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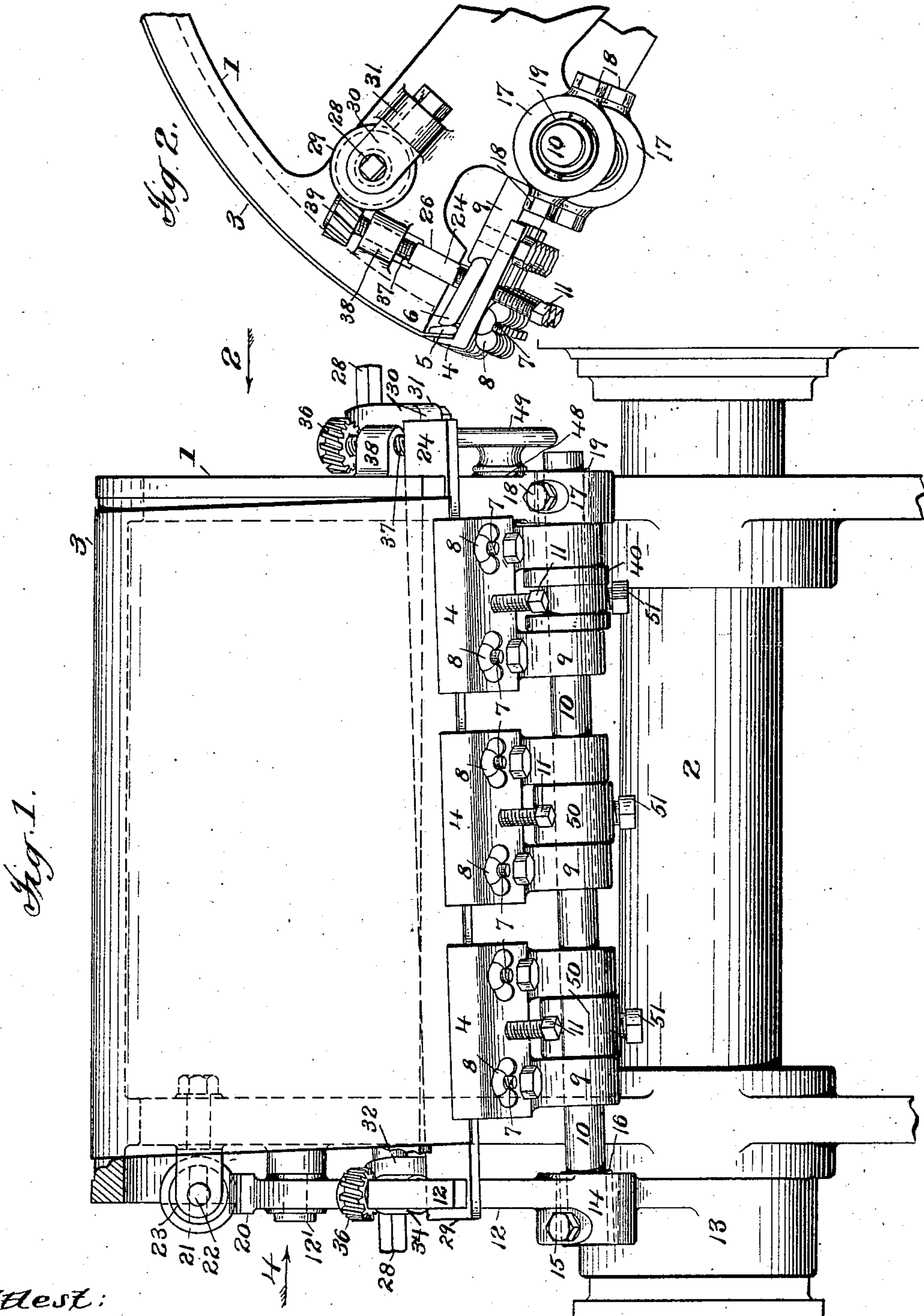
Patented Aug. 13, 1901.

J. WHITE.
PLATE HOLDING AND STRAINING DEVICE.

(Application filed Dec. 14, 1900.)

(No Model.)

3 Sheets—Sheet 1.



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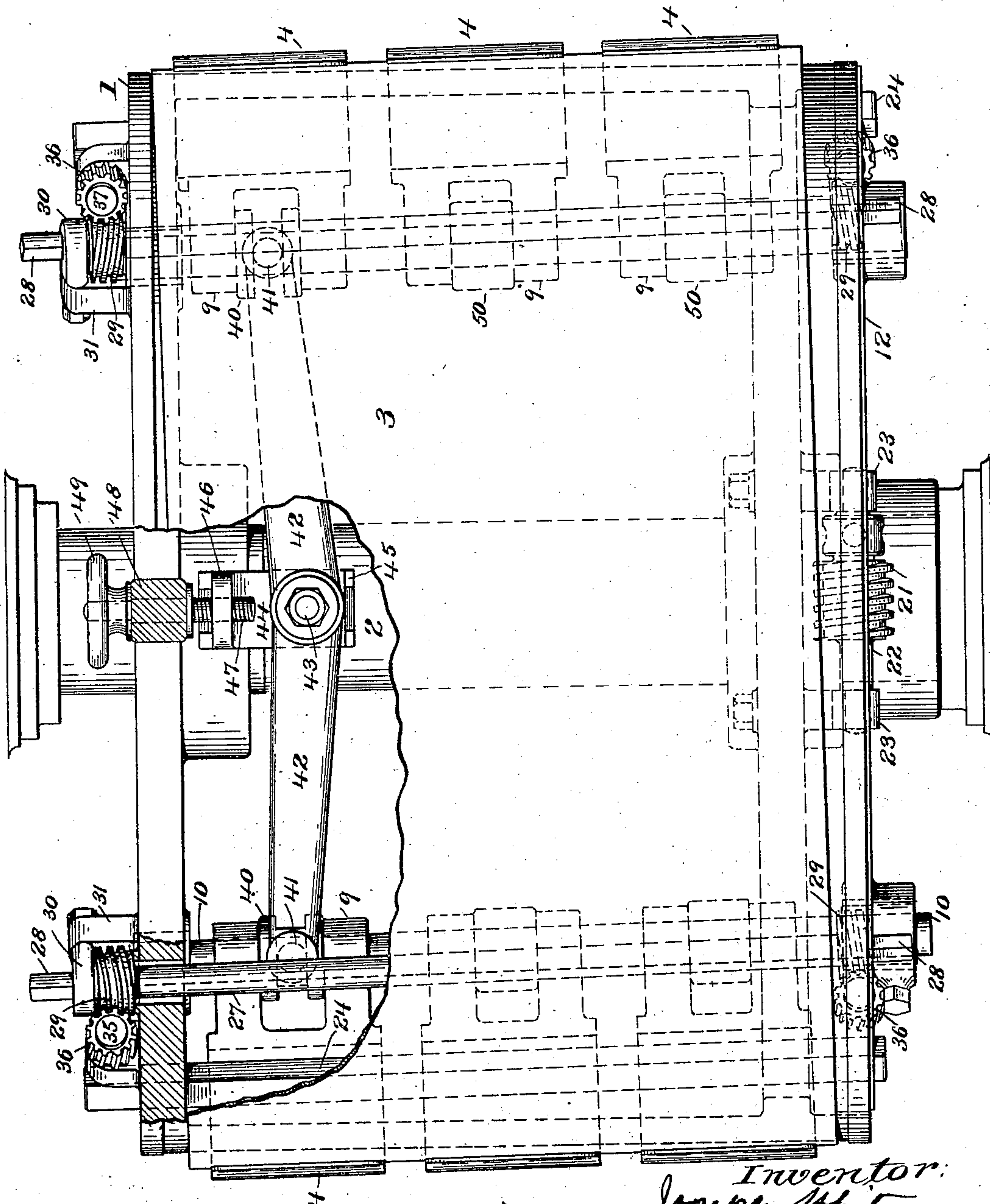
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Fig. 3.

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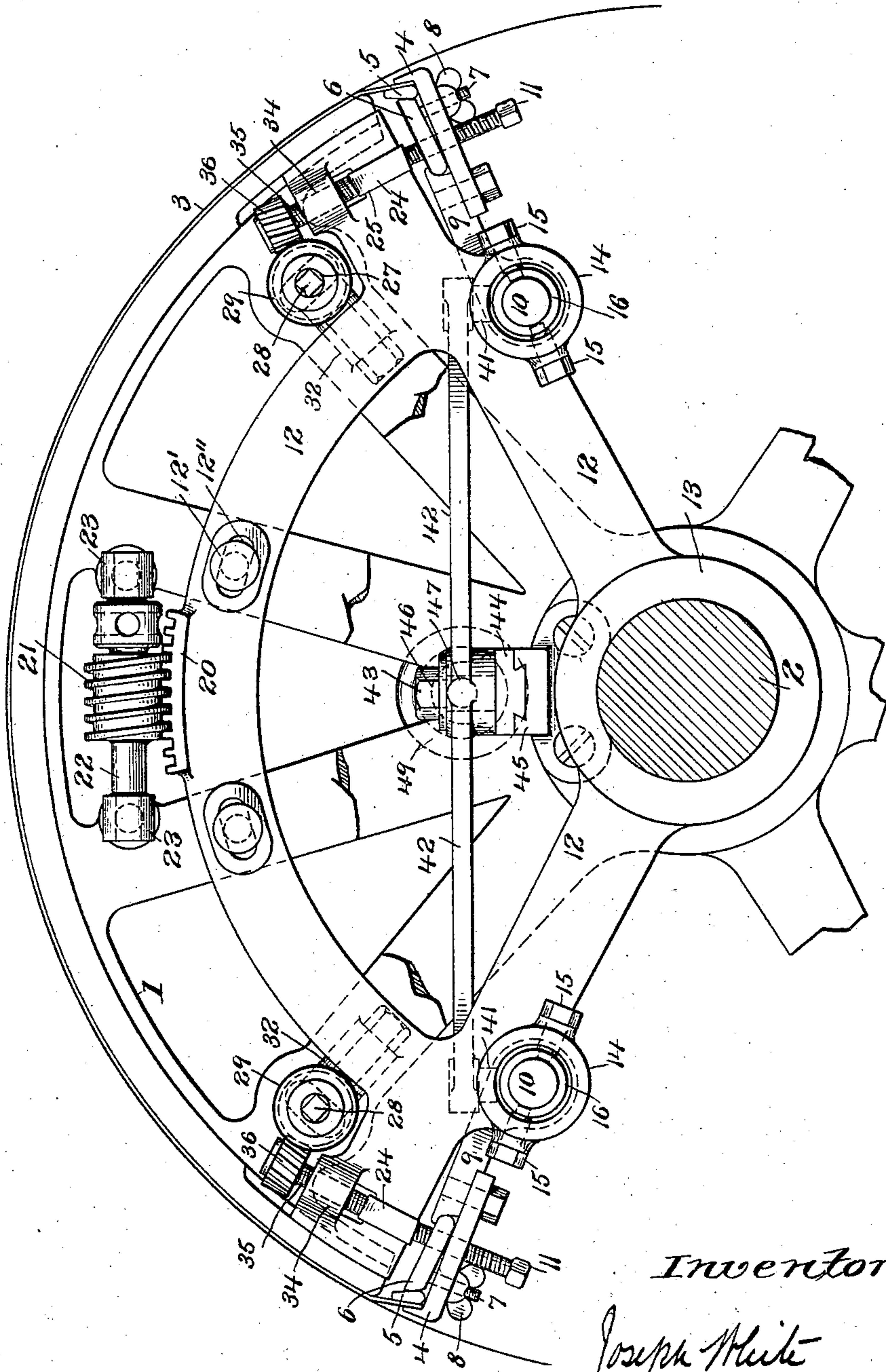
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3 Sheets—Sheet 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH WHITE, OF NEW YORK, N. Y., ASSIGNOR TO ROBERT HOE, OF SAME PLACE.

PLATE HOLDING AND STRAINING DEVICE.

SPECIFICATION forming part of Letters Patent No. 680,302, dated August 13, 1901.

Application filed December 14, 1900. Serial No. 39,814. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH WHITE, a citizen of the United States, residing at New York, county of New York, and State of New York, have invented certain new and useful Improvements in Plate Holding and Straining Devices, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 This invention relates to certain improvements in devices for straining flexible printing-plates—such, for instance, as plates of aluminium or zinc—to their seats and holding them in strained position.

15 The holding and straining devices for flexible printing-plates as now usually constructed embody a plurality of clamps mounted on a support, these clamps being independently adjustable, so that they may be manipulated to subject different parts of the plate to greater or less strain, as the case may require, in order to insure that the plate lies evenly and smoothly upon its bed. Two sets of such holding and straining devices are usually employed, the sets being located at opposite sides or edges of the plate. After a plate has been adjusted by the clamps, such as have been referred to, it is frequently found that it is not accurately positioned on its bed—20 that is to say, the plate may be too near one of the sets of clamps, thus being out of register longitudinally, or too near one of the side edges of its support, thus being out of register laterally, or it may be askew on its support, thus being out of register angularly. When the sheet to be printed is to receive but a single printing in the machine, inaccuracies in positioning the plate may often be compensated for by properly positioning the sheet-guides on the feeding-table, so that the sheet will be fed to the machine in accordance with the position of the plate on its support. When, however, the sheet is to receive two or more printings in the machine—as, for instance, 25 when it is to be printed in colors in a single machine—it is obvious that inaccuracies in positioning the plate cannot be compensated for in the manner described.

It is one of the objects of this invention to produce a holding and straining mechanism for printing-machines employing flexible

printing-plates which is capacitated to effect an angular adjustment of the printing-plate with respect to its supporting-surface.

A further object of the invention is to produce a holding and straining mechanism for printing-machines employing flexible plates which shall be capacitated to effect a lateral adjustment of the printing-plate.

A further object of the invention is to produce an improved holding and straining mechanism for machines employing flexible plates which will be capacitated to effect a longitudinal adjustment of the printing-plate on its supporting-surface—i. e., an adjustment in the line of strain of the holding devices for the plates.

With these and other objects in view the invention consists in certain constructions and in certain parts, improvements, and combinations, as will be hereinafter fully described and then specifically pointed out in the claims hereunto appended.

In the accompanying drawings, which form a part of this specification, and in which like characters of reference indicate the same parts, Figure 1 is a front view of a part of the cylinder of a rotary printing-machine, the improved holding and straining devices being shown in front elevation and the cylinder being shown partly in section in order to better illustrate some parts of the construction. Fig. 2 is an end view of a portion of the cylinder shown in Fig. 1, the direction of the observer's view being indicated by the arrow 2 in Fig. 1. Fig. 3 is a top plan view of the construction shown in Fig. 1, part of the cylinder being broken away. Fig. 4 is a side elevation of the construction shown in Fig. 1, the direction of the observer's view being indicated by the arrow 4 in said figure.

Referring to the drawings, which illustrate one embodiment of the invention in which the plate-support is a cylinder, 1 indicates a plate-carrying cylinder of the usual form, said cylinder being mounted on a shaft 2. The cylinder is shown as carrying a flexible printing-plate 3, said plate being of zinc, aluminium, or any other suitable material. This plate is held in position upon the cylinder by sets of suitable holding and straining devices, which may be of any suitable or de-

sired form. Preferably, however, each set will consist of a plurality of pairs of gripping-jaws, which are or may be of substantially the construction described in the patent to
 5 Thomas M. North, No. 629,916, granted August 1, 1899, to which patent reference is made for a full description of the construction. For the purposes of this application it is sufficient to say that each pair of jaws em-
 10 bodies a stationary jaw 4 and a movable jaw 5, said jaws being forced together by the action of a pivoted block 6, which is moved to cause the jaws to seize or release the plate by means of a screw 7 and a wing-nut 8. The
 15 jaws of each pair are carried on an arm 9, and the arms 9 of each set of holding and straining devices are preferably pivotally supported on a rod 10, each rod being mounted in a manner to be hereinafter described.
 20 Each clamp of the set is provided with a screw 11, the screws 11 of each set of clamps operating against a suitable bearing-surface, to be hereinafter described, in order to force the clamps away from the edge of the plate-
 25 supporting surface, thus straining the plate to its seat.

As has been before indicated, after the plate has been strained to its seat by the manipulation of the clamps at opposite edges it
 30 is frequently out of register, this fact being usually discovered by printing a trial-sheet. Hitherto in order to true up a plate which has been out of adjustment angularly with respect to its supporting-surface it has been
 35 necessary to loosen up all or the greater part of the clamps, reset the plate in them, and readjust the clamps. By this method all the labor which has been expended in straining the plate to its seat in the first instance is
 40 lost, besides which it frequently happens that the second adjustment leaves the plate out of register. In the improved holding and straining device, therefore, means are preferably provided for adjusting the plate with-
 45 out disturbing the clamps. Devices which vary widely in construction may be employed for effecting this angular adjustment. In the form of construction shown, however, each of the supporting-rods 10 has one of its
 50 ends mounted in a movable frame 12. This movable frame 12 is so arranged that it may be given a movement along the plate-supporting surface, and when this plate-supporting surface is a cylinder, as in the construction
 55 shown, the movement given the frame will be a movement in an arc. To this end, in the form shown, the frame is secured to a collar 13, which is mounted on the cylinder-shaft 2, so that the frame moves about the
 60 cylinder-shaft as a center. Any suitable means may be employed for mounting the ends of the supporting-rods 10 in the frame. As shown, however, the frame is provided with bearings 14. Bearing-screws 15 are
 65 tapped through these bearings 14, and the inner ends of said screws are arranged to engage collars 16, the collars being swiveled on

the screws. The rods 10 have their ends loosely inserted in the collars 16. By this construction the rods and their collars 16 are
 70 permitted to have an angular movement with respect to the bearings 14, and at the same time the rods are permitted to have a longitudinal movement with respect to the col-
 75 lars. The other ends of the rods 10 may be supported in any suitable manner. In the construction shown, however, they are supported in one of the ends of the cylinder by means which is the duplicate of that just de-
 80 scribed—that is to say, one of the spokes of the cylinder is provided with bearings 17, through which are tapped screws 18, said screws engaging collars 19, in which the ends of the rods are loosely mounted. With the
 85 construction as described it will be seen that as the frame carrying one end of each of the rods 10 is moved in one direction or the other, the other end of each rod being held
 90 by the cylinder-head, the clamps on the rods and the plate held by them will be given an angular adjustment with respect to the cyl-
 95 nder-surface.

Any suitable means may be employed for giving the frame 12 its movement. In the construction shown the frame 12 is provided
 95 with a rack 20, said rack being engaged by a worm 21, mounted on a worm-shaft 22, which is supported in bearings 23, secured to the head of the cylinder. Set-screws 12', passing
 100 through slots 12'' in the frame, may be used to hold the frame in position.

In order to give the plate the angular adjustment which has just been described, it is desirable to release the strain which has been
 105 put upon it by the clamps, since the friction between the plate and its supporting-surface will usually be so great as to make it impossible to shift the plate in its strained condition. The means for releasing the strain on
 110 the plate without disturbing the adjustment of the clamps with respect to the plate may be varied widely in form and construction. As shown, however, movable bars 24 are pro-
 115 vided, one side of each of these bars forming the bearing-surface for the screws 11, there being one of these bars for each set of clamps. These bars 24 are mounted at one end in slots
 120 25 in the frame 12, the other end of the bars being preferably supported in slots 26 in spokes of the cylinder. All the adjusting-screws 11 of each set of clamps operate against the bearing-surface of the bar 24 which is adjacent to that set of clamps. By moving
 125 the bars 24, therefore, away from the ends of the screws the strain on the plate held by the clamps will be released. Any suitable means may be employed for giving the bars the movement referred to. In the construction
 130 shown, however, shafts 27 extend across the cylinder from side to side, these shafts being preferably provided with screw ends 28, so that they may be easily turned by a wrench. The shafts 27 carry worms 29, each shaft hav-
 135 ing two such worms, one near each end. The

shafts 27 are preferably mounted, so that they may be given an angular movement corresponding to the angular adjustment of the clamp-supporting rods. While the means by which the shafts are thus moved may be varied in form, in the construction shown the shafts are supported at one end in bearings 30, swiveled in brackets 31, extending from one of the spokes of the cylinder. At the other end these shafts are supported in bearings 32, swiveled in the frame 12. Located in suitable bearings 34 in the frame 12 are screws 35, bearing at one end against the bars 24 and having on their other ends worm-gears 36, which engage two of the worms 29. Similar screws 37, tapped in bearings 38 at the other end of the cylinder, bear against the other end of the bars 24, said screws having worm-gears 39, which engage the other worms 29. With this construction it will be seen that when the shafts 27 are rotated in the proper direction the bearing-bars 24 will be allowed to move away from the ends of the screws 11, thus releasing the strain on the plate. When the strain is thus released, the angular adjustment before referred to may be effected by the movement of the frame 12, after which a reverse movement of the shafts will cause the bars 24 to move up into proper position to again strain the plate to its seat. It will be noted that by this construction the angular adjustment of the plate is effected without in any way disturbing the adjustment of the plate-clamps with respect to the plate. If, therefore, the plate has been properly strained to its seat in the first instance, by the operation of the clamps, the rotation of the shafts 27 in the proper direction, after the adjustment has been effected, will bring the plate back onto its seat properly strained, as in the first instance. Should it be desired to move the plate longitudinally of its supporting-surface, or, when the supporting-surface is a cylinder, circumferentially, this can be readily and quickly effected by manipulation of the bearing-bars 24, since by slacking up the bearing-screws 35 37 for one of the bars and tightening up the bearing-screws for the other bar the plate will be shifted bodily circumferentially of the surface. Furthermore, by mounting the bearing-surface, as in the present construction, independently of the plate-clamps a simple and compact device is obtained, and one in which a very considerable circumferential or longitudinal adjustment of the plate can be effected. Furthermore, within its limits this adjustment may be as fine as is necessary to exactly position the plate. The construction is therefore superior to other devices in the art in which the longitudinal adjustment of the plate is effected by a movement of the support on which the plate-clamps are carried. In the better class of these devices the adjustment is effected by means of a ratchet or other similar device by which the plate is

given successive movements each of a definite extent, and the fineness of the adjustment depends upon the length of each successive movement.

In addition to the adjustments before referred to the holding and straining devices are also preferably constructed so that the plate may be given a lateral adjustment—that is, an adjustment at right angles to the line of strain produced by said devices. The means by which this lateral adjustment is effected may vary within wide limits. In the construction shown each of the supporting-rods 10 is provided with collars 40, said collars being engaged by pins 41 on a cross-bar 42. This cross-bar 42 is secured by a suitable screw 43 to a sliding block 44, moving in suitable ways in a guiding-block 45. The block 45 is provided with a threaded ear 46, which is engaged by a screw 47, mounted in a bearing 48 in the cylinder-head, said screw carrying a hand-wheel or other adjusting means 49. It is obvious that by rotating the hand-wheel the bar 42 will be moved forward or backward and will carry with it the rods 10. Before effecting this adjustment the strain on the plate will be released in the manner hereinbefore described.

Suitable means are provided in order to insure that the clamps move when their supporting-rods are moved longitudinally in the manner described. While these means may vary in construction, as shown, the arms are bifurcated at their lower ends and are arranged to straddle collars 50, secured to the shaft by set-screws 51, or in any other suitable manner.

It will be understood that the devices by which the invention is carried into effect may be varied within wide limits. The invention is not, therefore, to be limited to the specific details of construction which have been hereinbefore described. While, furthermore, the invention is especially adapted for use with cylindrical plate-supporting surfaces, it is not to be limited to use with such surfaces, as it is adapted for use with surfaces which are other than cylindrical.

What is claimed is—

1. The combination with a plate-supporting surface, of devices for holding a plate in position thereon, and means for giving said holding devices an angular adjustment with respect to the surface while holding the plate, substantially as described.

2. The combination with a cylindrical plate-supporting surface, of devices for holding a plate in position thereon, and means for giving said holding devices an angular adjustment with respect to the surface while holding the plate, substantially as described.

3. The combination with a plate-supporting surface, of devices for holding a plate in position thereon, and means for giving said holding devices a lateral adjustment with respect to the surface while holding the plate, substantially as described.

4. The combination with a cylindrical plate-supporting surface, of devices for holding a plate in position thereon, and means for giving said holding devices a lateral adjustment with respect to the surface while holding the plate, substantially as described.
5. The combination with a plate-supporting surface, of devices for holding a plate in position thereon, means for giving said holding devices an angular adjustment with respect to the surface while holding the plate, and means for giving said devices a lateral adjustment, substantially as described.
6. The combination with a cylindrical plate-supporting surface, of devices for holding a plate in position thereon, means for giving said holding devices an angular adjustment with respect to the surface while holding the plate, and means for giving said devices a lateral adjustment, substantially as described.
7. The combination with a plate-supporting surface, of devices for holding a flexible plate in position thereon, means for adjusting said devices to strain the plate to its seat, means for releasing the strain on the plate, and means for giving said holding devices while holding the plate an angular adjustment with respect to the supporting-surface, substantially as described.
8. The combination with a cylindrical plate-supporting surface, of devices for holding a flexible plate in position thereon, means for adjusting said devices to strain the plate to its seat, means for releasing the strain on the plate, and means for giving said holding devices while holding the plate an angular adjustment with respect to the supporting-surface, substantially as described.
9. The combination with a plate-supporting surface, of devices for holding a flexible plate in position thereon, means for adjusting said devices to strain the plate to its seat, means for releasing the strain on the plate, and means for giving said holding devices while holding the plate a lateral adjustment with respect to the supporting-surface, substantially as described.
10. The combination with a cylindrical plate-supporting surface, of devices for holding a flexible plate in position thereon, means for adjusting said devices to strain the plate to its seat, means for releasing the strain on the plate, and means for giving said holding devices while holding the plate a lateral adjustment with respect to the supporting-surface, substantially as described.
11. The combination with a plate-supporting surface, of a bearing surface, plate-holding devices, means carried by the devices and operating against said surface to strain the plate to its seat, means for adjusting the bearing-surface to release the strain on the plate, and means for giving the holding devices while holding the plate an angular adjustment with respect to the supporting-surface, substantially as described.
12. The combination with a cylindrical plate-supporting surface, of a bearing-surface, plate-holding devices, means carried by the devices and operating against said surface to strain the plate to its seat, means for adjusting the bearing-surface to release the strain on the plate, and means for giving the holding devices while holding the plate an angular adjustment with respect to the supporting-surface, substantially as described.
13. The combination with a plate-supporting surface, of a bearing-surface, plate-holding devices, means carried by the devices and operating against said surface to strain the plate to its seat, means for adjusting the bearing-surface to release the strain on the plate, and means for giving the holding devices while holding the plate a lateral adjustment with respect to the supporting-surface, substantially as described.
14. The combination with a cylindrical plate-supporting surface, of a bearing-surface, plate-holding devices, means carried by the devices and operating against said surface to strain the plate to its seat, means for adjusting the bearing-surface to release the strain on the plate, and means for giving the holding devices while holding the plate a lateral adjustment with respect to the supporting-surface, substantially as described.
15. The combination with a plate-supporting surface, of devices for holding a plate in position thereon, a bearing-surface supported independently of the holding devices, means carried by the holding devices and operating against said surface to strain the plate to its seat, and means for adjusting the bearing-surface, substantially as described.
16. The combination with a cylindrical plate-supporting surface, of devices for holding a plate in position thereon, a bearing-surface supported independently of the holding devices, means carried by the holding devices and operating against said surface to strain the plate to its seat, and means for adjusting the bearing-surface, substantially as described.
17. The combination with a plate-supporting surface, of holding devices located at opposite edges of the plate, bearing-surfaces, one for each holding device, said surfaces being supported independently of the holding devices, means carried by said devices and operating against the bearing-surfaces to strain and hold the plate on the supporting-surface, and means for adjusting the bearing-surfaces, substantially as described.
18. The combination with a cylindrical plate-supporting surface, of holding devices located at opposite edges of the plate, bearing-surfaces, one for each holding device, said surfaces being supported independently of the holding devices, means carried by said devices and operating against the bearing-surfaces to strain and hold the plate on the supporting-surface, and means for adjusting the bearing-surfaces, substantially as described.

19. The combination with a plate-supporting surface, of holding devices located at opposite edges of the plate, bearing-surfaces, one for each holding device, said surfaces being supported independently of the holding devices, means carried by said devices and operating against the bearing-surfaces to strain and hold the plate on the supporting-surface, and means for giving the holding devices while holding the plate and the bearing-surfaces an angular adjustment, substantially as described.

20. The combination with a cylindrical plate-supporting surface, of holding devices located at opposite edges of the plate, bearing-surfaces, one for each holding device, said surfaces being supported independently of the holding devices, means carried by said devices and operating against the bearing-surfaces to strain and hold the plate on the supporting-surface, and means for giving the holding devices while holding the plate and the bearing-surfaces an angular adjustment, substantially as described.

21. The combination with a plate-supporting surface, of holding devices located at opposite edges of the plate, bearing-surfaces, one for each holding device, said surfaces being supported independently of the holding devices, means carried by said devices and operating against the bearing-surfaces to strain and hold the plate on the supporting-surface, and means for giving the holding devices while holding the plate and the bearing-surfaces a lateral adjustment, substantially as described.

22. The combination with a cylindrical plate-supporting surface, of holding devices located at opposite edges of the plate, bearing-surfaces, one for each holding device, said surfaces being supported independently of the holding devices, means carried by said devices and operating against the bearing-surfaces to strain and hold the plate on the supporting-surface, and means for giving the holding devices while holding the plate and the bearing-surfaces a lateral adjustment, substantially as described.

23. The combination with a plate-supporting surface, of holding devices located at opposite edges of the plate, bearing-surfaces, one for each holding device, said surfaces being supported independently of the holding devices, means carried by said devices and operating against the bearing-surfaces to strain and hold the plate on the supporting-surface, means for adjusting the bearing-surfaces, means for giving the holding devices while holding the plate and the bearing-surfaces an angular adjustment, and means for giving the holding devices while holding the plate and the bearing-surfaces a lateral adjustment, substantially as described.

24. In a plate-holding device, the combination with a plate-supporting surface, of a plurality of pairs of gripping-jaws, means for operating each pair of jaws to cause them to

seize and release the plate, a bearing-surface supported independently of the pairs of jaws, means whereby each pair of jaws may be adjusted with respect to the bearing-surface to strain the plate to its seat, and means for adjusting the bearing-surface, substantially as described.

25. In a plate-holding device, the combination with a plate-supporting surface, of a plurality of pairs of pivoted gripping-jaws, means for operating each pair of jaws to cause them to seize and release the plate, a bearing-surface supported independently of the pairs of jaws, means whereby each pair of jaws may be adjusted with respect to the bearing-surface to strain the plate to its seat, and means for adjusting the bearing-surface, substantially as described.

26. The combination with a plate-supporting surface, of a plurality of pairs of gripping-jaws, means for causing said jaws to clamp and release the plate, a support upon which the jaws are mounted, and means for giving the jaws and the support an angular adjustment with respect to the supporting-surface, substantially as described.

27. The combination with a plate-supporting surface, of a plurality of pairs of pivoted gripping-jaws, means for causing said jaws to clamp and release the plate, a support upon which the jaws are mounted, and means for giving the jaws and the support an angular adjustment with respect to the supporting-surface, substantially as described.

28. The combination with a plate-supporting surface, of a plurality of pairs of gripping-jaws, means for causing said jaws to clamp and release the plate, a support upon which the jaws are mounted, and means for giving the jaws and the support a lateral adjustment with respect to the supporting-surface, substantially as described.

29. The combination with a plate-supporting surface, of a plurality of pairs of pivoted gripping-jaws, means for causing said jaws to clamp and release the plate, a support upon which the jaws are mounted, and means for giving the jaws and the support a lateral adjustment with respect to the supporting-surface, substantially as described.

30. The combination with a plate-supporting surface, of a plurality of pairs of gripping-jaws, means for causing said jaws to grip and release the plate, a support on which said jaws are mounted, a bearing-surface, means for forcing the pairs of jaws away from the bearing-surface in order to strain the plate to its seat, and means for giving the supports and the bearing-surface an angular adjustment with respect to the plate-supporting surface, substantially as described.

31. The combination with a plate-supporting surface, of a plurality of pairs of pivoted gripping-jaws, means for causing said jaws to grip and release the plate, a support on which said jaws are mounted, a bearing-surface, means for forcing the pairs of jaws away

from the bearing-surface in order to strain the plate to its seat, and means for giving the supports and the bearing-surface an angular adjustment with respect to the plate-supporting surface, substantially as described.

32. The combination with a plate-supporting surface, of a plurality of pairs of gripping-jaws, means for causing said jaws to grip and release the plate, a support on which said jaws are mounted, a bearing-surface, means for forcing the pairs of jaws away from the bearing-surface in order to strain the plate to its seat, and means for giving the supports and the bearing-surface a lateral adjustment with respect to the plate-supporting surface, substantially as described.

33. The combination with a plate-supporting surface, of a plurality of pairs of pivoted gripping-jaws, means for causing said jaws to grip and release the plate, a support on which said jaws are mounted, a bearing-surface, means for forcing the pairs of jaws away from the bearing-surface in order to strain the plate to its seat, and means for giving the supports and the bearing-surface a lateral adjustment with respect to the plate-supporting surface, substantially as described.

34. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, means for forcing each pair of jaws away from the surface in order to strain the plate to its seat, and means for giving each set of jaws and the support therefor an adjustment with respect to the supporting-surface, substantially as described.

35. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, means for forcing each pair of jaws away from the surface in order to strain the plate to its seat, and means for giving each set of jaws and the support therefor an angular adjustment with respect to the surface, substantially as described.

36. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of pivoted gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, means for forcing each pair of jaws away from the surface in order to strain the plate to its seat, and means for giving each set of jaws and the support therefor an adjustment with respect to the surface, substantially as described.

37. The combination with a plate-supporting surface, of sets of holding and straining

devices arranged at opposite edges of the surface, each set including a plurality of pairs of pivoted gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, means for forcing each pair of jaws away from the surface in order to strain the plate to its seat, and means for giving each set of jaws and the support therefor an angular adjustment with respect to the surface, substantially as described.

38. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, means for forcing each pair of jaws away from the surface in order to strain the plate to its seat, means for giving each set of jaws and the support therefor an angular adjustment with respect to the surface, and means for giving the sets of jaws a lateral adjustment, substantially as described.

39. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of pivoted gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, means for forcing each pair of jaws away from the surface in order to strain the plate to its seat, means for giving each set of jaws and the support therefor an angular adjustment with respect to the surface, and means for giving the sets of jaws a lateral adjustment, substantially as described.

40. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, bearing-surfaces, means carried by each pair of jaws for forcing the jaws away from said surfaces, and means for giving each set of jaws, the support therefor and the cooperating bearing-surface an adjustment with respect to the plate-supporting surface, substantially as described.

41. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, bearing-surfaces, means carried by each pair of jaws for forcing the jaws away from said surfaces, and means for giving each set of jaws, the support therefor and the cooperating bearing-surface an angular adjustment with respect to the plate-supporting surface, substantially as described.

42. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of pivoted gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, bearing-surfaces, means carried by each pair of jaws for forcing the jaws away from said surfaces, and means for giving each set of jaws, the support therefor and the cooperating bearing-surface an adjustment with respect to the plate-supporting surface, substantially as described.

43. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of pivoted gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, bearing-surfaces, means carried by each pair of jaws for forcing the jaws away from said surfaces, and means for giving each set of jaws, the support therefor and the cooperating bearing-surface an angular adjustment with respect to the plate-supporting surface, substantially as described.

44. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, bearing-surfaces, means carried by each pair of jaws for forcing the jaws away from said surfaces, and means for giving each set of jaws, the support therefor and the cooperating bearing-surface a lateral adjustment with respect to the plate-supporting surface, substantially as described.

45. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of pivoted gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, bearing-surfaces, means carried by each pair of jaws for forcing the jaws away from said surfaces, and means for giving each set of jaws, the support therefor and the cooperating bearing-surface a lateral adjustment with respect to the plate-supporting surface, substantially as described.

46. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, bearing-surfaces, means carried by each pair of jaws for forcing the jaws away from the bearing-surfaces, means for giving each set of jaws, the support therefor and the cooperating bear-

ing-surface an angular adjustment with respect to the plate-supporting surface, and means for giving each set of jaws, the support therefor, and the cooperating bearing-surface a lateral adjustment with respect to the plate-supporting surface, substantially as described.

47. The combination with a plate-supporting surface, of sets of holding and straining devices arranged at opposite edges of the surface, each set including a plurality of pairs of pivoted gripping-jaws, a support for the jaws of each set, means for causing each pair of jaws to clamp and release the plate, bearing-surfaces, means carried by each pair of jaws for forcing the jaws away from the bearing-surfaces, means for giving each set of jaws, the support therefor and the cooperating bearing-surface an angular adjustment with respect to the plate-supporting surface, and means for giving each set of jaws, the support therefor, and the cooperating bearing-surface a lateral adjustment with respect to the plate-supporting surface, substantially as described.

48. The combination with a plate-supporting surface, of a frame, means for moving the frame along the surface, a pair of supports, one end of each support being mounted in the frame, straining devices mounted on each support, means for causing said devices to seize and release the plate, and means for causing said devices to strain the plate over the surface, substantially as described.

49. The combination with a plate-supporting surface, of a frame, means for moving the frame along the surface, a pair of supports, one end of each support being mounted in the frame, straining devices pivoted on each support, means for causing said devices to seize and release the plate, and means for causing said devices to strain the plate over the surface, substantially as described.

50. The combination with a plate-supporting surface, of a frame, means for moving the frame along the surface, a pair of supports, one end of each support being mounted in the frame, a pair of bearing-surfaces, one end of each bearing-surface being mounted in the frame, holding and straining devices mounted on each support, means for causing said devices to seize and release the plate, and means for adjusting the bearing-surfaces, substantially as described.

51. The combination with a plate-supporting surface, a frame, means for moving the frame along the surface, a pair of supports, one end of each support being mounted in the frame, a pair of bearing-surfaces, one end of each bearing-surface being mounted in the frame, holding and straining devices pivoted on each support, means for causing said devices to seize and release the plate, and means for adjusting the bearing-surfaces, substantially as described.

52. The combination with a cylindrical plate-supporting surface, of a frame, means

for giving the frame a movement in an arc, a pair of supports, one end of each support being mounted in the frame, holding and straining devices mounted on each support, means
5 for causing said devices to seize and release the plate, and means for causing said devices to strain the plate over the surface, substantially as described.

53. The combination with a cylindrical
10 plate-supporting surface, of a frame, means for giving it a movement in an arc, a pair of supports, one end of each support being mounted in the frame, holding and straining devices pivoted on each support, means for
15 causing said devices to seize and release the plate, and means for causing said devices to strain the plate over the surface, substantially as described.

54. The combination with a cylindrical
20 plate-supporting surface, of a frame, means for giving the frame a movement in an arc, a pair of supports, one end of each support being mounted in the frame, a pair of bearing-surfaces, one end of each surface being mount-
25 ed in the frame, holding and straining devices mounted on each support, means for causing said devices to seize and release the plate, and means for adjusting the bearing-surfaces, substantially as described.

30 55. The combination with a cylindrical plate-supporting surface, of a frame, means for giving the frame a movement in an arc, a pair of supports, one end of each support being mounted in the frame, a pair of bearing-
35 surfaces, one end of each surface being mounted in the frame, holding and straining devices pivoted on each support, means for causing said devices to seize and release the plate, and means for adjusting the bearing-surfaces,
40 substantially as described.

56. The combination with a cylinder having a plate-supporting surface, of a frame supported on the cylinder-shaft, means for giving the frame a movement about the shaft, a
45 pair of supports, one end of each support being mounted in the frame, a plurality of straining devices mounted on each support, means for causing each pair of straining devices to grip and release the plate, and means
50 for giving the straining devices a movement to strain the plate to its seat, substantially as described.

57. The combination with a cylinder having a plate-supporting surface, of a frame supported on the cylinder-shaft, means for giving the frame a movement about the shaft, a
55 pair of supports, one end of each support being mounted in the frame, a plurality of straining devices pivoted on each support, a pair of bearing-surfaces, one end of each bearing-surface being mounted in the frame, and means for giving each bearing-surface a bodily adjustment, substantially as described.

58. The combination with a plate-support-
65 ing surface, of sets of straining devices located at opposite edges thereof, means for

causing the straining devices to seize and release the plate, a bearing-bar for each set of devices, means cooperating with the bars whereby each straining device of each set may
70 be operated to strain the plate to its seat, a shaft adjacent to each bar, and means operated by the shafts for adjusting the bearing-bars with respect to the straining devices, substantially as described.

59. The combination with a cylinder having a plate-supporting surface, of a frame, means for giving the frame a movement in an arc, a support at each end of the frame, each sup-
80 port having one end mounted in the frame and the other end mounted in the cylinder, a plurality of plate-clamps mounted on each support, means for causing said clamps to seize and release the plate, a bearing-bar at each end of the frame, one end of each bar
85 being mounted in the frame and the other end being mounted in the cylinder, means for giving each bar a bodily adjustment, and means cooperating with the bars whereby each clamp is caused to strain the plate to its
90 seat, substantially as described.

60. The combination with a cylinder having a plate-supporting surface, of a frame, means for giving the frame a movement in an arc, a support at each end of the frame, each sup-
95 port having one end mounted in the frame and the other end mounted in the cylinder, a plurality of plate-clamps pivoted on each support, means for causing said clamps to seize and release the plate, a bearing-bar at each
100 end of the frame, one end of each bar being mounted in the frame and the other end being mounted in the cylinder, means for giving each bar a bodily adjustment, and means cooperating with the bars whereby each clamp
105 is caused to strain the plate to its seat, substantially as described.

61. The combination with a cylinder having a plate-supporting surface, of a frame, means for giving the frame a movement in an arc,
110 a support at each end of the frame, each support having one end mounted in the frame and the other end mounted in the cylinder, a plurality of plate-clamps pivoted on each support, means for causing said clamps to seize
115 and release the plate, a bearing-bar at each end of the frame, one end of each bar being mounted in the frame and the other end being mounted in the cylinder, shafts extending across the cylinder adjacent to the bars,
120 worms on the shafts, suitably-mounted screws driven by the worms and bearing against the bars, whereby the bars are bodily adjusted, and means cooperating with the bars whereby each clamp is caused to strain the plate to
125 its seat, substantially as described.

62. The combination with a cylinder having a plate-supporting surface, of sets of plate-clamps at opposite edges of the surface, sup-
130 porting-rods on which the clamps are mounted, means for causing the clamps to seize and release the plate and to strain the plate to its

seat, and means for giving the rods and the clamps mounted on them a lengthwise adjustment, substantially as described.

63. The combination with a cylinder having
5 a plate-supporting surface, of sets of plate-clamps at opposite edges of the surface, supporting-rods on which the clamps are pivoted, means for causing the clamps to seize and release the plate and to strain the plate to its
10 seat, and means for giving the rods and the clamps mounted on them a lengthwise adjustment, substantially as described.

64. The combination with a cylinder having
15 a plate-supporting surface, of sets of plate-clamps at opposite edges of the surface, supporting-rods on which the clamps are pivoted, means for causing the clamps to seize and release the plate and to strain the plate to its seat, and means for giving the rods and the
20 clamps mounted on them a simultaneous adjustment, substantially as described.

65. The combination with a cylinder having
a plate-supporting surface, of sets of plate-clamps at opposite edges of the surface, rods
25 on which the sets of clamps are pivoted, a bar supported in the cylinder, connections between the ends of the bar and the rods, and means for moving the bar to give the rods a lengthwise adjustment, substantially as described.
30

66. The combination with a cylinder having
a plate-supporting surface, of a frame, means for giving the frame a movement in the arc
35 of a circle, a set of plate-clamps at each end of the surface, rods on which the clamps are pivoted, one end of said rods being mounted in the frame and the other end in the cylinder,

der, bearing-bars one for each set of clamps, one end being mounted in the frame and the other end in the cylinder, means for causing
40 the clamps to seize and release the plate, means cooperating with the bearing-bars for causing the clamps to strain the plate against the supporting-surface, means for giving the bearing-bars a bodily adjustment, and means
45 for giving the supporting-rods a longitudinal adjustment, substantially as described.

67. The combination with a cylinder having
a plate-supporting surface, of a frame, means for giving the frame a movement in the arc
50 of a circle, a set of plate-clamps at each end of the surface, rods on which the clamps are pivoted, one end of said rods being mounted in the frame and the other end in the cylinder, bearing-bars one for each set of clamps,
55 one end of said bars being mounted in the frame and the other end in the cylinder, means for causing the clamps to seize and release the plate, means cooperating with the bearing-bars for causing the clamps to strain
60 the plate against the supporting-surface, shafts mounted in the cylinder adjacent to the bearing-bars, means driven by the shafts for bodily adjusting the bars, and means for
65 giving the supporting-rods a longitudinal adjustment, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEPH WHITE.

Witnesses:

F. W. H. CRANE,
L. ROEHM.