 99 and 100, respectively, which correspond in operation to the upper leg elements of the modification of Figs. 1 to 3. The sills 99 and 100 are hingedly connected as at 102 and 104 to pedestal legs 106, 108, terminating in base portions 110, 112 having floor-engaging feet or casters 114, 116, there being two casters upon each base relatively widely spaced apart, as will be understood in the art.

Depending from the center of the under side of the table top section 90, are a pair of spaced brackets one of which appears at 118. Pivoted between the spaced brackets are a pair of arms or links 120, 122 arranged on pivot pins 124, 126. The ends of the arms are pivotally connected as at 128 and 130, to the pedestals 106, 108. The arrangement is such, as in the modification of Fig. 1, that the pivot points 96, 104, 130 and 126, and 98, 102, 128 and 124 are at the corners of parallelograms such that, as the legs are extended by reason of the sills 99 and 100 being moved to vertical positions and forming leg extensions, the pedestal portions of the legs 106, 108 remain in parallel relation to one another.

The arms 120, 122 may have drum-like por-

tions 132, 134 upon which are arranged cross straps 136, as described in the modification of Fig. 1, for coordinating the movement of both legs when the elevation of the table is to be changed.

There may be provided a bracket 138 of substantially triangular shape, hinged as at 140 to the under surface of the drop leaf 94, so that the table in the position shown in Fig. 4 may be braced against any movement of the parts as might otherwise result by one leaning heavily upon the outer extremity of the drop leaves 94 and 92. The triangular block may be swung so as to lie in a horizontal plane parallel with the drop leaf 94, whereupon its function as a brace is eliminated and the table readily moved to elevated position. The legs 108 at their upper ends may have a supporting bracket 131 adapted to engage abutments 133, to steady the table when in the position shown.

Referring to the modification of Figs. 6, 7 and 8 (also shown in application Ser. No. 641,739, filed January 17, 1946), there is shown a table top comprising a center section 150 and side sections 152 and 154 pivotally secured to the center section by hinges 156, 158. The center section is provided with a short skirt 160 on either side and the end sections are likewise provided with a skirt in the form of side members 162. The side members 162 are arranged in staggered relation to the skirt 160 so that upon hinging the top portions 152 and 154, as is shown in Fig. 8, the skirts 160 and 162 will not interfere. Each of the skirt members 162 is provided with a depending ear or lug 166 adjacent each corner of the table, to which are pivotally connected table legs 168, as at 169. The table legs 168 at either end are connected by a member 164, acting as an end skirt. Each of the skirt members 164 is provided with an inwardly extending arm 170 hingedly connected to links 172 at 173 and 175. The links 172 are pivotally connected to the under side of the center table top section 150 at 174, 178, respectively. As in the previous modifications, the pivot points 173, 174, 169 and 158, and the corresponding pivot points at the other end of the table are arranged upon a parallelogram so that parallel movement of the legs 168 with relation to each other is always assured.

In order to coordinate the movement of the two pairs of legs 168 at the time that it is desired to shift the height of the center section of the table, there is provided an endless chain 180 passing about free running pulleys 182, 184, the chain having introduced therein on the opposite reaches thereof links 186, 188 having provision for pivotal connection at 190, 192 to the central portion of each of the links 172, so that upon the movement of the legs at one end of the table to vary the height of the center section, the legs at the other end of the table are forced to move in a symmetrical fashion. Thus by merely raising or lowering the center section of the top of the table and positioning one pair of legs, the entire operation of properly positioning the remaining legs is automatically taken care of.

In the modification of Fig. 9, the table shown is adapted to be supported in its elevated position upon inclined legs having upper and lower elements, and when in its lowered position is adapted to rest upon the lower elements of the legs, arranged in parallel relation. Briefly, the table top 200 has hingedly secured to its under side, upper leg elements 202 and 204, and lower leg elements 206 and 208. Each of the elements



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may be panel-like as in the modification of Fig 1. The lower elements 206 and 208 are provided with inwardly extending brackets 210 and 212 to which links 214 and 216 are pivotally connected. The links in turn are pivoted on pins 218, 220 arranged between spaced brackets one of which is shown at 222. The links may have keyed thereto for rotation on the pins 218 and 220, a pair of intermeshing sector gears 224, for the purpose of synchronizing the movement of the legs 206 and 208, and the upper members thereof 202 and 204. When the table is in the elevated position shown, the brackets 210 and 212 act as bumpers through a felt pad or the like, at 226, to thereby steady the table.

When the table is placed in its lowered position the upper leg members 202 and 204 take the positions shown by dotted lines 202' and 204' and the lower leg elements 206 and 208 take the positions shown at 206' and 208'.

In this modification it will be appreciated that the pivot points 209 and 211 between the leg elements and the hinge connections 213 and 215 between the upper elements and the table, and the pivot points upon the links 214 and 216, are not in exact parallelogram arrangement, this being for the reason that it is desired to cause the lower leg elements 206 and 208 to swing from the inclined position shown when the table is in elevated position, to the parallel relationship shown by dotted lines when the table is in its lowered position. Deviation from the parallelogram relation of the pivot points as previously described in the various modifications is relatively slight and may be effected in any desired manner to produce the desired slight angular movement of the legs upon changing the elevation of the table top.

The extent of movement of the legs along the floor when shifting the table from one elevation to the other may be varied by varying the leg inclination in the elevated position. The inclination may be increased over that shown so that leg ends in floor engagement will not require shifting along the floor when the table height is varied.

This modification may be provided with casters as shown in Fig. 9a, the casters 228 being adapted to engage the floor when the legs are vertical, as at 208', and being lifted from the floor by the floor-engaging heel 229, which contacts the floor when the legs are on a slant as at 208, the heel being of such a length as to automatically contact the floor when the legs are slanted.

In the modification shown in Fig. 10, the center section of the table top 230 is provided with side leaf sections 232, 234 hinged to the center section as at 236 and 238. The leaf 234 is provided with an additional hinged drop leaf section 235 with a knee-action brace 240, the links 242 and 244 of which are adapted to be held in alignment when the leaf is positioned horizontally in alignment with the leaf section 234. The side sections or leaves 232, and 234 are provided with bolsters 246, 248 which are hingedly connected to pairs of legs 250, 252, the hinge connections being indicated at 254 and 256, respectively. The legs in this form may be in the form of tubes with the floor-engaging ends curved outwardly for tangential engagement with the floor. Each of the pairs of legs 250, 252 have top plates or bracket-like members 258, 260, extending inwardly of the table and to which arms or links 262 and 264 forming parts of bell cranks are attached, as at pivots 261 and 263. The

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bell cranks are pivoted as at 266 and 268 between the depending brackets 270 and 272, and bell crank arms 274 and 276, which are of substantially the same length, are connected by a link 278. The angular movement of the bell cranks is such as to approximate 90°, and the arms 274 and 276 are arranged so as to extend at right angles to one another, with the link 278 extending substantially upon a line having a 45° slope with respect to either arm. The distance between pivots 266 and 268 is approximately double the length of one of the arms 274 or 276. Thus as the arm 276 moves to a vertical position, and the arm 274 becomes horizontal, the link 278 is repositioned on a 45° angle with respect to either arm.

To hold the links in the position shown and thus positively hold the table in open position, a detent 280 is provided pivoted at 282 and bearing against arm 276 when in the position shown. A rock shaft 284 with a handle 286 may form the pivot shaft for the detent 280, and be keyed thereto, so that the detent can be conveniently moved against the tension of spring 288, to an inactive position to permit raising of the central section of the table. The leg connecting arms 262 and 264 of the bell cranks and their pivot points 261 and 266, and 263 and 268 bear parallelogram relation to the pivots 236 and 254 and 238 and 256, respectively, so that the legs are held in parallel relation during the movements described.

If it be desired, like bell cranks 290 and 292 may be employed as in Fig. 12, in which case they may be arranged on a common pivot 294. In such an arrangement, the crank arms 296 and 298 are connected by suitable links 300 and 302 pivoted upon the upper blocks or leg elements as at 304 and 306, the distance between the hinge connections 302 and 310 between the blocks and table top and pivot points 304 and 306 being the same as the effective length of the arms 296 and 298. If the bell cranks are adapted to rotate 90° in the movement of the top from the lower position to the elevated position, the arms 296 and 298 will preferably extend in a direction 45° from the horizontal, when in either end position, and the line between pivot points 304 and 308 and also the line between points 306 and 310 will extend in directions at 45° from the horizontal, it being assumed that these angles apply when the links 300 and 302 are arranged to extend substantially horizontal.

In the form shown in Fig. 13, each of the pairs of legs 314 and 316 are provided with shelf-like projections 318 and 320, rigidly secured to their respective pairs of legs. The shelves are each provided with upstanding column members 322 and 324, of a length suitable for engagement with the under surface of the top 326, when the upper leg members, 328 and 330, and their respective top leaves 332 and 334 are positioned horizontally. As with certain of the above examples, pivoted arms or links 336 and 338 are provided having synchronizing cross connected straps 340, and the pivots 342, 344, 346 and 348 for legs 314, and the corresponding pivots for legs 316, are arranged to form a parallelogram, so that the legs move to parallel positions.

It will be seen from the foregoing disclosure that there is provided a table construction having a dual function making it possible to employ such a table in housing projects where efficient use of space is of great importance. The various forms of synchronizing devices may be applied to any



of the different embodiments with such changes as will at once appear requisite after an understanding of the principles involved. In some instances it may be desirable to eliminate the synchronizing mechanism in any or all of the modifications, thereby permitting the shifting of the legs at one end independently of the legs at the other end to accommodate change in design. Also any of the modifications may be spring balanced as in Figure 1, either by tension springs as shown or by the utilization of well known spring hinges for example. Also the table heights, and a determination as to whether the table area may be altered as in the drop leaf type or remain constant, as for example in the form of Fig. 1, are considerations which will at once appear to be in the range of equivalents applicable to the different forms.

While the invention has been illustrated and described in a number of different forms, it is to be understood that the invention is not to be limited thereto, but may be embodied in various modified forms. As many changes in construction and arrangement of parts may be made to accommodate varying requirements, without departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. In a table construction having a top middle portion adjustable for use at either a lower or upper elevation while being retained horizontal, the combination comprising two lower leg structures which are spaced apart when said top portion is adjusted to the upper elevation and further spaced apart when said top portion is at the lower elevation, a pair of drop-leaf structures hingedly connected to opposite edges of said top portion and providing substantially vertical upward continuations for said lower leg structures respectively when said top portion is at the upper elevation, said drop leaf structures respectively being pivotally connected to points fixed with respect to the upper ends of said leg structures, a pair of links each pivotally connected at a point fixed with respect to the underside of the mid-part of said table top portion, said links also being pivotally connected respectively at points fixed with respect to said lower leg structures, whereby said leg structures, portions of said drop leaf structures and said links collectively form under each side of the table, substantially a quadrilateral linkage with the table top, and additional means located just beneath the mid portion of the table top and interconnecting one of said quadrilateral linkages with the other and coacting therewith to cause said members to pivot through equal and opposite angles when said table top portion is raised or lowered.

2. In a table construction having a top adjustable for use at either a lower or upper elevation while being retained horizontal, the combination comprising two lower leg structures which are spaced apart when the top is adjusted to the upper elevation and further spaced apart when the top is at the lower elevation, a pair of members which form substantially vertical upward continuations for said leg structures respectively when the top is at the upper elevation, one end of each of said members respectively being pivotally connected to points fixed with respect to the upper ends of said leg structures, the other ends of said members respectively being pivotally con-

nected at spaced points with respect to the underside of the top, a pair of links each pivotally connected at a point fixed with respect to the underside of the mid-portion of the table top, said links also being pivotally connected respectively at points fixed with respect to said lower leg structures, whereby said leg structures, members and links collectively form under each side of the table, substantially a quadrilateral linkage with the table top, and additional means located just beneath the mid portion of the table top and interconnecting one of said quadrilateral linkages with the other and coacting therewith to cause said members to pivot through equal and opposite angles when the table top is raised or lowered.

3. In a table construction having a top adjustable for use at either a lower or upper elevation while being retained horizontal, the combination comprising two lower leg structures which are spaced apart when the top is adjusted to the upper elevation and further spaced apart when the top is at the lower elevation, a pair of members which form upward continuations for said leg structures respectively when the top is at the upper elevation and which are directed inwardly toward each other in folded positions along below the level of the table top when the latter is at the lower elevation, one end of each of said members respectively being pivotally connected to points fixed with respect to the upper ends of said leg structures, the other ends of said members respectively being pivotally connected at spaced points with respect to the underside of the top, a pair of links each pivotally connected at a point fixed with respect to the underside of the mid-portion of the table top, said links also being pivotally connected respectively at points fixed with respect to said lower leg structures, and additional linkage means with connections to control the relative movement of said members with respect to the underside of the mid portion of the table top to cause said members to pivot through equal and opposite angles when the table top is raised or lowered.

4. In a table construction having a top portion adjustable for use at either a lower or upper elevation while being retained horizontal, the combination comprising two lower leg structures which are spaced apart when said top portion is adjusted to the upper elevation and further spaced apart when said top portion is at the lower elevation, articulated link-like connections between the upper portions of each of said leg structures and said top portion, such connection for at least one of said leg structures comprising part of a drop-leaf structure hingedly connected to an edge of said top portion and providing an upward continuation of its leg structure when the top portion is at the upper elevation and being pivotally connected to a point fixed with respect to the upper end of its said leg structure, a link pivotally connected at a point fixed with respect to the underside of the mid-part of said top portion, the other end of said link being pivotally connected at a point fixed with respect to said last named leg structure, a bell crank having its intermediate pivot at a point fixed with respect to the underside of said top portion, one arm of said bell crank being pivotally connected to a link which in turn is pivotally connected with respect to said drop-leaf, and the other bell-crank arm being pivotally connected at a point fixed with respect to the other of said lower leg structures, the parts being so proportioned that downwardly



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and upward movements respectively of the drop-leaf cause the leg structures to move through equal distances, with respect to the top portion, toward and away from each other.

BORIS HOPPE.

### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

Number	Name	Date
135,274	Hofmann	Jan. 28, 1873
587,518	Bartelle	Aug. 3, 1897
893,031	Stone	July 14, 1908

5

10

15

10

Number	Name	Date
940,804	Hanson	Nov. 23, 1909
1,042,020	McCarty	Oct. 22, 1912
1,069,483	Simonton	Aug. 5, 1913
1,074,753	Smouse	Oct. 7, 1913
1,115,731	Owens	Nov. 3, 1914
1,621,324	Hughes	Mar. 15, 1927
1,808,305	Howe	June 6, 1931
1,865,254	Howe	June 28, 1932
1,900,528	Statz	Mar. 7, 1933
2,035,718	Perl	Mar. 31, 1936
2,256,004	Thomas	Sept. 16, 1941
2,329,213	Neutra et al.	Sept. 14, 1943
2,409,495	Kelley	Oct. 15, 1946