

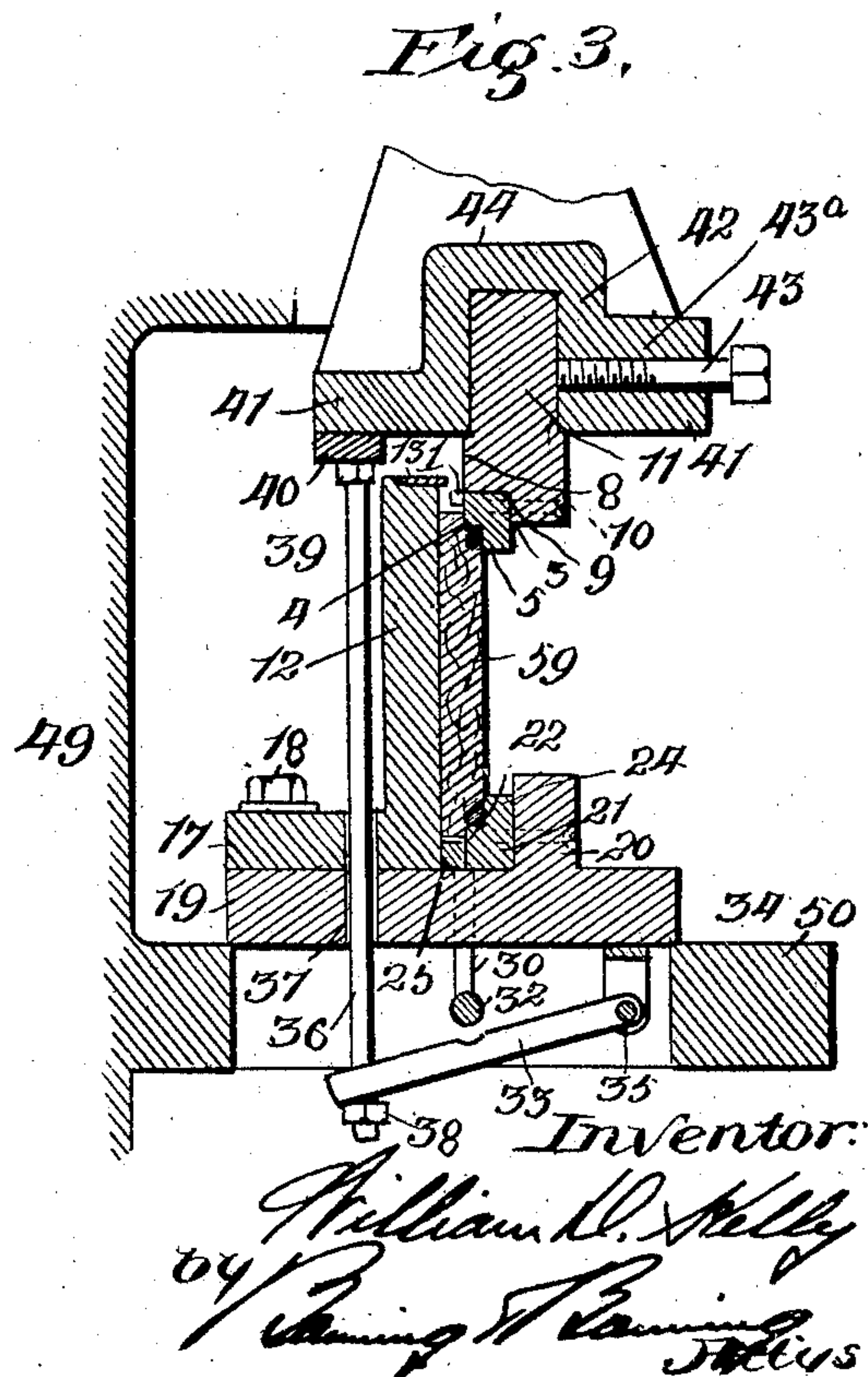
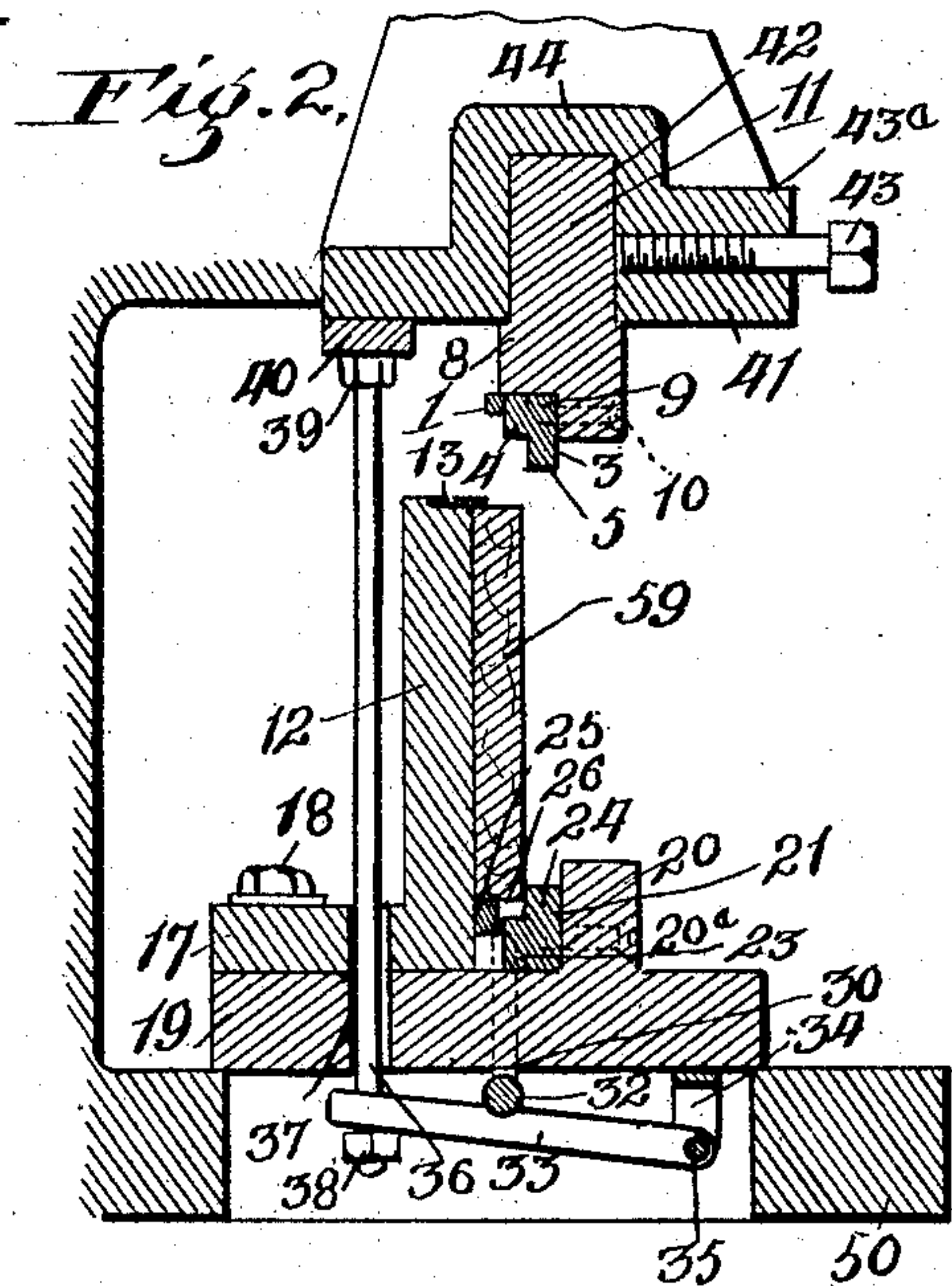
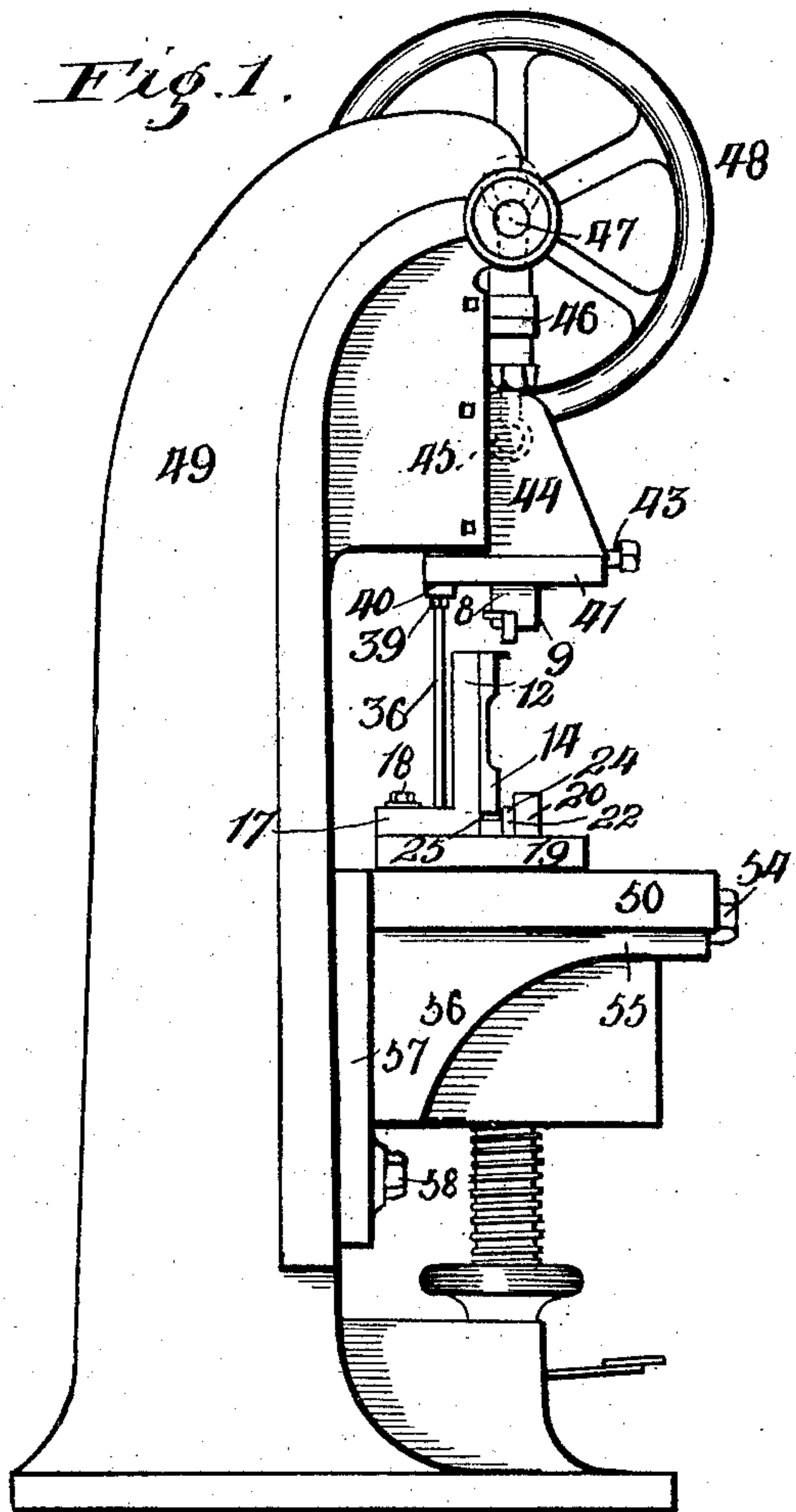
No. 850,888.

PATENTED APR. 16, 1907.

W. D. KELLY.
DOVETAILING AND TENONING MACHINE.

APPLICATION FILED AUG. 27, 1906.

3 SHEETS—SHEET 1.



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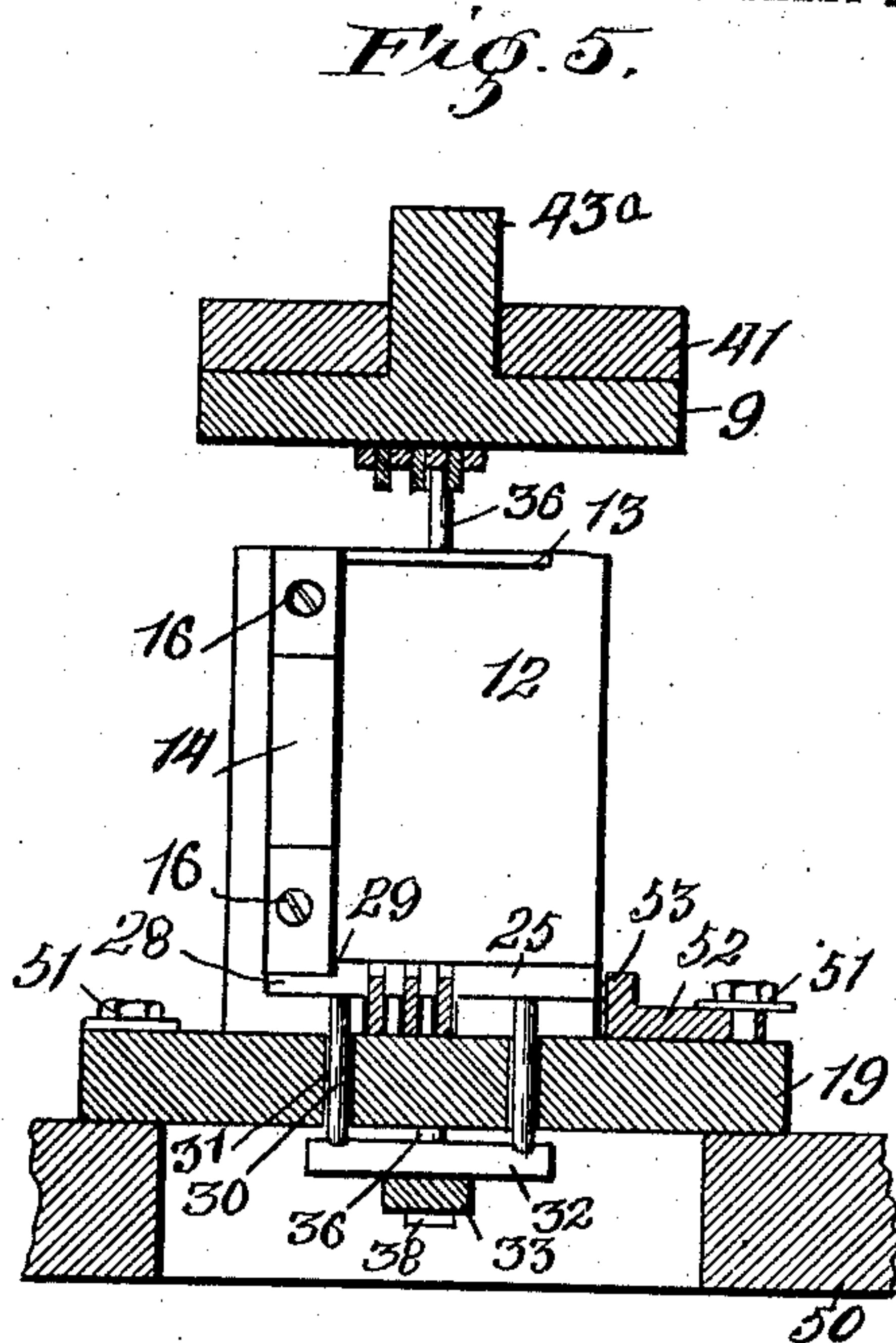
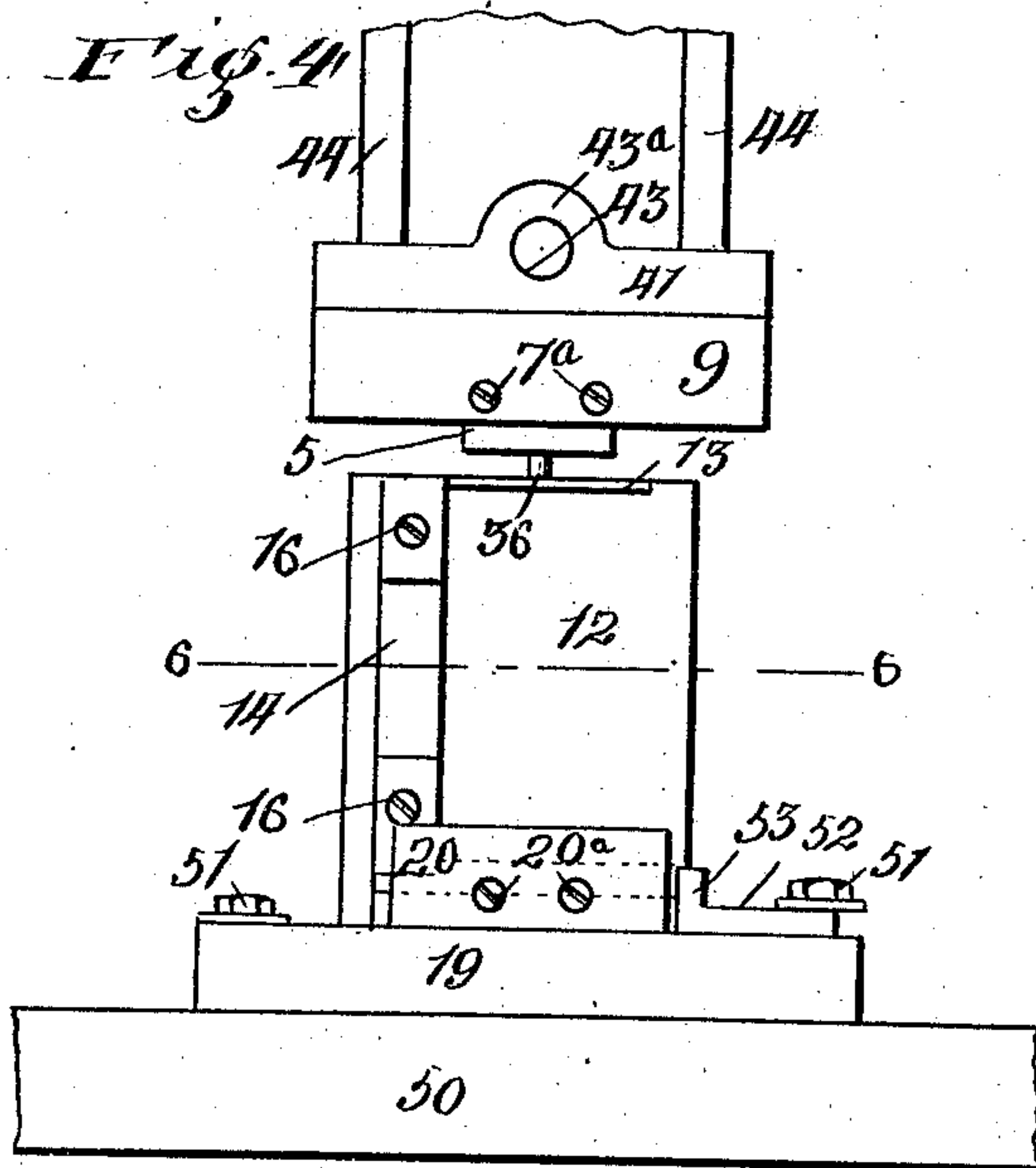


Fig. 6.

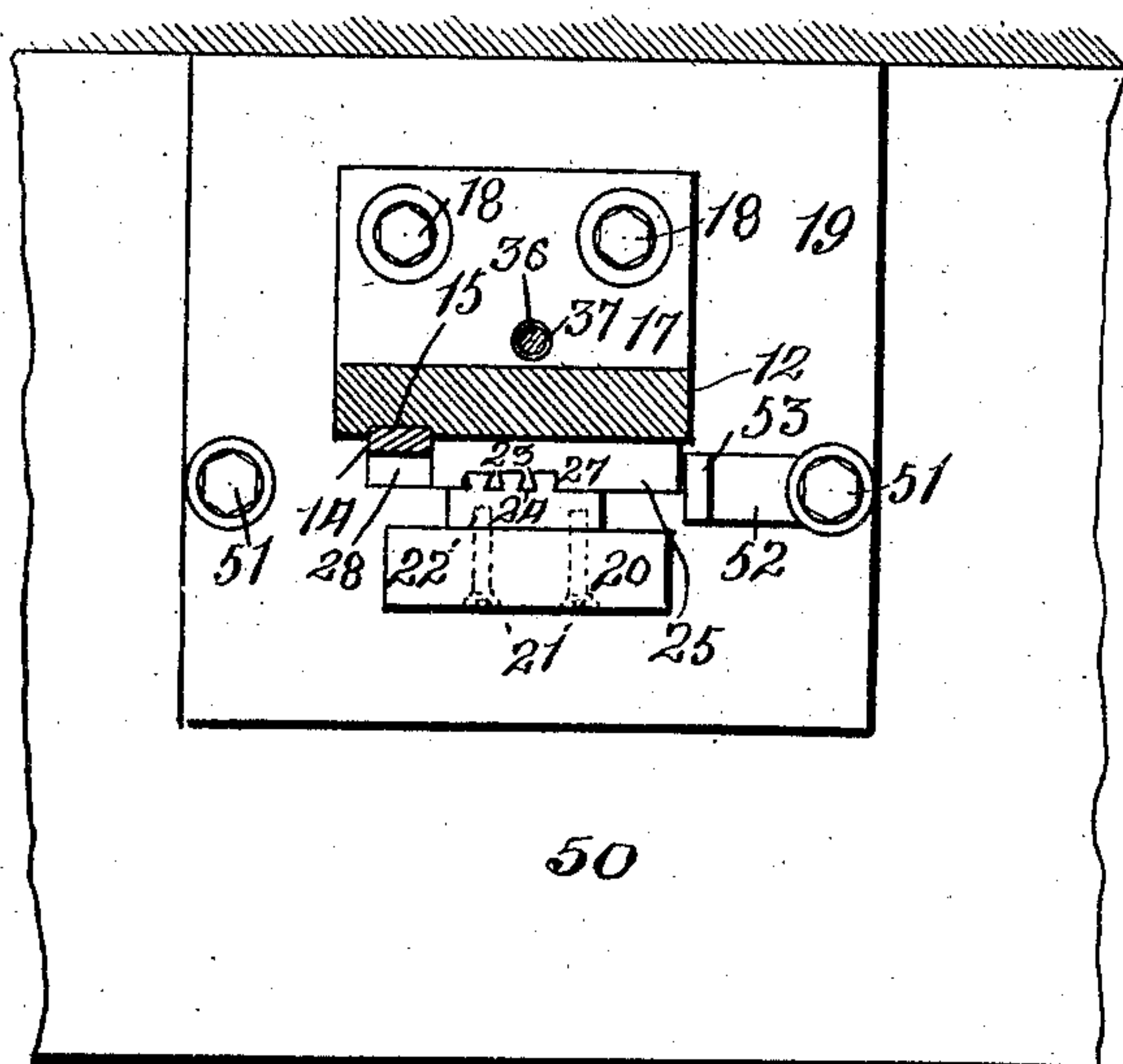


Fig. 7.

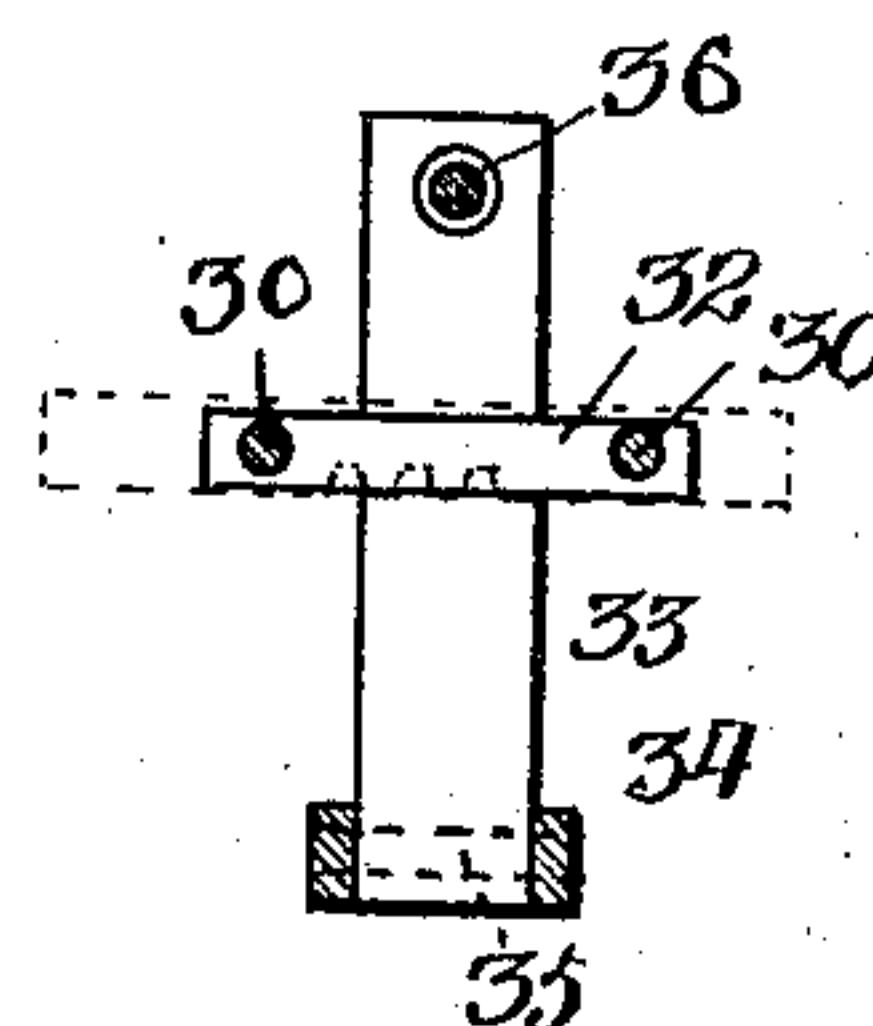
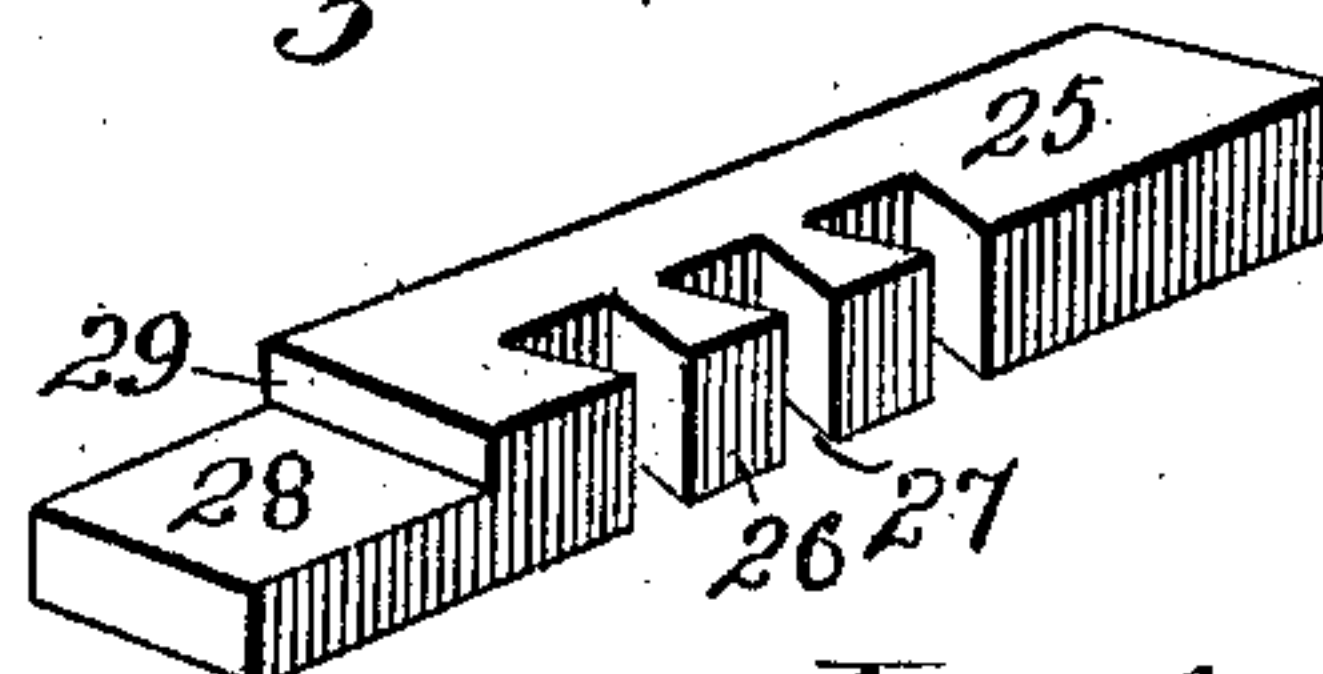


Fig. 8.



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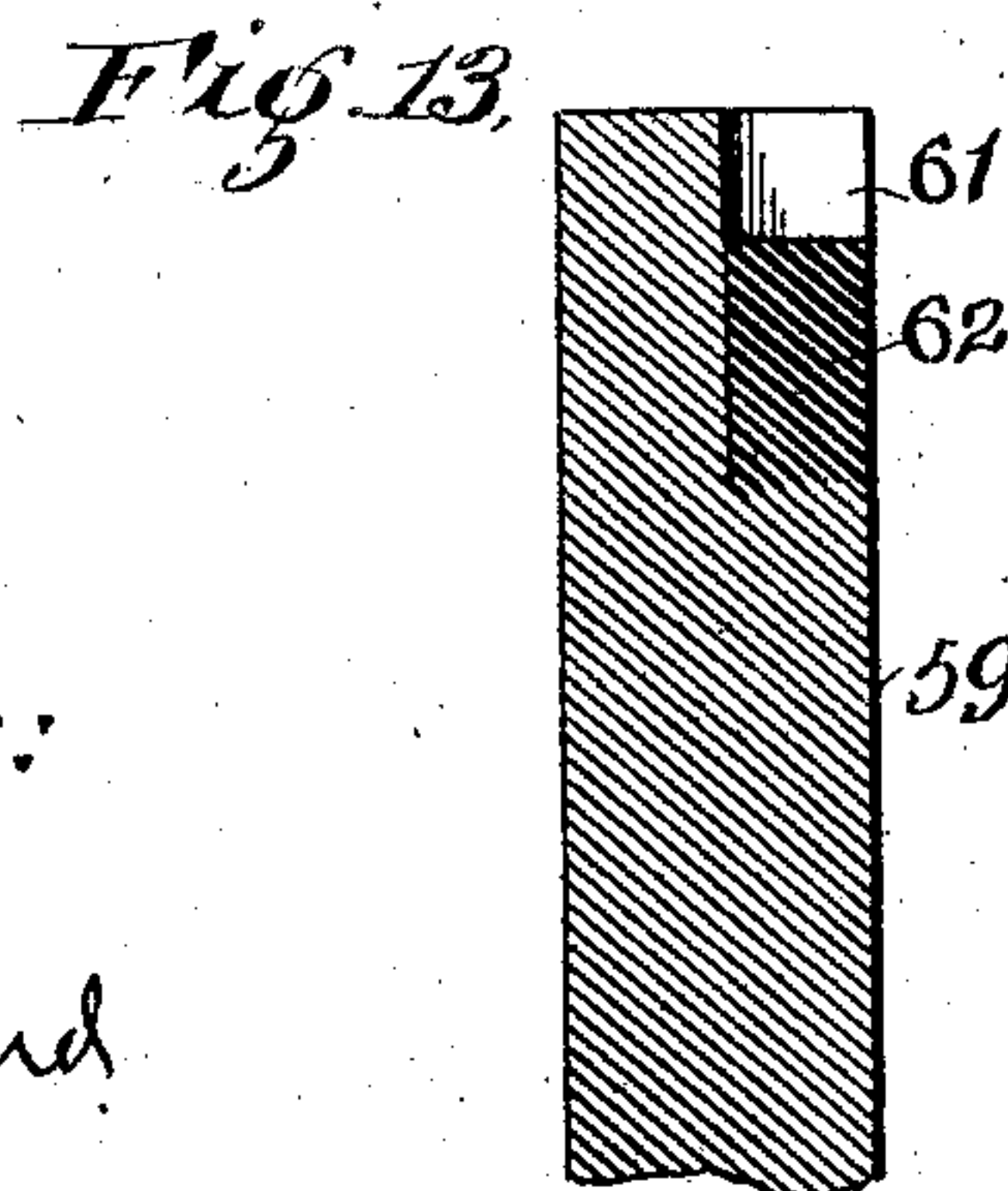
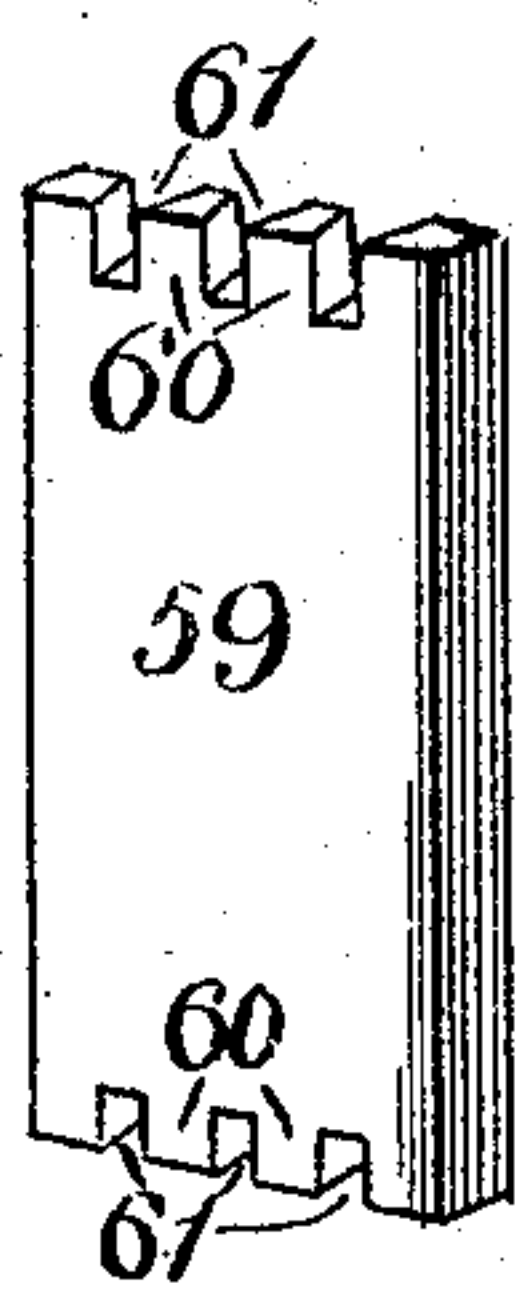
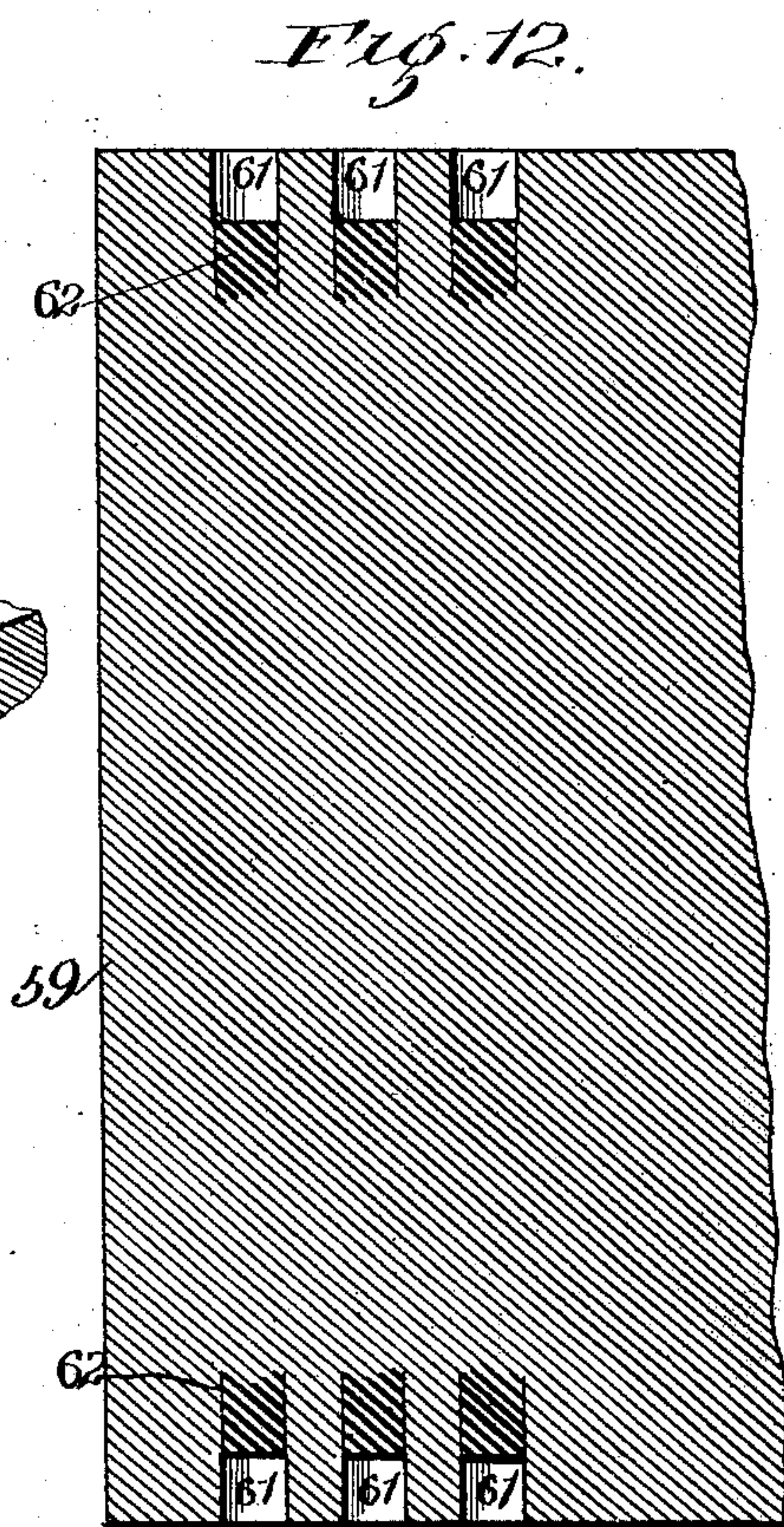
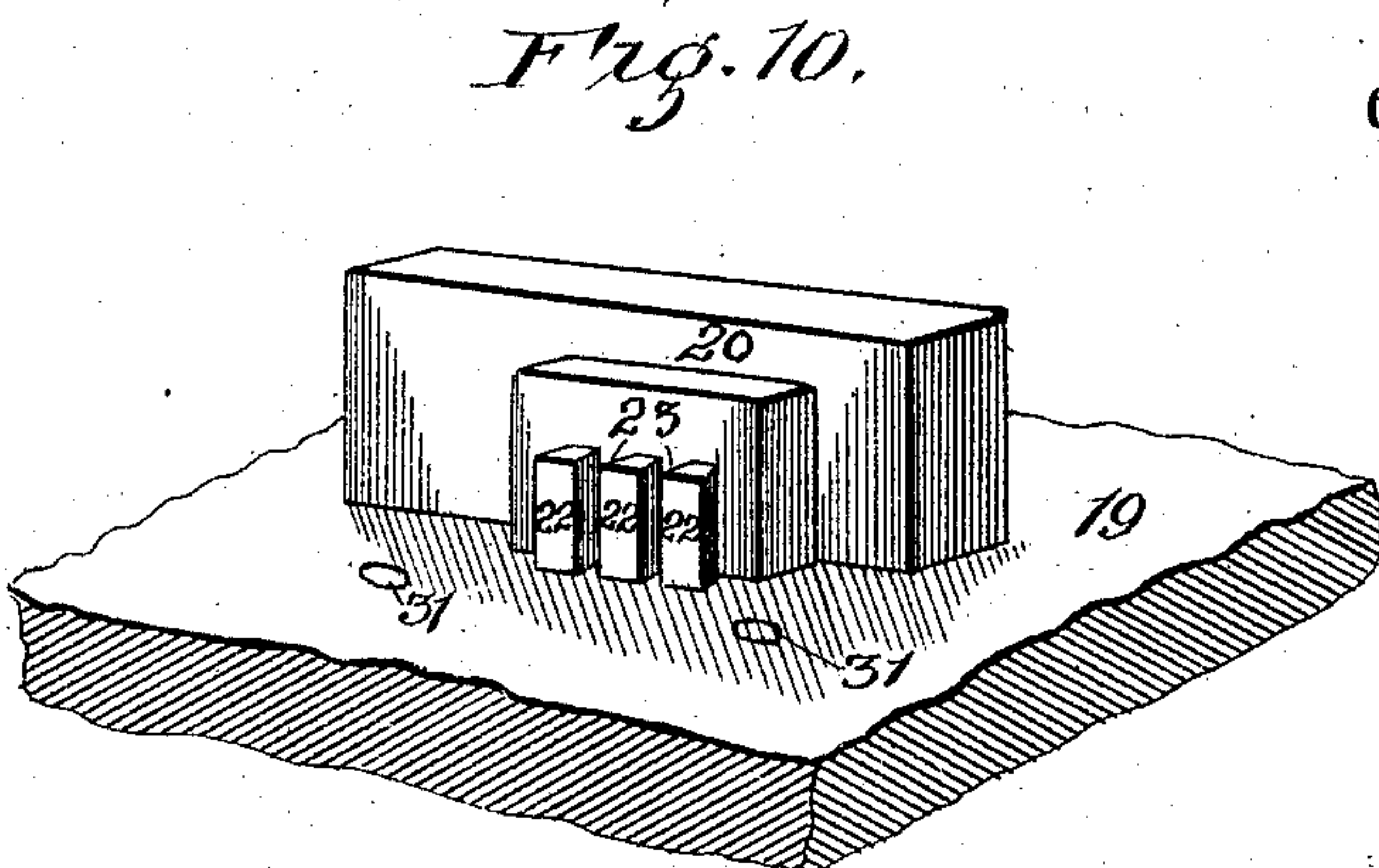
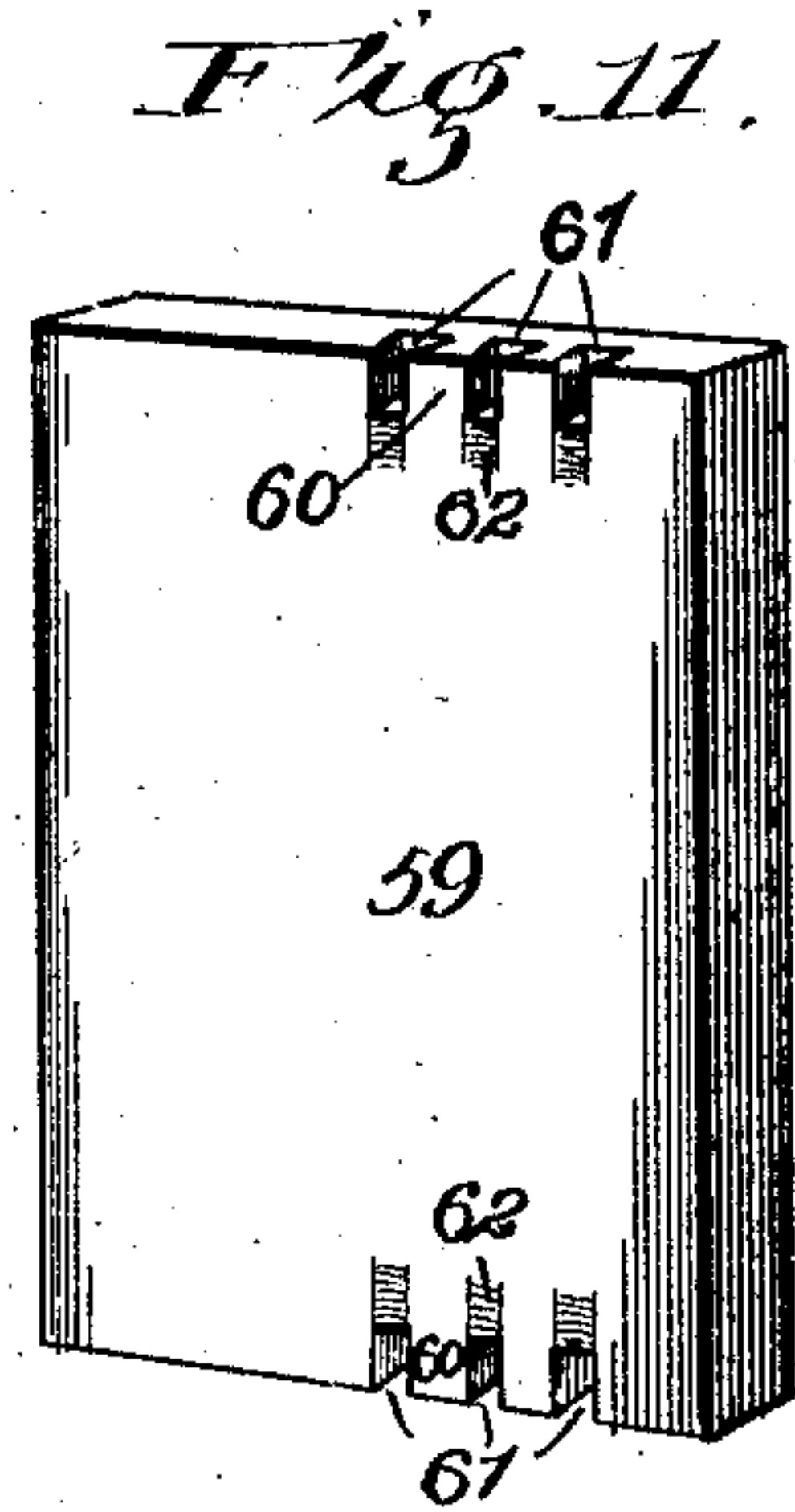
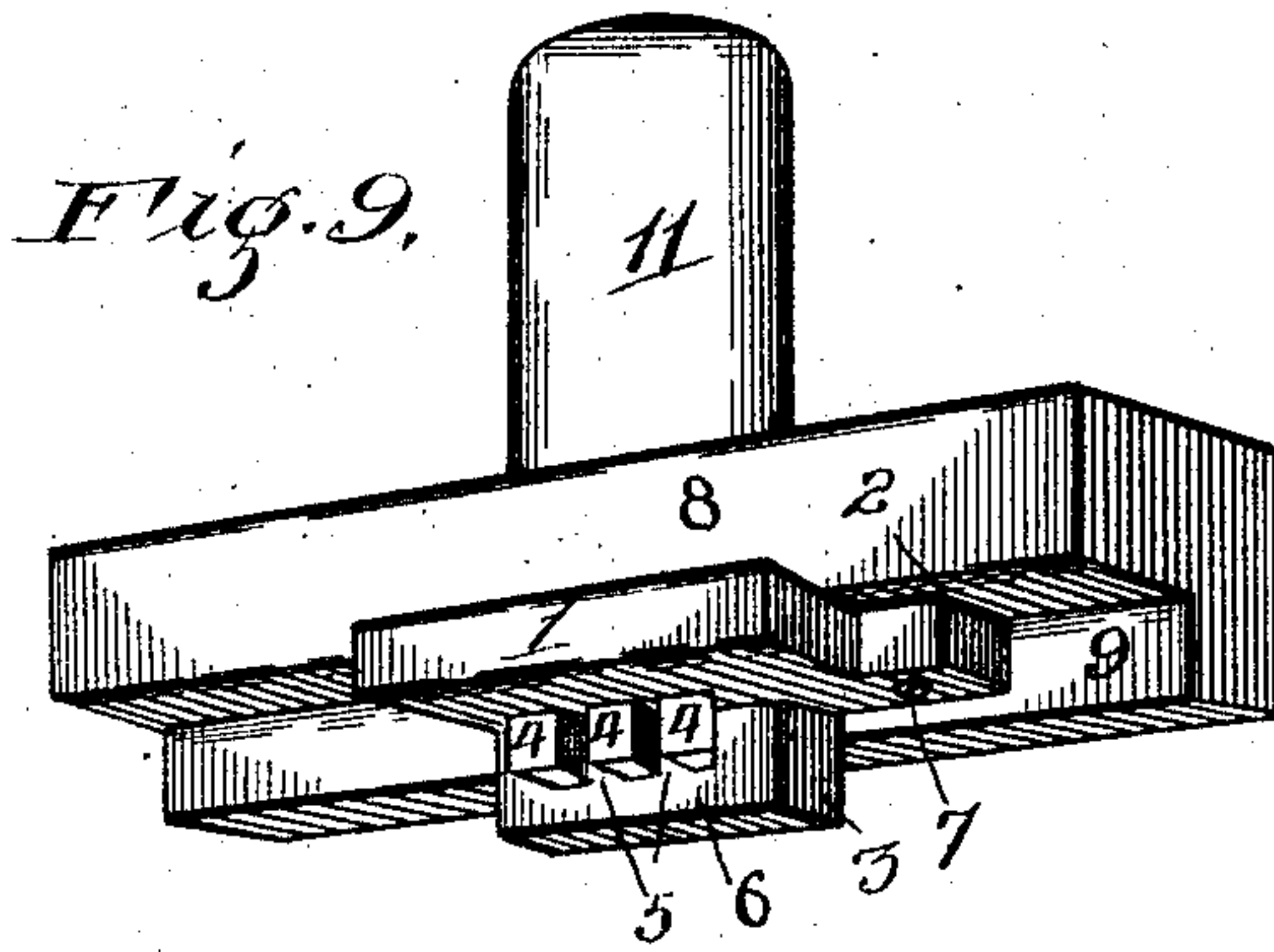
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DOVETAILING AND TENONING MACHINE.

APPLICATION FILED AUG. 27, 1906.

3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

WILLIAM D. KELLY, OF CHICAGO, ILLINOIS.

DOVETAILING AND TENONING MACHINE.

No. 850,888.

Specification of Letters Patent.

Patented April 16, 1907.

Application filed August 27, 1906. Serial No. 332,186.

To all whom it may concern:

Be it known that I, WILLIAM D. KELLY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Dovetailing and Tenoning Machines, of which the following is a specification.

This invention relates more particularly to the making of what are known or termed "dovetails," blind, and other tenons and mortises in the ends of boards or strips of wood.

The objects of the invention are to employ dies so arranged and operated as to form the tenons and mortises without removing the section of the wood occupying the place of the mortise; to furnish an upper and lower die, the upper one of which is given a powerful or forcible stroke by which the section of wood for the mortise is driven bodily into the fiber of the main wood below the base of the tenon and mortise; to construct an upper die and a lower die with the upper die movable and the lower die fixed and receiving between the dies a piece or strip of wood, with the dies so operated as to crush the section of wood for the mortise bodily into the fiber of the wood at the base-line of the tenon and mortise; to furnish a backing-plate and guide with an upper and lower stripper coacting with a movable upper die and a fixed lower die for receiving and supporting between the strippers and dies the piece or strip of wood to be acted upon; to furnish a backing-plate and a jaw or guard coöperating with a movable upper die and a lower fixed die for forcibly driving the section for the mortise bodily into the fiber of the wood below the base-line of the tenon and mortise and preventing the in-driven section of wood from out-bulging, so as to destroy the continuity of the face of the piece or strip of wood; to form a tenon and mortise by bodily driving the mortise-section of the wood into the fiber of the main portion of the wood below the base-line of the tenon and mortise; to form a dovetail, blind, or other tenon having the mortise-section bodily driven into the fibers of the wood below the base-line of the tenon and mortise; to form a tenon having the mortise produced with straight side walls and a straight uninterrupted base-wall by forcibly driving the section of the mortise into the fiber of the wood below the base-line of the tenon and mortise, and to improve generally

the construction and operation of the dies and the formation of the tenon and mortise as a whole.

The invention consists in the features of construction and operation of the dies and the coacting parts therefor and the features of formation for the tenons and mortises.

In the drawings, Figure 1 is a side elevation of a press adapted for supporting and operating the forming-dies for the tenons and mortises, which are shown in position on the base; Fig. 2, a sectional elevation of the movable upper die, the fixed lower die, the backing-plate, the piece or strip of wood, and the press-head and table supporting and carrying the dies, with the movable die in its elevated position; Fig. 3, a similar view to Fig. 2, with the movable upper die in its descended position for the two dies to operate and form the tenons and mortises simultaneously in both ends of the piece or strip of wood; Fig. 4, a front elevation of the upper and lower dies and their supports and the backing-block for the piece or strip of wood; Fig. 5, a sectional front elevation of the parts shown in Fig. 4; Fig. 6, a cross-section looking down, taken on line 6 6 of Fig. 4; Fig. 7, a bottom view of the support for the lower stripping-plate; Fig. 8, a detail in perspective of the lower stripping-plate; Fig. 9, a detail in perspective of the upper die and its supporting head; Fig. 10, a detail in perspective of the lower die and its support; Fig. 11, a perspective view of a piece or strip of wood with the tenons and mortises formed in each end thereof; Fig. 12, a sectional face view of the piece or strip of wood with the tenons and mortises in each end thereof; Fig. 13, a perspective view, in sectional edge elevation, of the piece or strip of wood and the mortise therein; and Fig. 14, a perspective view of a piece or strip of wood with open tenons and mortises formed in each end thereof.

The upper die in the construction shown consists of a plate 1, with an ear 2 at each end and having a depending wall or block 3, on which and integral with which are formed the lips or punches 4, with openings 5 between them and of the requisite contour to produce dovetail tenons and mortises, and the number of lips or punches and openings can be varied to suit the number of tenons and mortises to be made or formed in the end of the board or strip of wood. The wall or block 3 extends below the lower face or edge of the lips or punches and forms a jaw or

guard 6 to abut against the face of the board or strip of wood and prevent out-bulging of the in-driven section of wood for the mortise. A screw or bolt 7 passes through each ear 2 and enters a cross-head 8 for attaching the upper die as a whole in a recess 9, formed in the cross-head, as shown in Fig. 9, and additional strength of attachment for the upper die to the cross-head is furnished by screws or bolts 10 passing through the cross-head and into the body of the die. The cross-head 8 in the construction shown has an upwardly-extending stem 11 for connecting the cross-head and upper die with the head of the press.

A backing-plate 12, having at its upper end a stripping-plate 13, is located below and at the rear of the upper die when in its elevated position, as shown in Fig. 2, and this backing-plate on one side has a guide or rest 14, against which one side edge of the board or strip of wood abuts when in position for making the tenons and mortises in the ends of the board or strip of wood. The guide or rest 14, as shown, is entered into a recess 15, formed in the face of the backing-plate 12, as shown in Fig. 6, and is secured in position by means of screws or bolts 16, as shown, or in any other suitable manner, or this guide or rest 14 could be formed direct with or be made adjustable on the backing-plate. The backing-plate has a rearwardly-extending flange 17, through which bolts 18 pass and enter a bed-plate 19 for securing the backing-plate in position on the bed-plate and in proper relation to the forming-dies and the piece or strip of wood for locating the piece or strip of wood in position to have the forming-dies operate on the ends of the piece or strip of wood and simultaneously form the tenons and mortises thereon and therein.

The lower forming-die in the construction shown consists of a wall or block 20, formed with or suitably secured to the base-plate, as shown in Fig. 10. The wall or block 20 has secured thereto, by bolts or screws 20^a, a plate 21, having thereon the lips or punches 22, with openings 23 between them and constituting the lower forming-die, and the lips or punches 22 and the openings 23 are of the requisite contour to produce the dovetail tenons and mortises in the end of the piece or strip of wood. The plate 21 projects above the upper face or edge of the lips or punches, as shown in Fig. 10, and forms a jaw or guard against which the face of the board or strip of wood abuts for the jaw or guard to prevent out-bulging of the in-driven section of wood forming the mortise. The upper forming-die is movable downward, and the lower die has a fixed position, and the lips or punches of the two dies are in alignment, so that when the upper die is forced down the lips or punches and the

openings between the lips or punches will simultaneously form in both ends of the board or strip of wood the tenons and mortises, which tenons or mortises will be of uniform configuration with straight side walls and a straight base-wall for each mortise, as shown in Fig. 11.

The lower die has a movable stripping-plate 25, with tongues 26 and openings 27 to receive, respectively, the openings and lips or punches of the lower die, and this stripping-plate 25 when in normal position is located for its upper face to lie, when the stripping-plate is in normal position, above the plane of the upper edge or face of the lips or punches of the lower die, as shown in Figs. 2 and 5. The stripping-plate 25 at one end has an extension 28, with a shoulder 29, forming a stop and guide to coact with the guide or rest 14 and limit the upward movement and insure the proper positioning of the stripping-plate when in its raised or normal position.

At each end of the stripping-plate 25 are depending rods 30, which pass through holes 31 in the bed-plate 19, and each rod is connected or attached to or rests on a cross bar or rod 32, located below the bed-plate 19, as shown in Figs. 2, 3, and 5. The cross rod or bar 32 is arranged to be engaged by a bar 33, attached at one end between ears 34, depending from the bed-plate 19, by a pin or pivot 35, so that the free end of the bar 33 is free to rise and fall. The free end of the bar 33 has passing therethrough the end of a rod 36, which rod extends up through a hole 37 therefor in the bed-plate 19 and flange 17, and its lower end is threaded and receives a nut 38, forming a stop for the end of the bar 33, and its upper end is threaded into and receives a stop-nut 39 and is entered into a cross-plate 40, and by means of the nuts 38 and 39 the rod 36 can be properly adjusted to give the required throw to the bar 33 to raise the stripping-plate 25 and retain such plate in its normal or raised position, as shown in Fig. 2, and with the drop of the bar 33 the stripping-plate 25 is free to descend with the forcing down of the piece or strip of wood, as shown in Fig. 3.

The attaching-plate 40 for the rod 36 is secured to the under side of the head 41 of the press by screws or otherwise. The head 41 of the press has a socket 42, which receives the stem 11 of the cross-head of the upper die, and the stem 11 is locked in the socket by a set-screw 43, entered into a boss 43^a on the head of the press, as shown in Figs. 2 and 3. The head 41 of the press has ears 44, which support a wrist-pin 45 of a pitman 46, connected with a crank-shaft 47, driven by a pulley 48 and a clutch mechanism. (Not shown.) The crank-shaft is supported in suitable bearings at the upper end of a standard or frame 49 of suitable con-

struction which carries the bed-plate 50, constituting the movable horizontal section of the bed-plate proper of the press, to which bed-plate 50 is attached the bed-plate 19, and, as shown, the attachment is by means of bolts 51, passing through the bed-plate 19 and entering the bed-plate 50 for the bolt 51 at one side to attach a plate 52, having a flange 53, and forming a guide for the edge of the board or piece of wood in the arrangement shown. The horizontal movable bed-plate 50 is adjusted in or out by means of rods 54, as usual, and this bed-plate 50 is mounted on a plate or support 55, connected by a web 56 with a vertical bed-plate 57, attached to the standard or frame 49 by bolts 58, as usual, so as to be adjustable up and down vertically, thereby raising the bed-plate 19 with the lower fixed die thereon into proper position, and the horizontal adjustment of the fixed lower die is obtained through the movable bed-plate 50 in the usual manner.

The upper and lower dies are adjusted to enter between them the piece or strip of wood 59, and this adjustment practically is obtained through raising or lowering the bed-plate proper of the press, and the position horizontally is obtained by adjusting the movable section of the bed-plate proper of the press, and when adjusted the piece or strip of wood 59 will be entered between the upper stripping-plate 13 and the lower stripping-plate 25, as shown in Fig. 2, with the ends of the piece or strip of wood in proper position to receive the thrust of the upper and lower forming-dies and produce in the ends the tenons 60 and the mortises 61, and in producing the mortises the section of wood occupying the space of the mortises is forcibly driven into the body of the wood for the fibers to coalesce and unite and form a closely-impacted section 62 below the base-line of the tenons and mortises, as shown in Figs. 11, 12, and 13.

The tenons and mortises of Figs. 11, 12, and 13 are "blind" tenons and mortises, so termed; but the invention is applicable for use and can be used for making open tenons and mortises, as shown in Fig. 14, in which the tenons 60 and the mortises 61 extend across the full thickness of the piece or strip instead of only partly across, as in Figs. 11, 12, and 13. The tenons 60 and the mortises 61 are formed the same as described for the tenons and mortises of Figs. 11, 12, and 13 by in-driving endwise the section of the material originally occupying the space of each mortise, and this in-driven section, forced into the body of the wood or material, is coalesced and united with the fiber of the body and forms a closely-impacted section similar to the section 62 (shown in Figs. 11, 12, and 13) and below the base-line of the tenons and mortises.

The operation will be understood from the foregoing description, but briefly is as follows: The upper and lower forming-dies are adjusted at the required distance apart for the length endwise of the piece or strip of wood to be operated upon, and when adjusted the piece or strip of wood is entered between the upper stripping-plate 13 and the lower stripping-plate 25, with the upper forming-die above and clear of the upper end of the piece or strip of wood and with the lower forming-die below the lower end of the piece or strip of wood, as shown in Fig. 2. The piece or strip of wood is held against the backing-plate 12 and the side guide or rest 14 when in position, and its face on the side to have formed therein the tenons and mortises projects beyond the stripping-plates, with the face of the piece or strip of wood in the vertical plane of the face of the upper jaw or guard 5 and the face of the lower jaw or guard 24, as shown in Fig. 2. The head of the press is carried down by the action of the pitman and crank-shaft for the under face of the lips or punches 4 to engage the upper end of the board or strip and have the lower end thereof engaged by the upper face of the lips or punches of the lower die, and when both the upper and lower dies engage with the ends of the piece or strip of wood the upper die is given a powerful, firm, or forcible down-thrust by which the sections occupying the spaces for the mortises will be driven forcibly into the fiber of the body of the wood below the base-line of the tenons and mortises, as clearly shown in Figs. 11, 12, and 13. The down-thrust of the upper forming-die forces the piece or strip of wood downward, and the action of the upper and lower dies simultaneously forms in the ends of the piece or strip of wood the tenons or mortises. The downward movement of the piece or strip of wood forces the lower stripping-plate 25 down to the limit of the down-thrust, and with the completion of the tenons or mortises the press-head is returned to normal position by the action of the crank-shaft and pitman, carrying with it the upper die, releasing such die from the end of the piece or strip of wood. The return movement of the head of the press through the connecting-rod 36 raises the free end of the bar 33 for the body of the bar to contact the cross rod or bar 31 and through the rods 30 return the lower stripping-plate to normal position, releasing the tenons and mortises formed in the lower end of the piece or strip of wood from the fixed lower die, and with the return movement of the upper forming-die the stripping-plate 13 acts to release the board or strip of wood from the upper die. The piece or strip of wood after the upper die and the lower stripping-plate have returned to normal position can be removed by the operator, and when removed the parts are in position for the en-

tering of another piece or strip of wood to be operated on by the dies and have the tenons and mortises formed in its end, which piece or strip of wood can be released as just described. The operation can be repeated until the required number of pieces or strips of wood have been operated upon in the manner described.

The lips or punches of both the upper and lower forming-dies do not act to remove any portion or section of the body of the piece or strip of wood, but operate to forcibly drive the section of the wood occupying naturally the space of the mortises bodily and directly into the fiber of the wood below the base-line of the tenons and mortises, and this section of wood so driven into the fiber will be impacted and coalesced with the body of the wood and not forced outward, for the reason that when the section for the mortise is forcibly driven to place in the body of the wood the jaws or guards of the upper and lower die impinge against the wood and prevent any out-bulging of the in-driven section, so that when completed the tenons and mortises will have straight side walls and a straight base-wall without any break or interruption in the base-wall, and the plane of the face of the piece or strip of wood at the point of in-driving the mortise-sections will not be impaired or rendered unsightly by any out-bulging. It will thus be seen that tenons and mortises are quickly and rapidly formed in the ends of pieces or strips of wood, and this without removing any portion of the wood to form the mortises; but all of the wood will be retained, as the mortise-sections are forcibly driven into the fiber of the body of the wood below the plane of the base of the tenons and mortises, and this without impairing the strength of the tenons and the mortises and the piece or strip of wood at the base-line of the tenons or mortises.

The arrangement of dies and backing-support shown is vertical; but the dies and backing-support could be arranged horizontal, one of the dies being movable and the other fixed, as in the construction of vertical dies, or both dies with either arrangement could be movable. The process or method of the present invention consists in driving endwise and lengthwise into the body of the wood or material that section or portion of the wood or material originally present and the removal of which forms the mortise or recess, leaving the tenon or tongue in position, and the process or method of the present invention forcibly drives, crushes, or wedges into the body of the wood or material either by a quick, sharp, and positive thrust or pressure or by a force of pressure sufficiently strong to carry ahead of the lips or punches the mortise-section of the wood or material which remains unbroken or intact and is embedded or impacted into and solidified with the body of

the wood or material in the line of the mortise or recess and below the base-line of the tenon and mortise and becomes an integral part of the body of the wood without any material out-bulging at the point of impacting or wedging the section into the body of the wood or material. The invention and the process or method of making tenons or tongues and mortises or recesses is specially designed and applicable for use in producing dovetail work, but can be used in the formation of other joints or unions having entering tenons or tongues and receiving mortises or recesses. The process or method of the invention can be carried out by means of the dies, backing-support, and stripping-plates with a suitable press, or the dies can be otherwise operated so long as the operation is of a nature to cause the dies to impact or wedge the mortise-section of the wood or material forcibly into the body of the wood or material.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a dovetailing and tenoning machine, the combination of a movable tenon and mortise forming die, a fixed tenon and mortise forming die, and a backing support between the two dies, for the dies to act and simultaneously form the tenon and mortise at and in both ends of the material operated upon, the mortise being formed by endwise in-driving the section therefor into the body of the material below the plane of the base of the tenon and mortise, substantially as described.

2. In a dovetailing and tenoning machine, the combination of a movable tenon and mortise forming die, having punches and openings thereon, a jaw overhanging the punches and carried by the die, a fixed tenon and mortise forming die having punches and openings thereon, a jaw overhanging the punches and carried by the die, and a backing-support between the two dies, for the dies to act and simultaneously form the tenon and mortise at and in both ends of the material operated upon, the mortise being formed by endwise in-driving the section therefor into the body of the material below the plane of the base of the tenon and mortise, substantially as described.

3. In a dovetailing and tenon forming machine, the combination of a movable tenon and mortise forming die, a fixed tenon and mortise forming die, a backing-plate between the two dies, a stripping-plate fixed on the backing-plate to coact with the movable die, and a movable stripping-plate to coact with the fixed die, for the dies to act and simultaneously form the tenons and mortises, the mortise being formed by endwise in-driving the section therefor into the body below the plane of the base of the tenon and mortise, substantially as described.

4. In a dovetailing and tenoning machine, the combination of a movable tenon and mortise forming die having punches and openings thereon, a jaw overhanging the punches and carried by the die, a fixed tenon and mortise forming die having punches and openings thereon, a jaw overhanging the punches and carried by the die, a backing-support between the two dies, a stripping-plate fixed on the backing-plate to coact with the movable die, and a movable stripping-plate to coact with the fixed die, for the dies to act and simultaneously form the tenons and mortises, the mortise being formed by endwise in-driving the section therefor into the body below the plane of the base of the tenon and mortise, substantially as described.

5. In a dovetailing and tenoning machine, the combination of a movable upper tenon and mortise forming die, a fixed lower tenon and mortise forming die, a vertical backing-support between the two dies, for the dies to act and simultaneously form the tenon and mortise at and in both ends of the material operated upon, the mortise being formed by endwise driving the section therefor into the body of the material below the plane of the tenon and mortise, substantially as described.

6. In a dovetailing tenoning machine, the combination of a movable upper tenon and mortise forming die, a fixed lower tenon and mortise forming die, a vertical backing-support between the two dies, an upper stripping-plate coacting with the upper die, and a lower stripping-plate coacting with the lower die, for the dies to act and simultaneously form the tenon and mortise at and in both ends of the material operated upon, the mortise being formed by endwise driving the section therefor into the body of the material below the plane of the tenon and mortise, substantially as described.

7. In a dovetailing and tenoning machine, the combination of a movable upper tenon and mortise forming die, a fixed lower tenon and mortise forming die, a vertical backing-support between the two dies, a fixed upper stripping-plate coacting with the movable upper die, and a movable lower stripping-plate coacting with the lower fixed die, for the dies to act and simultaneously form the tenon and mortise at and in both ends of the material operated upon, the mortise being formed by endwise driving the section therefor into the body of the material below the plane of the tenon and mortise, substantially as described.

8. In a dovetailing and tenoning machine, the combination of a movable tenon and mortise forming die, a fixed tenon and mortise forming die, a fixed backing-support between the two dies, a stripping-plate for the upper die on the backing-support, a movable stripping-plate for the lower fixed die, and

means for raising the plate coincident with the raising of the movable upper die, substantially as described.

9. In a dovetailing and tenoning machine, the combination of a movable tenon and mortise forming die, a fixed tenon and mortise forming die, a fixed backing-support between the two dies, a stripping-plate for the upper die on the backing-support, a movable stripping-plate for the lower fixed die, rods depending from the lower stripping-plate, a cross-rod, a swinging bar for engaging the cross-rod, and a connection between the swinging bar and the support for the movable die, substantially as described.

10. In a dovetailing and tenoning machine, the combination of a movable tenon and mortise forming die having punches and openings for making the mortises and tenons, a fixed tenon and mortise forming die having punches and openings for making the mortises and tenons, means for giving the movable die a powerful thrust, a backing-plate between the two dies supporting the piece to be operated upon, and an overhanging jaw for each die to coact with the backing-plate, substantially as described.

11. In a dovetailing and tenoning machine, the combination of a movable tenon and mortise forming die having punches and openings for making the mortises and tenons, a fixed tenon and mortise forming die having punches and openings for making the mortises and tenons, means for giving the movable die a powerful thrust, a backing-plate between the two dies supporting the piece to be operated upon, an overhanging jaw for each die to coact with the backing-plate, a stripping-plate for the movable die, and a stripping-plate for the fixed die, substantially as described.

12. In a dovetailing and tenoning machine, the combination of a movable die and a fixed die of corresponding shape, a backing-plate between the two dies, and means for giving the movable die a powerful thrust for simultaneously forming the tenons and mortises by both dies, substantially as described.

13. In a dovetailing and tenoning machine, the combination of a movable die and a fixed die of corresponding shape, a backing-plate between the two dies, means for giving the movable die a powerful thrust for simultaneously forming the tenons and mortises by both dies, a stripping-plate for the movable die, and a stripping-plate for the fixed die, substantially as described.

14. In a dovetailing and tenoning machine, the combination of a movable die and a fixed die of corresponding shape, a backing-plate between the two dies, means for giving the movable die a powerful thrust for simultaneously forming the tenons and mortises by both dies, a fixed stripping-plate on the backing-support to coact with the movable

die, and a movable stripping-plate to coact with the fixed die and operated coincidentally with the movements of the movable die, substantially as described.

5 15. In a dovetailing and tenoning machine, the combination of a movable die and a fixed die of corresponding shape, a backing-plate between the two dies, means for giving the movable die a powerful thrust for simultaneously forming the tenons and mortises by both dies, a fixed stripping-plate carried by the backing-plate and coacting with the movable die, a movable stripping-plate coacting with the fixed die, and a connection
10 15 between the movable stripping-plate and the movable die, substantially as described.

16. In a dovetailing tenoning-machine, the combination of a movable tenon and mortise forming die having punches and openings for making the mortises and tenons, means for supporting and maintaining the material in the plane of the movement of the die, and means for giving the die a powerful thrust, substantially as described.

25 17. In a dovetailing tenoning-machine, the combination of a movable tenon and mortise forming die having punches and openings for making the mortises and tenons, means for giving the die a powerful thrust, and a backing-plate supporting and maintaining the material in the plane of the movement of the movable die and in position to be operated upon by the punches of the die, substantially as described.

35 18. In a dovetailing tenoning-machine, the combination of a movable tenon and mortise forming die having punches and openings for making the mortises and tenons, means for giving the die a powerful thrust, a backing-plate supporting and maintaining the material in the plane of the movement of the movable die and in position to be operated upon by the punches of the die, and a jaw on the die at the rear of and projecting beyond the end of the punches and coacting with the backing-plate for preventing out-bulging of the material from the action of the die, substantially as described.

50 19. In a dovetailing tenoning-machine, the combination of a movable tenon and mortise forming die having punches and openings for making the mortises and tenons, means for giving the die a powerful thrust, a backing-plate supporting and maintaining the material in the plane of the movement of the movable die and in position to be operated upon by the punches of the die, a jaw on the die at the rear of and projecting beyond the end of the punches and coacting with the backing-plate for preventing out-bulging of the material from the action of the die, and a stripping-plate on the end of the backing-plate for holding the material against end movement on the return of the die, substantially as described.
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20. In a dovetailing tenoning-machine, the combination of a movable tenon and mortise forming die, means for giving the movable die a powerful thrust, a backing-plate for supporting and maintaining the material in the plane of the movement of the die, and a jaw on the die at the rear of and projecting beyond the end of the punches of and coacting with the backing-plate for preventing out-bulging of the material from the action of the die, substantially as described. 70 75

21. In a dovetailing tenoning-machine, the combination of a movable tenon and mortise forming die, means for giving the movable die a powerful thrust, a backing-plate for supporting and maintaining the material in the plane of the movement of the die, a jaw on the die at the rear of and projecting beyond the end of the punches and coacting with the backing-plate for preventing out-bulging of the material from the action of the die, and a fixed stripping-plate on the end of the backing-plate for preventing end movement of the material with the return of the movable die, substantially as described. 80 85 90

22. In a dovetailing and tenoning machine, the combination of a tenon and mortise forming die, a backing-support coacting with the die and maintaining and holding the material in position in the plane of the movement of the die for the die to act and form the tenon and mortise at and in the end of the material operated upon, the mortise being formed by endwise in-driving the section therefor into the body of the material below the plane of the base of the tenon and mortise, substantially as described. 95 100

23. In a dovetailing and tenoning machine, the combination of a tenon and mortise forming die having punches and openings, a jaw on the die at the rear of and projecting beyond the end of the punches and a backing-support coacting with the die and maintaining and holding the material in position in the plane of the movement of the die for the die to act and form the tenon and mortise at and in the end of the material operated upon, the mortise being formed by endwise in-driving the section therefor into the body of the material below the plane of the base of the tenon and mortise, substantially as described. 105 110 115

24. In a dovetailing and tenoning machine, the combination of a pair of tenon and mortise forming dies, and a backing-support between the two dies for the dies to act and simultaneously form the tenon and mortise at and in both ends of the material operated upon, the mortise being formed by endwise in-driving the section therefor into the body of the material below the plane of the base of the tenon and mortise, substantially as described. 120 125

25. In a dovetailing and tenoning machine, the combination of a pair of tenon and 130

mortise forming dies having punches and openings thereon, a jaw for each die overhanging the punches, and a backing-support between the two dies for the dies to act and simultaneously form the tenon and mortise at and in both ends of the material operated upon, the mortise being formed by endwise in-driving the section therefor into the body of the material below the plane of the base of the tenon and mortise, substantially as described.

26. In a dovetailing and tenoning machine, the combination of a pair of tenon and mortise forming dies, a backing-plate between the two dies, and a stripping-plate for each die, for the dies to act and simultaneously form the tenon and mortise, the mortise being formed by endwise in-driving the section therefor into the body below the

plane of the base of the tenon and mortise, substantially as described. 20

27. In a dovetailing and tenoning machine, the combination of a pair of tenon and mortise forming dies having punches and openings thereon, a jaw for each die overhanging the punches, a backing-support between the two dies, and a stripping-plate for each die, for the dies to act and simultaneously form the tenon and mortise, the mortise being formed by endwise in-driving the section therefor into the body below the plane of the base of the tenon and mortise, substantially as described. 25 30

WILLIAM D. KELLY.

Witnesses:

OSCAR W. BOND,
WALKER BANNING.