

(No Model.)

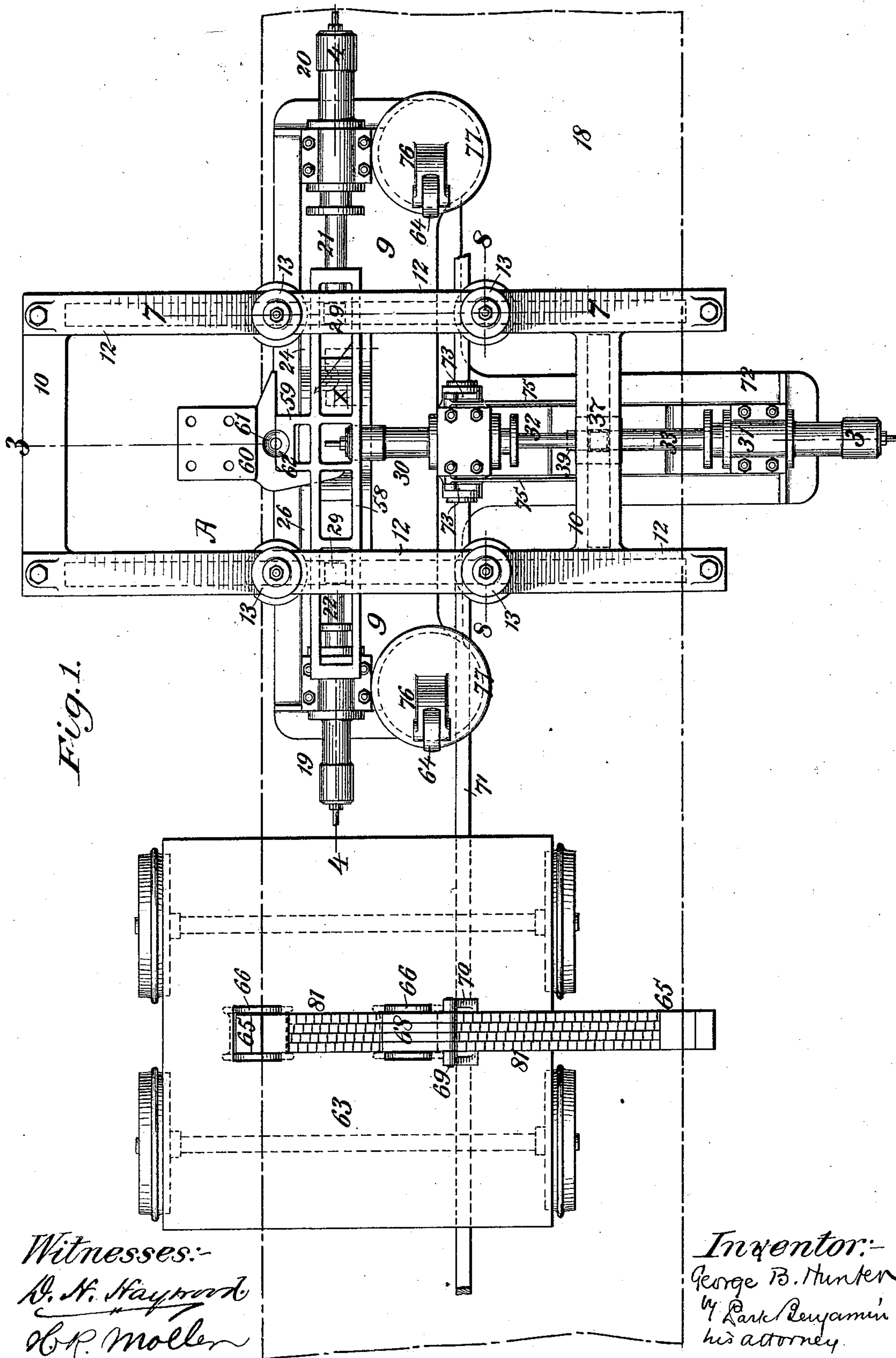
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G. B. HUNTER.

APPARATUS FOR FEEDING PLATES OR BARS TO PUNCHING MACHINES, &c.

No. 512,829.

Patented Jan. 16, 1894.



Witnesses:-

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Inventor:-

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his attorney.

(No Model.)

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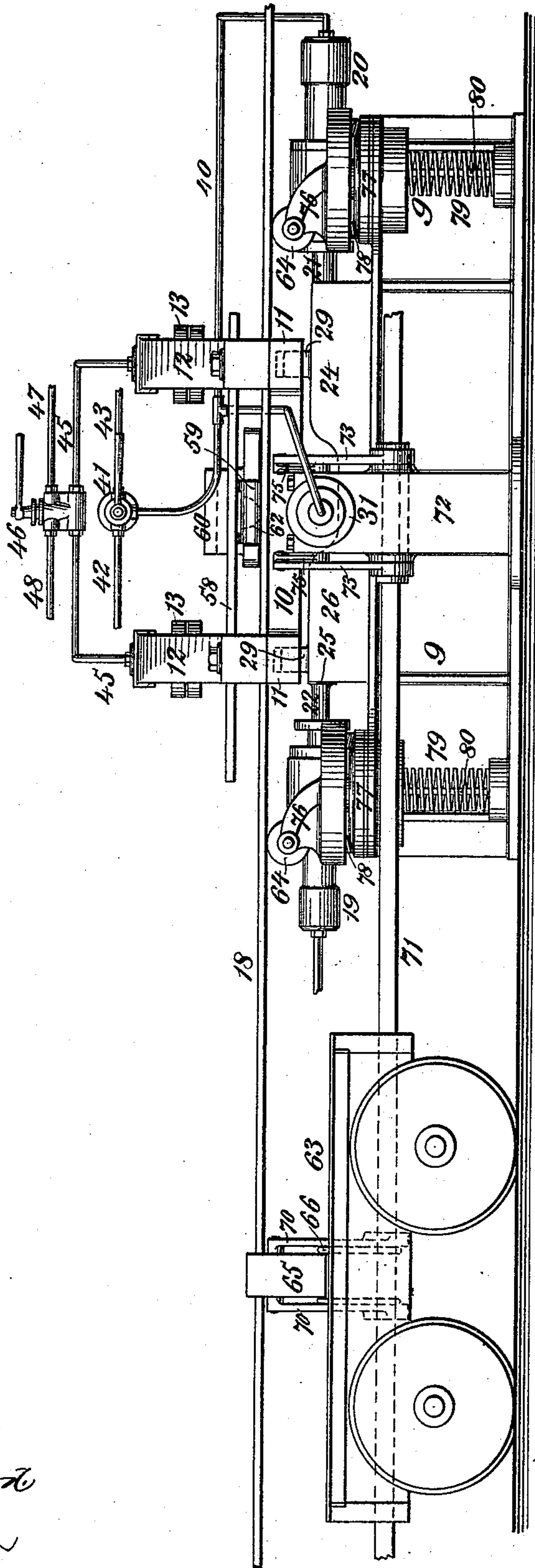
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No. 512,829.

Patented Jan. 16, 1894.

Fig. 2.



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(No Model.)

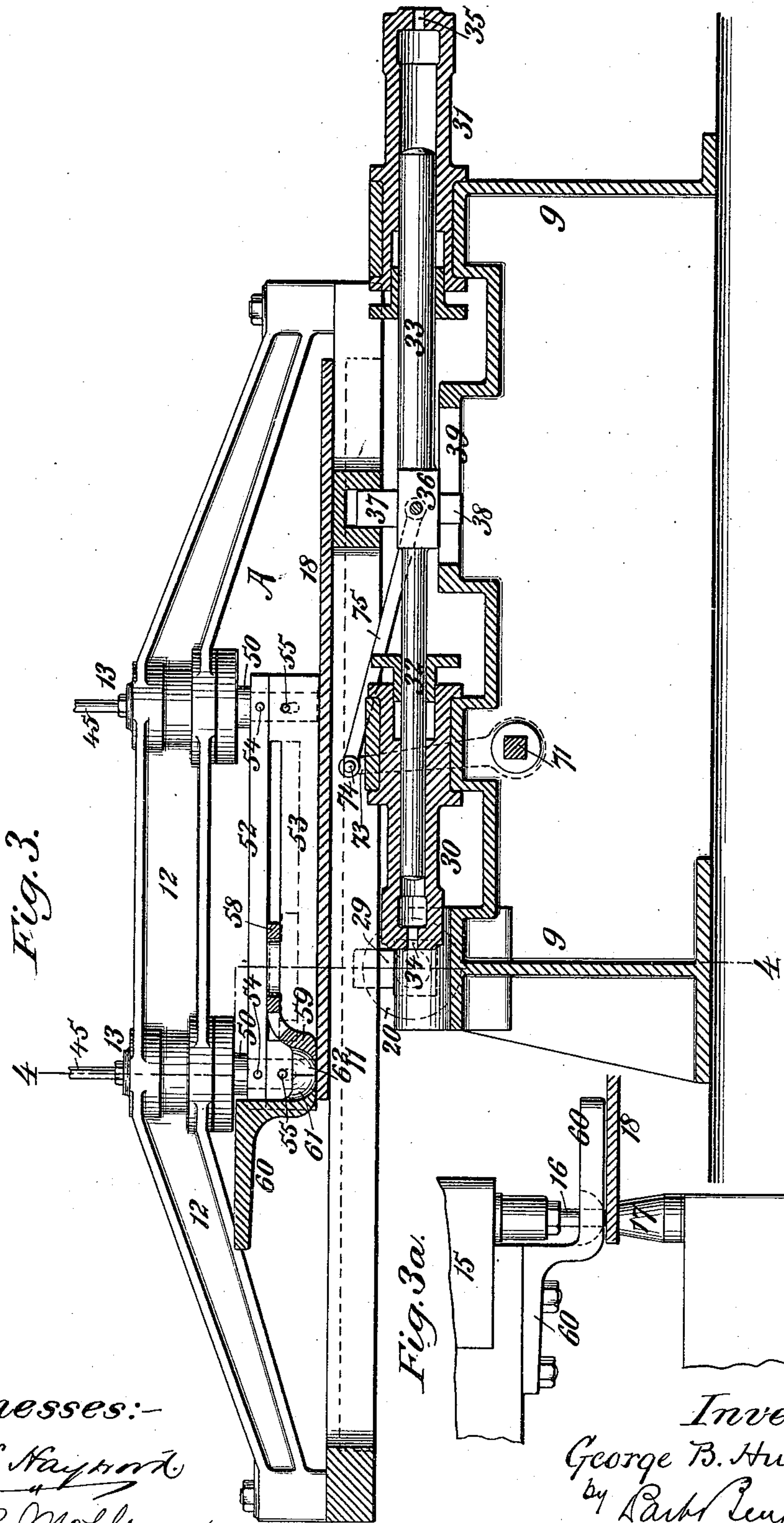
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APPARATUS FOR FEEDING PLATES OR BARS TO PUNCHING MACHINES, &c.

No. 512,829.

Patented Jan. 16, 1894.



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(No Model.)

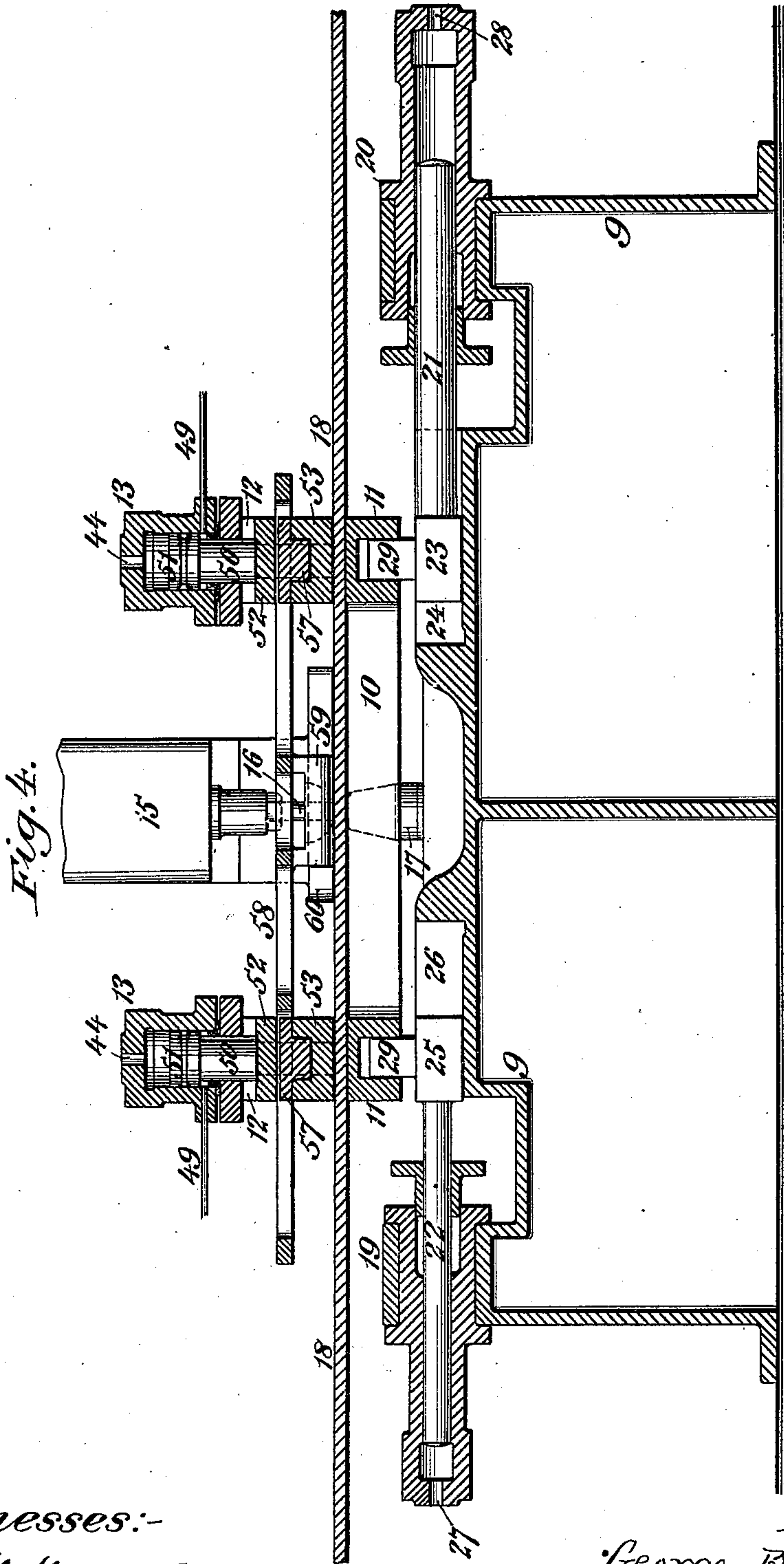
5 Sheets—Sheet 4.

G. B. HUNTER.

APPARATUS FOR FEEDING PLATES OR BARS TO PUNCHING MACHINES, &c

No. 512,829.

Patented Jan. 16, 1894.



Witnesses:-

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(No Model.)

5 Sheets—Sheet 5.

G. B. HUNTER.

APPARATUS FOR FEEDING PLATES OR BARS TO PUNCHING MACHINES, &c.

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Fig. 5.

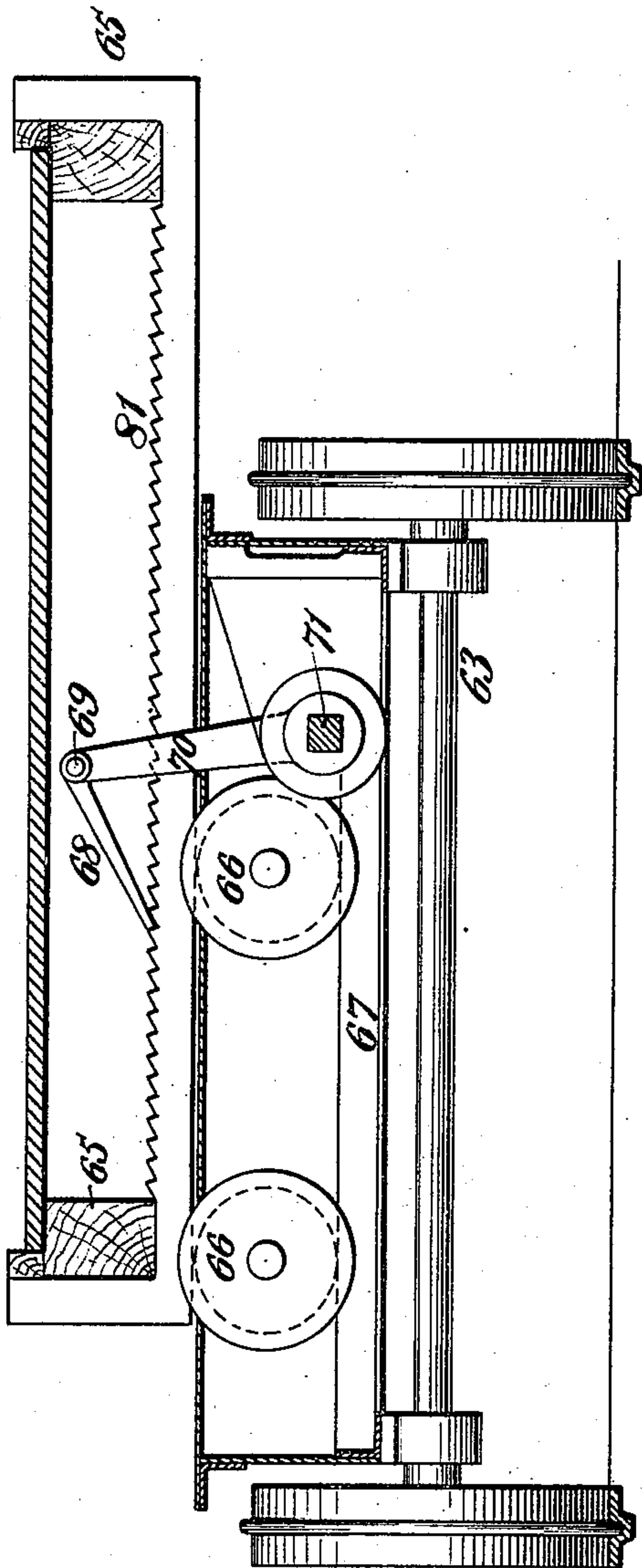


Fig. 7.

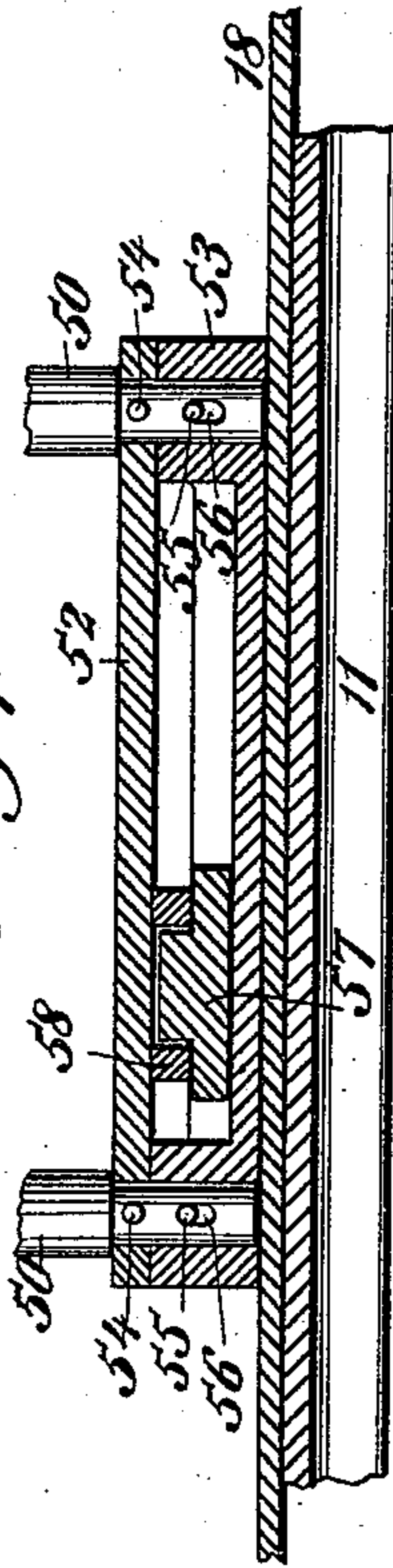


Fig. 8.

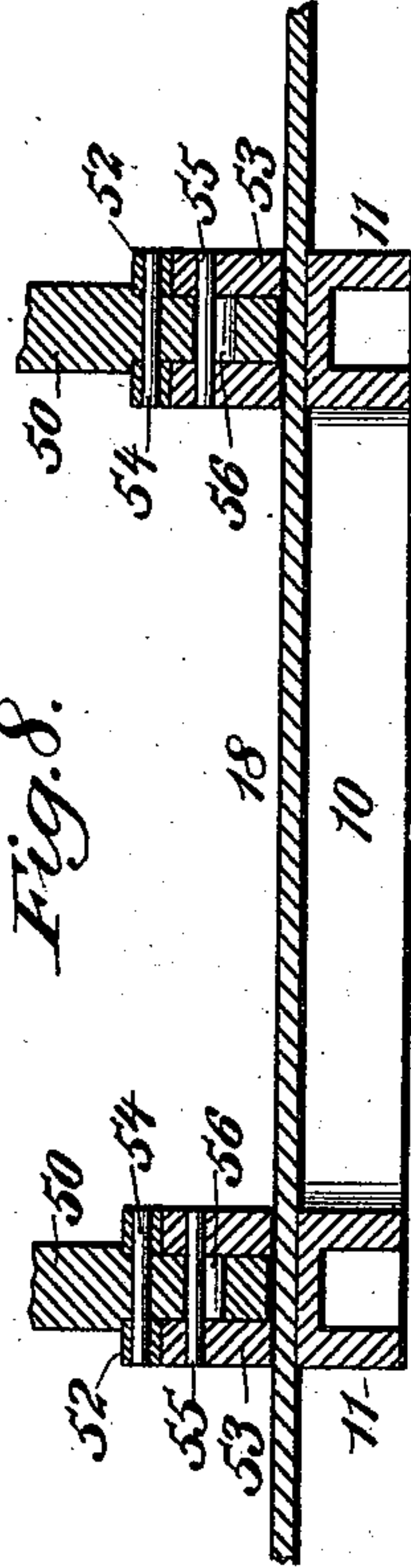
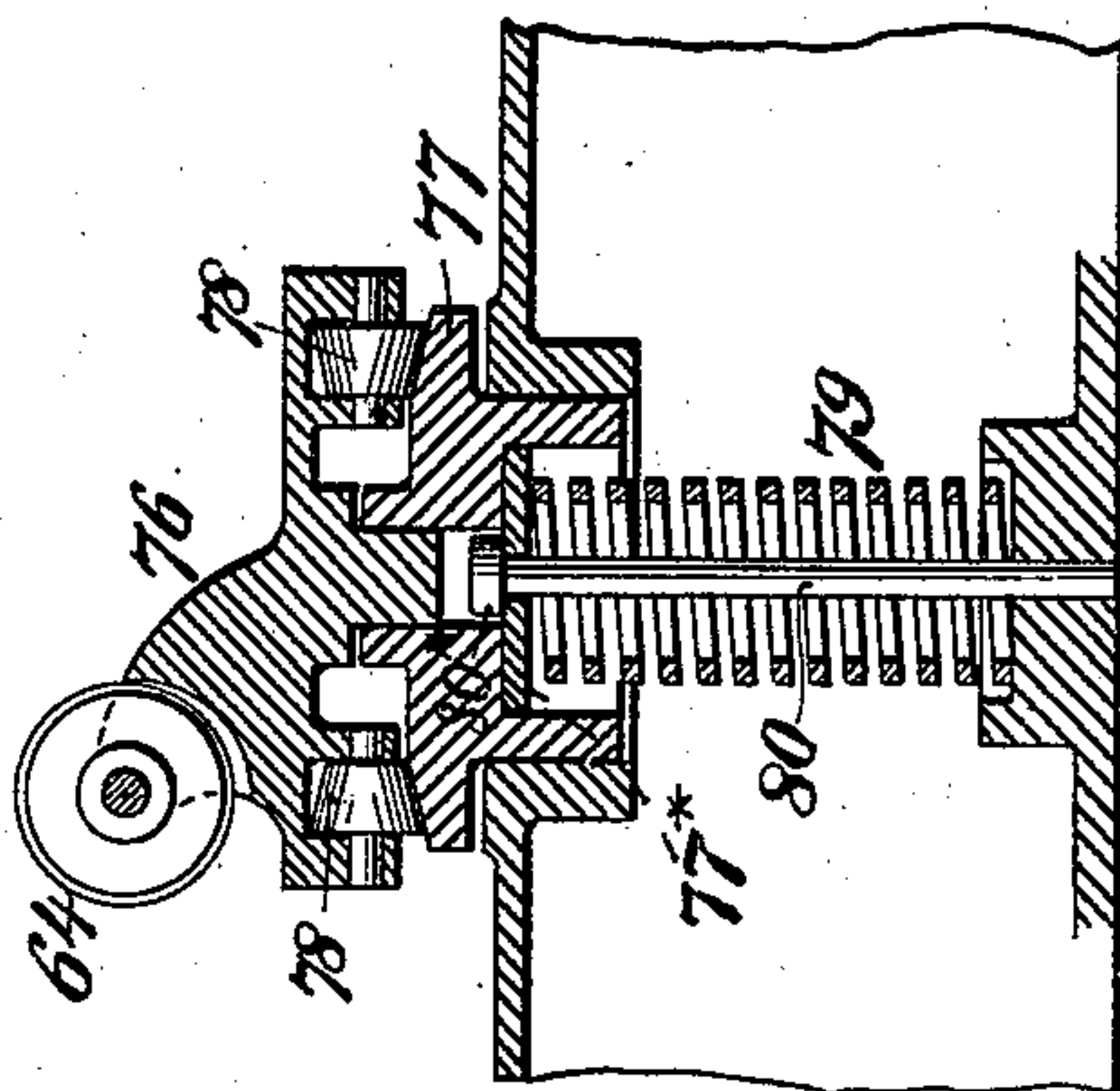


Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE B. HUNTER, OF NEWCASTLE-ON-TYNE, ENGLAND.

APPARATUS FOR FEEDING PLATES OR BARS TO PUNCHING-MACHINES, &c.

SPECIFICATION forming part of Letters Patent No. 512,829, dated January 16, 1894.

Application filed May 26, 1893. Serial No. 475,569. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. HUNTER, of Newcastle-on-Tyne, England, have invented a new and useful Improvement in Apparatus for Feeding Plates or Bars to Punching, Shearing, or Similar Machines, of which the following is a specification.

My invention relates to an apparatus for feeding plates or bars to machines designed for punching, drilling, slotting, shearing, or otherwise acting upon them.

My invention has for its object the substitution of steam, hydraulic or other power for the hand labor hitherto employed in accomplishing this work, which hand labor, owing to the size of the plates and their great weight, is both slow and expensive. By my present apparatus, a plate which would require from four to ten men to move it can be easily handled by at most two men.

My invention consists more particularly in the construction and mechanical arrangement of the machine hereinafter set forth, and more particularly in the devices for moving and adjusting the plate by hydraulic, steam, or other power with reference to the tool; the mechanism for gripping and relieving the plate: and the index bar adjustable on said plate, with the fixed stop or guide with which said bar is brought into contact in order to to more accurately and certainly cause the plate to become adjusted in proper position.

In the accompanying drawings, my invention is shown applied to an ordinary punching machine for making holes in metal plates, such as are commonly used in ship-building. The construction and arrangement of this punching machine are not material, and therefore the details of said punching machine are not shown here.

Figure 1 is a plan view of the machine, and also of the bogie which carries the plate to be punched. Fig. 2 is a front elevation. Fig. 3 is a section on the line 3, 3 of Fig. 1. Fig. 3^a is a detail view showing in side elevation the arrangement of punch and die. Fig. 4 is a section on the line 4, 4 of Fig. 3. Fig. 5 is an end view of the bogie showing the means for advancing the plate. Fig. 6 is a vertical section showing in detail the construction of the rams on which the plate rests while in the machine. Fig. 7 is a section on the line 7, 7

of Fig. 1, showing in detail the arrangement of the clamping bars and index bar. Fig. 8 is a section on the line 8, 8 of Fig. 1, and also shows in detail the arrangement of the same parts.

Similar numbers and letters of reference indicate like parts.

In order to avoid confusion with the indicating numbers of the section lines, the numerical references to the parts of the machine begin with the number 9.

9 is the fixed bed of the machine upon which the various working parts are supported. Above this bed-plate there is disposed a rectangular frame having longitudinal bars, 11, and cross bars, 10. Secured to the ends of this frame and extending longitudinally thereto and above the same are two girders, 12. This structure, composed of the frame 10—11 and girders 12, is marked A on the drawings, and will hereinafter be so designated. Each girder 12 of structure A has two cylinders, 13, so that there are four cylinders 13. These, as will hereinafter be explained, constitute means for clamping the plate 18 in the structure A.

In Fig. 4, 15 represents the body of the punching machine, 16 represents the punch, and 17 the die. The same parts are also shown in Fig. 3^a.

In all the views, 18 represents the plate to be acted upon; and it is to be particularly noted that in Fig. 1 this plate, for purposes of clearness, is indicated only by dotted lines. Of course the longitudinal edge of the plate 18 is shown in Figs. 2, 4 and 8, and its lateral or transverse edge is shown in Figs. 3, 5 and 7. The plate is shown in plan in Fig. 1. The plate 18 is supported independently of this structure A upon three points; namely, upon the die 17 and upon two rollers, 64, upon the bed 9. The details of these rollers will be explained farther on. The plate, resting always upon these supports, extends over the frame 10—11 and under the girders 12; or, in other words, between frame and girders. The cylinders 13 are therefore above the plate, and, as will be hereinafter explained, when the rams of these cylinders are forced down upon the plate, then the effect is to cause the entire structure A to rise, so that the upper surface of the frame 10—11 then meets the lower

side of the plate, and hence the plate becomes clamped between said frame 10—11 and the cylinder rams. This I will now explain in detail.

5 In each cylinder 13 (see Fig. 4) there is a port, 44, which communicates by pipes, 45, with the cock 46, Fig. 2. The cock 46 communicates with the outlet pipe 47 and the inlet pipe from the main 48; consequently, by
10 turning the cock 46, the full main pressure may be delivered into the cylinder 13 through the port 44; or, by turning the cock 46 in the other direction, the contents of the cylinders may be allowed to escape through the ports
15 44 to pipe 47 and so to waste. Also in the sides of the cylinders 13 are ports, which communicate by suitable pipes 49 directly with the main. In each cylinder 13 is a ram, 50, of less diameter than the bore of the cylinder, but provided with a head, 51, which fits the cylinder. As will be seen from Fig. 4, the constant pressure from the main delivered through pipe 49 acts on the under side of the head, or rather upon simply the annular
20 border of the head. On the other hand, the pressure delivered through the port 44 acts upon the whole area of the head 51. As the pressure of the main through pipe 49 is constant, it follows that the plunger 50 is normally
25 kept in its highest position; in which case, of course the cock 46 is turned to open the waste outlet. When, however, it is desired to force the plunger down, then the cock 46 is turned to communicate with the main through pipe 48, and the water pressure, acting on the whole
30 cross-sectional area of the head 51, easily overcomes the pressure which is exerted simply on the annular lower side thereof. Now the effect of forcing the plunger down against an
35 abutment is of course to raise the structure A. Therefore, as the plungers press down on the upper side of the plate 18 (or, as will be hereinafter seen, upon certain interposed parts) and the whole structure A rises, the frame
40 10—11 moves up against the under side of the plate, and thus the plate and the structure A aforesaid become tightly clamped together.

The frame 10 and 11 has on the under sides of its longitudinal bars 11 and on the under
45 side of one of its cross bars 10, long channels. In these channels enter projections, 29, Fig. 4, and 37, Fig. 3. These projections I will explain farther on, but for the present I refer to them to show how the structure A is supported, and particularly to point out that said
50 structure may move freely up and down to a limited extent upon said projections.

In Figs. 3 and 4 it will be seen that the frame 10 and 11 is shown as raised against the plate, and hence there is a space above the tops of the projections 29 and 37. When the plate is clamped in the manner described in the structure A, it is ready to be moved in proper position to be acted upon by the tool. The tool
55 here shown, for purposes of illustration, is a punching machine, which is, of course, fixed and invariable in position.

In order that the punch may act upon any part of a plate, the plate must have a universal movement in a horizontal plane; and, as is well known, such a universal movement may be given by devices acting upon the plate to move it in directions relatively at right angles one to the other. These devices I will now describe; it being understood that
60 such devices do not move the plate in the structure A, but do move the entire structure A, and with it the plate.

Referring to Fig. 1, 19 and 20 are two hydraulic cylinders. Their function is to move
65 the plate to and fro in a longitudinal direction. 30 and 31 are two hydraulic cylinders disposed with their axes at right angles to the axes of the cylinders 19 and 20. Their function is to move the plate to and fro in a lateral direction.

Referring to Fig. 4, there is here shown a longitudinal section of the cylinders 19 and 20 and associated parts. In the cylinder 20 is a ram, 21, and in cylinder 19 a ram, 22.
70 The ram 21 has a head, 23, which operates in a trough-shaped guide box, 24, supported on the main frame 9. The ram 22 has a similar head, 25, which operates in a guide box, 26, also supported on the main frame 9. The ram
75 22 is operated by water admitted into the cylinder 19 through the port 27. The inlet port of cylinder 20 is shown at 28. On the upper sides of the ram heads 23 and 25, are the projections 29. These projections enter longitudinal grooves or channels formed on the under sides of the longitudinal bars 11 of the frame 10—11. It will therefore be plain that when the rams 21 and 22 move in one direction or the other, they will cause a movement
80 of the supporting structure A from right to left, or left to right, of the drawings, Fig. 4. The plate 18 will therefore be carried forward or back in the direction of its length; but by reason of the long channels in the bars 11, it is clear that the structure A may still be moved by other means in a lateral direction. This lateral movement is caused by the cylinders 30 and 31, Fig. 1. A longitudinal section of the cylinders 30 and 31 is given in Fig. 3.
85 The cylinder 30 has a ram, 32, and the cylinder 31 a ram, 33. Water is admitted into these cylinders respectively at the ports 34 and 35. The rams 32 and 33 are connected to a single head, 36, and on this head is an upward projection, 37. This projection enters a long channel or groove in one of the transverse bars 10, and of course this channel in the bar 10 stands at right angles to the channels already described as existing in the bars 11. Therefore the rams 32 and 33 of cylinders 30 and 31 serve to move the structure A to and fro in a lateral direction, and this motion is permitted by the sliding of the channel in the bars 11 over the projections 29 on
90 the rams 21 and 22; and, on the other hand, the structure A is moved in a longitudinal direction by means of the rams 21 and 22, and this motion is permitted by reason of the chan-

nel in bar 10 sliding over the projection 37 on rams 32, 33. Therefore, by admitting water in suitable manner into the cylinders 30, 31 and 19, 20, it becomes easily possible to cause the structure A, and hence the plate thereon, to move under the fixed punch 16 in any direction in the plane of the plate. The head 36 is guided by a projection, 38, which moves in a slot, 39, on the bed 9.

It will be noticed that the rams 33 and 21 are of larger cross-sectional area than the rams 32 and 22. The object of this construction is as follows: The port 27 of cylinder 19 and 34 of cylinder 30 are both connected directly to the water pressure main, so that a constant pressure is maintained upon the rams 22 and 32, which therefore proceed to the outer limit of their stroke, and therefore carry the structure A to a definite position. The ports 28 and 35 of the cylinders 20 and 31, on the other hand, communicate with a source of water supply by a pipe, 40, Fig. 2. This pipe leads to a two-way cock, 41, which in turn connects both with the main by pipe 42 and with the waste outlet by pipe 43. Now when the cock 41 is turned so as to open the waste, the rams 32 and 22 will move the structure A to a certain extreme position, and when the cock 41 is turned to communicate with pipe 42 so as to allow the pressure of the main to act upon the rams 33 and 21, then these rams, being of larger area than the rams 32 and 22, the pressure thereon will overbalance the pressure constantly exerted on rams 32 and 22, and hence the structure A will be moved by a force equal to the difference of pressure in a direction opposite to that in which it was moved by the rams 32 and 22; and this is the movement whereby the plate becomes adjusted underneath the punch in some desired position. While, therefore, it might be possible, by the exercise of care, to adjust the pressures in the cylinders which move the support A so that the plate is exactly brought to a certain predetermined position, it will readily be seen that this might be a somewhat slow operation, or require considerable skill and niceness of manipulation on the part of the operator. It is to be distinctly understood that the machine in such condition would be by no means inoperative. It would be distinctly useful, and would be a valuable improvement over any means of adjusting the plate which, so far as I know now, exists. But for purposes of convenience of handling and of reducing the skill required therefor, it is better to provide the machine with another and additional device whereby the setting of the plate in a definite predetermined position with accuracy is insured irrespective of any manipulative skill or special capacity for adjustment by the operator. This device I will now describe.

Referring to Figs. 7 and 8, it will there be seen that the lower extremities of the rams 50 belonging to the cylinders 13 are connected to two cross-bars, 52 and 53. The rams are

connected rigidly to the cross-bar 52 by pins, 54, and the bar 52 therefore has no play up and down on the ends of the rams 50. The bar 53, on the other hand, is connected to the rams 50 below the bars 52 by pins, 55. These pins pass through elongated slots, 56, in the ends of the rams 50, and therefore the bar 53 has some play on the ends of the rams 50. Now, still referring to Fig. 7, it will be plain that when the rams 50 rise, the structure A descends and the frame 10 11 moves away from contact with the under side of the plate. The bar 53 does not rise with the ram until the pin 55 reaches the end of the slot 56. The bar 52, connected to the plungers 50, remains fixed in position with relation thereto, so that the plate 18 is first freed from the clamping pressure between frame 10 11 and then the interval between bars 52 and 53 becomes increased. In the bar 53 is a longitudinal groove in which slides a shoe, 57. The shoe has an upward projection which enters a slot in the index bar 58. It will be seen from this construction that while the shoe may slide to and fro in one direction in the channel in the bar 53, the index bar 58 may slide to and fro in a direction at right angles to that of the movement of the shoe 57. Upon the shoe 57, therefore, a point on the index bar 58 has universal movement in a horizontal plane. The relation of this index bar 58, which is a light piece of metal, to the other parts of the apparatus will be readily understood from Figs. 1 and 3, from which it will be seen that at the middle there is a downward projection, 59, the rectangular corner of which projection is received in the rectangle formed by a fixed guide, 60, which guide is secured, as shown in Fig. 3^a, upon the fixed punching machine.

In the projection 59, and likewise in the fixed guide 60 are formed two semicircular conical openings, 61 and 62, Fig. 1, which openings come together to form a circular aperture directly underneath the punch. This is shown in Figs. 3 and 4 in section. Through this opening the punch descends upon the plate beneath. Now, by referring to Fig. 7, it will be seen that the index bar 58 and its traveling shoe 57 are both located between the bars 52 and 53, and that, by reason of the mode of connection already described of the bars 52 and 53 to the rams 50, the effect of the descent of the rams 50 and the rising of structure A is not merely to clamp the plate 18 in place as described, but also to clamp the index bar 58 and its traveling shoe 57 between the bars 52 and 53.

I will now explain the relation of the index bar to the plate and to the fixed guide 60, and thus show how the machine does its work. Suppose, simply to illustrate, that we desire to punch a hole in the plate 18 at the point X represented in Fig. 1. A chalk mark is made at that point and the thing that we have to do is to move the plate so as to bring that chalk mark accurately underneath the punch. No pressure being exerted in the clamping

cylinders, the pistons being raised and hence the structure A lowered, the workman grasps the index plate 58 with his hand, and moves it say to the position indicated in dotted lines 5 of Fig. 1; so that the semi-circular openings 62 at the edge of the projection 59 will come directly over the chalk mark on the plate. This, of course, he can easily do, because the index plate slides freely, as has already been 10 explained, upon its shoe 57, and because the shoe slides freely in the bar 53. The cock 46 is then turned so as to close the outlet 47 and open the inlet 43; and the water pressure being admitted to the top of the rams 50 lifts 15 the structure A, thus securing the index bar 58 in place as adjusted, and also the plate 18 firmly in said structure A. Neither plate nor index bar can now move with reference to structure A, but all parts now are united. 20 Meanwhile, the pressure acting upon the rams in cylinders 19 and 30 has moved the structure A into some definite position, as already described; and these rams are at the farther end of their stroke. The operator 25 now admits, by means of cock 41, the pressure of the main into the cylinders 20 and 31, so that the rams of these two cylinders now act upon the structure A simultaneously, and move it, and hence the plate, of course, in a 30 resultant direction; say in that of the arrow crossing the point X shown in Fig. 1. Whatever, however, this resultant direction may happen to be, it is certain that the plate will be carried longitudinally until one side of the 35 projection 59 on the index bar strikes the guide 60, and laterally until the adjacent side of the projection 59 on the index bar strikes the parallel side of the guide 60, or, in other words, until the projecting angle of the pro- 40 jection 59 fits itself into the re-entering angle of the guide 60. Then the projection 59 on the index bar 58 and the guide 60 will have come into contact and hold the relative position shown in Fig. 1, and then of course the 45 two semi-circular openings respectively in the projection 59 and the guide 60 will register and will form a complete circular opening. As the chalk mark on the plate is below the semi-circular opening 62, it is clear that we 50 shall have moved the plate into exactly the right position underneath the punch 16, which in descending passes through that opening, and so reaches the plate. After the punch has been caused to descend to make the hole, 55 the cock 46 is opened so as to allow the water above the pistons in the clamping cylinders to pass to the outlet 47. The water from the main then acting upon the under side of the rams 50 causes the structure A to descend 60 and the clamping pressure upon the index bar and the plate to be relaxed. The index bar may now be set in a new position to suit a new mark indicating the next hole to be punched. Meanwhile, the cock 41 is turned 65 to allow the pressure to be relaxed in cylinders 20 and 31. The pressure from the main then acts upon the rams in cylinders 30 and

19, and the structure A is returned to its initial position. The operation then above described is repeated until all the holes are 70 punched in the plate. It will be seen that the labor of the operator consists simply in adjusting the index plate 58 in the manner described, and in manipulating the cocks which regulate the water pressure to the several cyl- 75 inders.

I will now describe certain details of the mechanism which are conveniently added, though not essential to the operation of the machine in any way. It will be apparent 80 from Fig. 2 that the plate 18 is supported upon the bogie 63, and also upon rollers, 64, which are supported on the bed 9 of the machine. The plate is further supported upon the lower die, 17, of the punch, so that 85 in the machine proper the plate 18 rests upon three points—the lower die and the two rollers 64. The construction of the rollers 64 is shown in detail in Fig. 6, and they are ar- 90 ranged upon yielding supports, so that the plate may rest firmly upon the lower die 17. To this end, the rollers 64 are carried on brackets, 76, which are pivoted in a supporting 95 plate, 77. Bracket 76 also has rollers, 78, conical in shape, which rest upon the beveled, circular, upper side of the plate 77 and turn thereon. The plate 77 is received in a flanged opening in the bed 9, and has on its under side a circular recess in which is re- 100 ceived a spiral spring, 79, which also rests upon the bed-plate. In the said recess is a plate, 77*, having a central opening. Through this opening and through the spring 79 passes a fixed spindle, 80, which has a head, 80*, 105 above the plate 77*. The weight of the plate 18 resting on the rollers 64 forces down the plate 77 against the action of the spring; but the extent of its downward motion is limited by the bed-plate 9, while its upward motion is limited by the head 80* meeting the plate 110 77*. In this way, any inequality in the shape of the plate 18 is provided for by the yielding of the spring, and any movement of said plate in a horizontal plane is allowed for by the turning of the brackets 76 about their pivot 115 centers.

In order to assist the lateral movement of the plate in the machine, the plate rests upon a supporting frame, 65, in the bogie 63. This frame is supported on rollers, 66, which are 120 free to travel on ways, 67, laterally the bogie. On the bottom of the frame 65 is a number of ratchet bars, 81, having inclined teeth, stepped as indicated in Figs. 1 and 5. With these teeth engage pawls, 68, which pawls are 125 pivoted on a transverse bar, 69, carried by the levers 70, which levers are fast upon the square shaft 71. The shaft 71 is supported so as to rotate in the standard 72 of the bed-plate 9 (see Fig. 2), and carries levers, 73, 130 which are united to a cross head, 74, Fig. 3, to which cross head is pivoted one end of a pitman, 75, the other end of which is pivoted to the ram head 36. The motion of this ram

head, therefore, is transmitted to the square shaft 71 to cause it to vibrate, and thus to move the pawls 68, which pawls engage with rack bars, 81, and move the carriage, and thus
5 cause a transverse or lateral travel of the plate 18. By this means the plate may be adjusted in the structure A.

While I have described here a machine organized for the use of hydraulic power, I wish
10 it distinctly understood that I do not limit myself to this power only; because, in place of the hydraulic cylinders I may use steam cylinders arranged in substantially the same way and operating by steam pressure differentially applied as described; or, I may use any
15 form of electric motors also applied and operating in substantially the same manner; or I may impart motion to the structure A by other mechanisms, such as screws or levers
20 acted upon by electric or other motors.

By the term "plane of the plate," as herein used, I mean the plane coinciding with the face of the plate or that surface thereof having the greatest superficial area.

25 By the term "fluid pressure" I mean pressure exerted by any fluid, whether liquid or gaseous.

By the term "punching machine" I mean any machine embodying a reciprocating
30 punch and fixed die, between which the work is acted upon.

The word "tool" in the claims means any tool capable of doing useful work upon the plate, when said plate is adjusted and moved
35 with reference to it, by the apparatus herein set forth.

I claim—

1. In a machine for moving and adjusting a plate with reference to a tool, the combination of a movable holder, a means for clamping
40 said plate to said holder, and means for moving said holder universally in a plane parallel to the plane of the plate, whereby said plate is adjusted in definite position with reference to said tool, substantially as described.

2. In a machine for moving and adjusting a plate with reference to a tool, the combination of a movable holder for said plate, a tool
50 constructed to act upon said plate, a guide, and means for moving said holder universally in a plane parallel to the plane of the plate and into contact with said guide: whereby said plate is adjusted and by said guide arrested, in definite position with reference
55 to said tool, substantially as described.

3. In a machine for moving and adjusting a plate with reference to a tool, the combination of a movable holder for said plate, a tool
60 constructed to act upon said plate, a guide projection upon said holder, a guide or stop, and means for moving said holder universally and in a plane parallel to the plane of the plate and causing said guide projection to meet said guide: whereby said plate is ad-
65 justed and by said guide arrested in definite position with reference to said tool, substantially as described.

4. In a machine for moving and adjusting a plate with reference to a tool, the combination of a movable holder for said plate, a tool
70 constructed to act upon said plate, a guide projection having two faces disposed relatively at a salient angle, a fixed guide or stop having two faces disposed relatively at a re-
75 entering angle equal to said salient angle, and means for moving said holder universally and in a plane parallel to the plane of the plate and causing said angular projection to enter said fixed guide: whereby said plate is ad-
80 justed and by said fixed guide arrested in definite position with reference to said tool, substantially as described.

5. In a machine for moving and adjusting a plate with reference to a tool, the combination of a movable holder for said plate, a tool con-
85 structed to act upon said plate, an adjustable guide projection upon said holder, a guide or stop and means for moving said holder universally in a plane parallel to the plane of the plate and causing said guide projection
90 to meet said guide: whereby said plate is adjusted and by said guide arrested in definite position with reference to said tool, substantially as described.

6. In a machine for moving and adjusting a
95 plate with reference to a tool, the combination of a tool constructed to act upon said plate, a guide projection secured to said plate, a guide or stop and means for moving said plate uni-
100 versally in the plane of its face and thus causing said guide projection to meet said guide: whereby said plate is adjusted and by said guide arrested in definite position with reference to said tool, substantially as described.

7. In a machine for moving and adjusting a
105 plate with reference to a tool, the combination of a tool constructed to act upon said plate, a guide projection secured to said plate supported in a plane parallel to the plane of the plate, and independently movable universally
110 over the surface of said plate, a guide or stop, and means for imparting to said plate a universal movement in its own plane, and thus causing said guide projection to meet said
115 guide: whereby said plate is adjusted, and by said guide arrested, in definite position with reference to said tool, substantially as described.

8. In a machine for moving and adjusting a
120 plate with reference to a tool, the combination of a tool constructed to act upon said plate, a guide projection supported in a plane parallel to the plane of the plate, and independently movable universally over the surface of
125 said plate, a means for detachably clamping said guide projection rigidly to said plate, a guide or stop, and means for imparting to said plate a universal movement in its own plane and thus causing said guide projection
130 to meet said stop: whereby said plate is adjusted, and by said stop arrested, in definite position with reference to said tool, substantially as described.

9. In a machine for moving and adjusting a

plate with reference to a tool, the combination of a tool constructed to act upon said plate, a movable holder for said plate and a cylinder having a movable piston or ram acting upon said holder to move the same in a plane parallel to the plane of the plate: the said parts being constructed and arranged so that when said piston is actuated by pressure exerted within said cylinder the said plate is changed in position with reference to said tool, substantially as described.

10. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, a movable holder for said plate and two cylinders each having a movable piston or ram acting upon said holder to move the same in a plane parallel to the plane of the plate and in relatively opposite directions: the said parts being constructed and arranged so that when said pistons are respectively actuated by pressure exerted within said cylinders, the said plate is changed in position in relatively opposite directions with reference to said tool, substantially as described.

11. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, a movable holder for said plate and two cylinders each having a movable piston or ram acting upon said holder to move the same in a plane parallel to the plane of the plate and in directions relatively at an angle: the said parts being constructed and arranged so that when said pistons are respectively actuated by pressure exerted within said cylinders, the said plate is changed in position in directions relatively at an angle with reference to said tool, substantially as described.

12. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, a movable holder for said plate, two cylinders, and in each cylinder a movable piston or ram acting upon said holder to move the same in a plane parallel to the plane of the plate and in relatively opposite directions: the said pistons or rams being of different cross-sectional area and the said parts being constructed and arranged so that when said pistons are actuated by pressure simultaneously exerted within said cylinders, the said plate is changed in position with reference to said tool by the action of the piston having the greater area of cross section, substantially as described.

13. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, a movable holder for said plate, two cylinders, a movable piston or ram in each cylinder acting upon said holder to move the same in a plane parallel to the plane of the plate and in relatively opposite directions, and means for varying the pressure in one of said cylinders: whereby the overbalancing pressure in the other cylinder may change the

position of the plate with reference to the tool, substantially as described.

14. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, a holder for said plate, a cylinder, and a movable piston or ram within said cylinder: the said parts being constructed and arranged so that pressure exerted upon said piston or ram shall cause said piston to clamp or compress said plate in said holder, substantially as described.

15. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, a holder for said plate, a cylinder, a movable piston or ram and means for conveying a fluid under pressure into said cylinder on opposite sides of the head of said piston or ram: the said parts being constructed and arranged so that pressure exerted upon said piston or ram in one direction shall cause said plate to be clamped in said holder, and in the opposite direction shall relieve said pressure, substantially as described.

16. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, a holder for said plate, a cylinder, a movable piston or ram within said cylinder having a head of different effective cross-sectional area on opposite sides, means for conveying a fluid under pressure into said cylinder on opposite sides of said piston head, and means for varying the pressure on one side of said head: whereby the direction of movement of said piston or ram with reference to said plate to clamp the same in said holder is determined by the overbalancing pressure exerted upon said piston.

17. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, an independent support for said plate, a frame or structure extending around said plate and in front of both faces thereof, and a pressing device in said frame abutting upon said plate: the aforesaid parts being constructed and arranged so that when said pressing device is forced against one side of said plate, said frame may be moved bodily to bring it into contact with the opposite side of said plate, thereby clamping said plate in said frame.

18. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, an independent support for said plate, a frame, 10 11, below said plate, girders, 12, united to said frame 10 11 and extending over said plate, cylinders 13 supported on said girders above said plate, and rams, 50, in said cylinders constructed to abut upon said plate.

19. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said

plate, the movable structure A, means for securing said plate in said structure, cylinders 19 and 20, movable rams 21 and 22 in said cylinders, and projections 29 on said rams entering grooves or channels in the longitudinal bars 11 of said structure, substantially as described.

20. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, the movable structure A, means for securing said plate in said structure, cylinders 30 and 31, movable rams 32 and 33 in said cylinders, and a projection, 37, connected to said rams and entering a groove or channel in a lateral bar 10 of said structure A, substantially as described.

21. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, the movable structure A, means for securing said plate in said structure, cylinders 19 and 20, movable rams 21 and 22 in said cylinders, projections 29 on said rams entering grooves or channels in the longitudinal bars 11 of said structure A, cylinders 30 and 31, movable rams 32 and 33 in said cylinders 30 and 31, and a projection, 37, connected to said rams and entering a groove or channel in a lateral bar 10 of said structure, substantially as described.

22. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, the movable structure A, pressure cylinders 13, rigidly secured upon said structure, pistons or rams, 50, in said cylinders and means for admitting fluid pressure into said cylinders, whereby said rams are moved to clamp said plate in said structure, substantially as described.

23. In a machine for moving and adjusting

a plate with reference to a tool, the combination of a tool constructed to act upon said plate, the movable structure A, pressure cylinders 13, rigidly secured in said structure, pistons or rams, 50, in said cylinders, a bar, 52, extending between and rigidly connected to said rams 50, a second bar, 53, extending between and loosely connected to said rams 50, and a freely movable index plate, 58, between said bars 52 and 53: the aforesaid parts being constructed and arranged so that said pistons operate to clamp said plate in said structure and also said index plate 58 between said bars 52 and 53, substantially as described.

24. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, the movable structure A, the index bar 58 secured upon said structure and movable universally thereon in a plane parallel to the plane of said plate, a means for rigidly clamping said bar upon said structure A, and a fixed guide or stop, 60, wherewith said bar may be moved into contact, substantially as described.

25. In a machine for moving and adjusting a plate with reference to a tool, the combination of a tool constructed to act upon said plate, the movable structure A, the bars 52 and 53, the shoe 57 disposed and sliding in a longitudinal groove or channel in said bar 53, the sliding index bar 58, having a longitudinal slot or opening receiving a projection on said shoe 57, the said index bar and shoe being disposed between said bars 52 and 53, and means for forcing together said bars 52 and 53 and thereby rigidly securing said index bar in position, substantially as described.

GEORGE B. HUNTER.

Witnesses:

GEO. F. ALLISON,
H. R. MOLLER.