

No. 658,024.

Patented Sept. 18, 1900.

H. B. SMITH.

DEVICE FOR CORRUGATING AND CREASING PAPER BOARD.

(Application filed Dec. 12, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

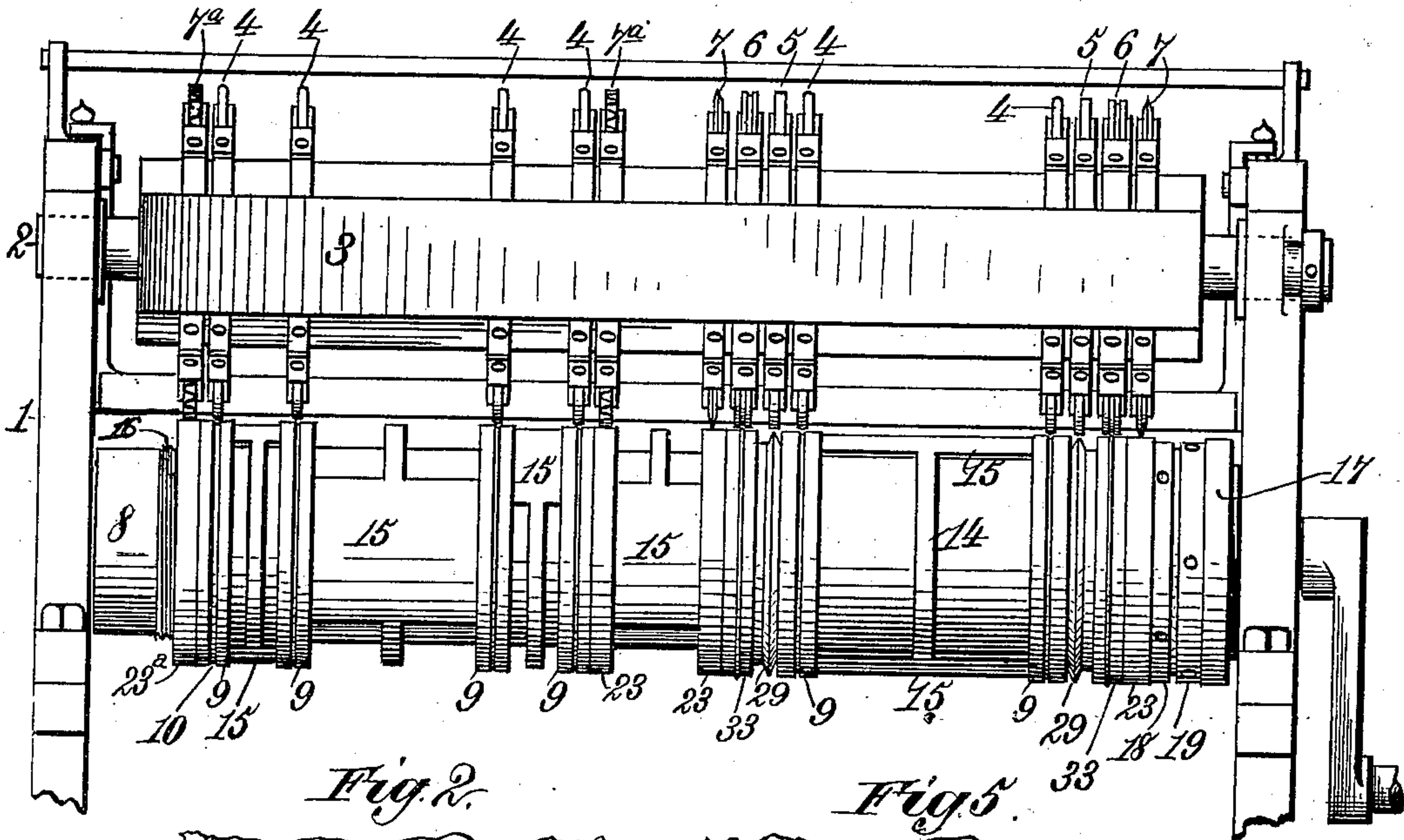


Fig. 2.

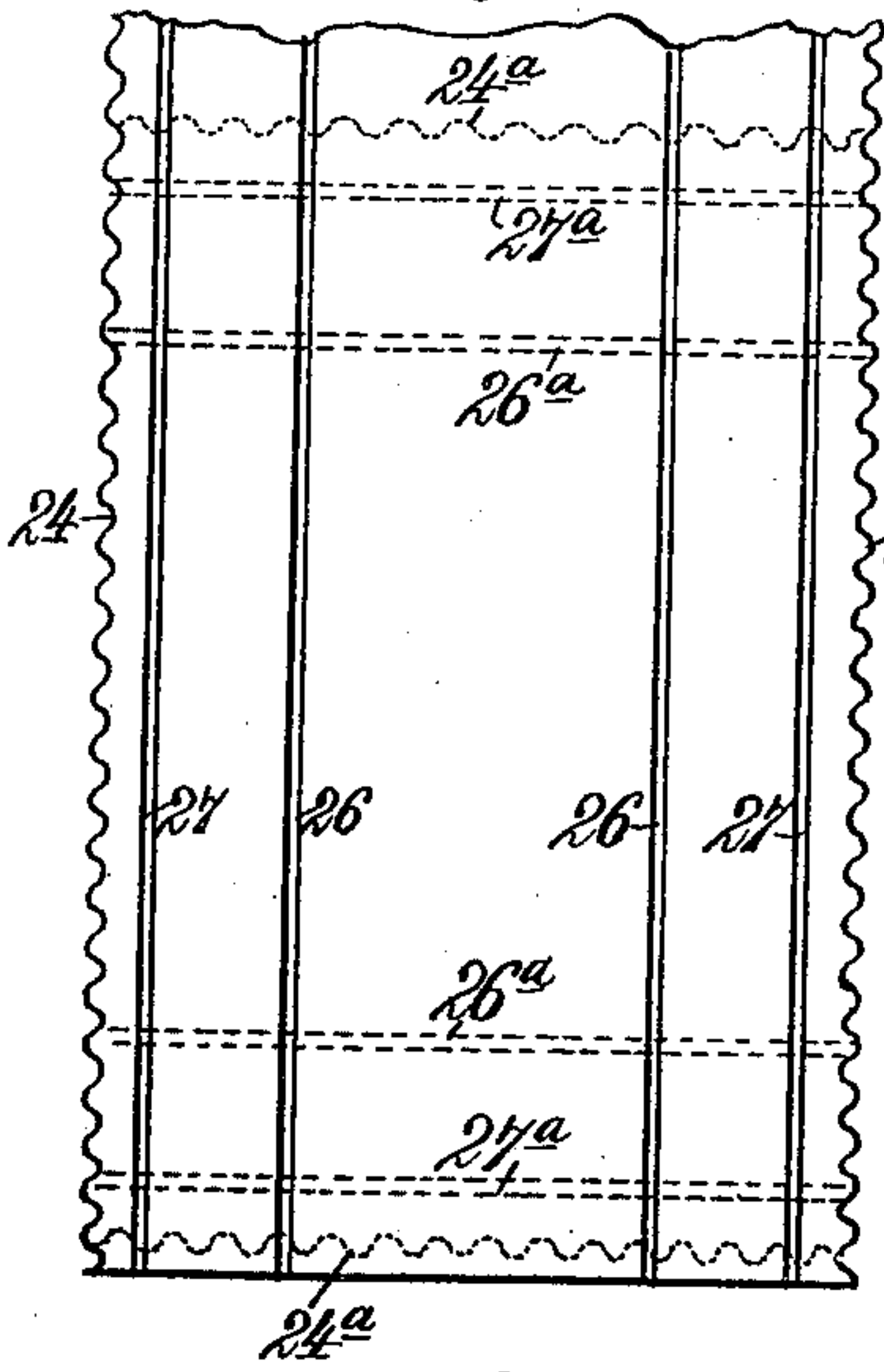


Fig. 3.

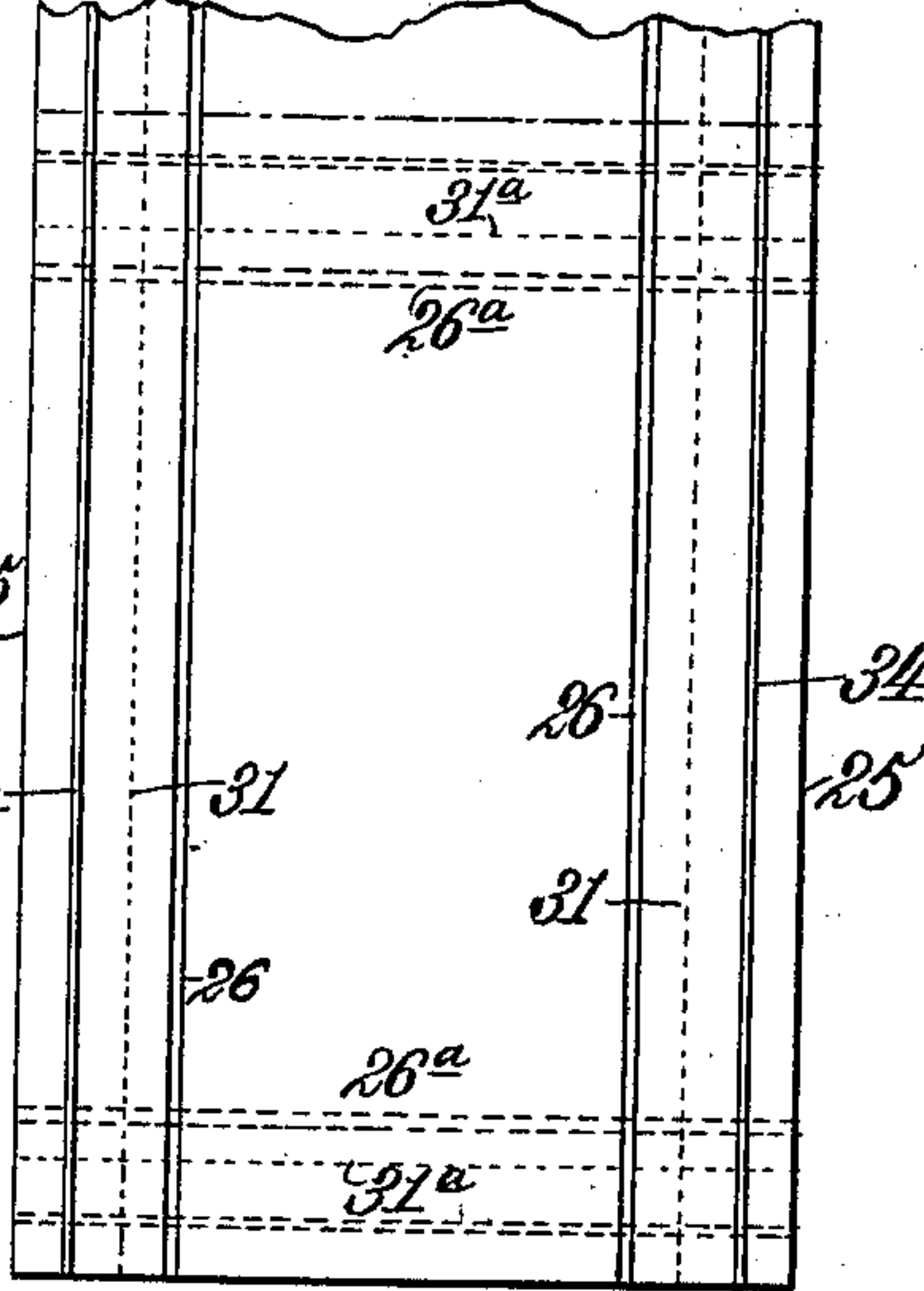


Fig. 4.

Witnesses.  
Robert G. Smith.  
Wm. Stockbridge

Fig. 5.

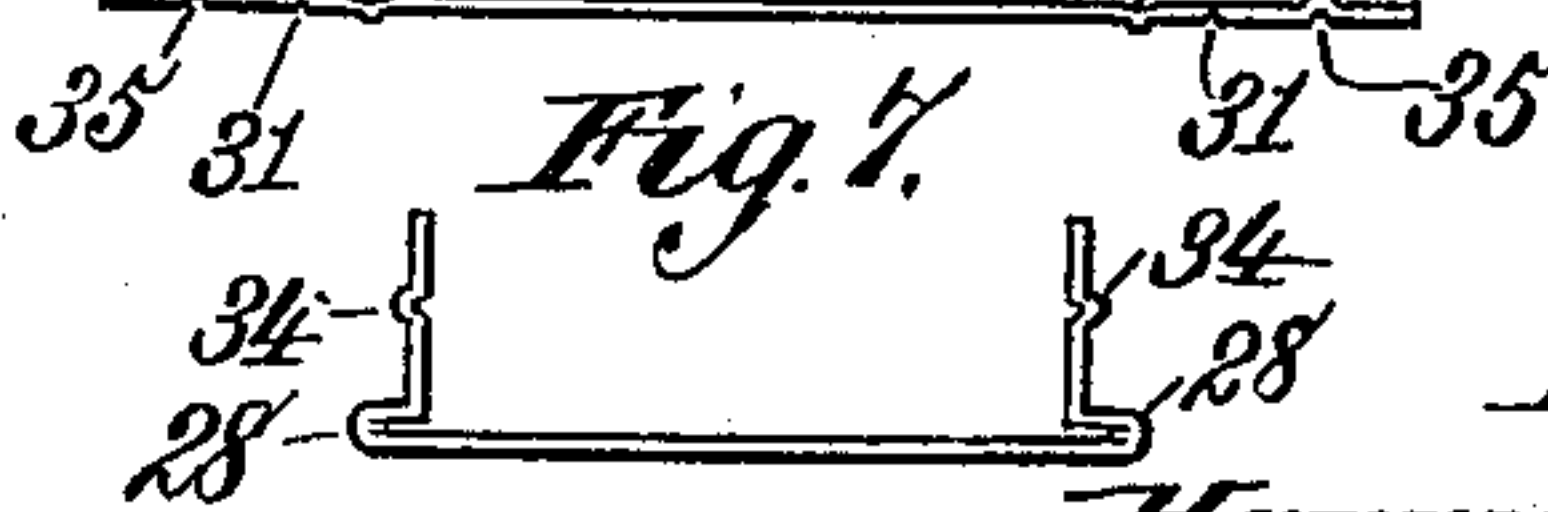


Fig. 6.

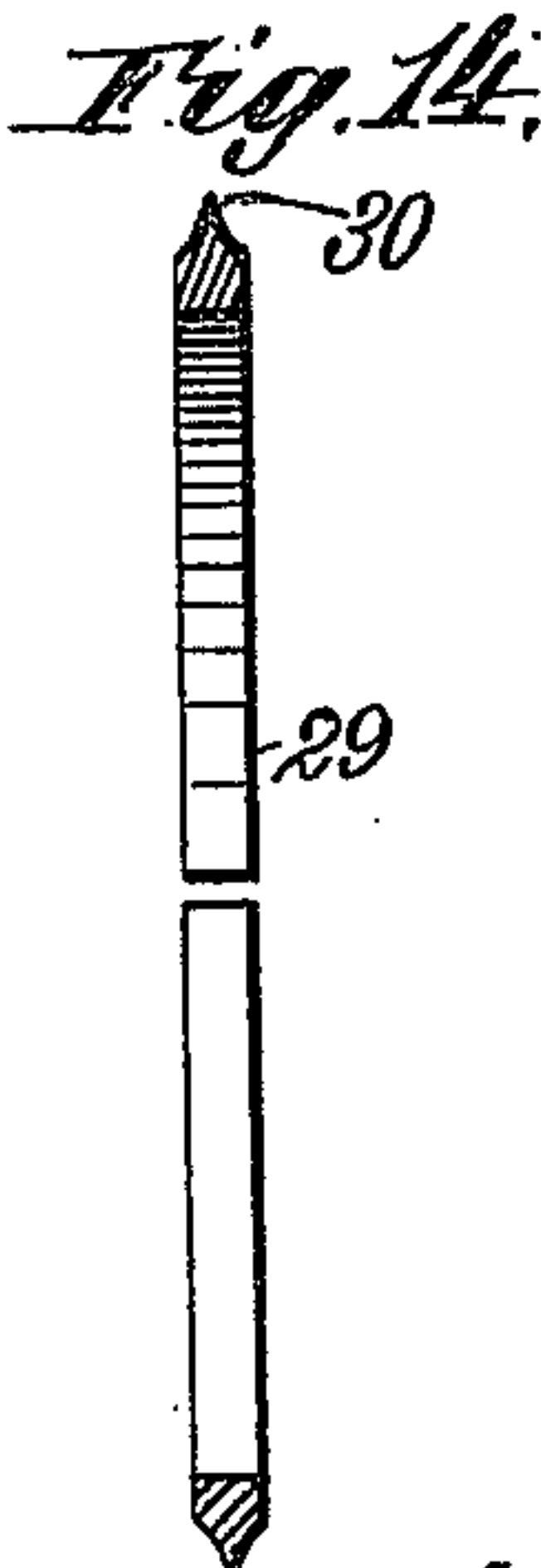
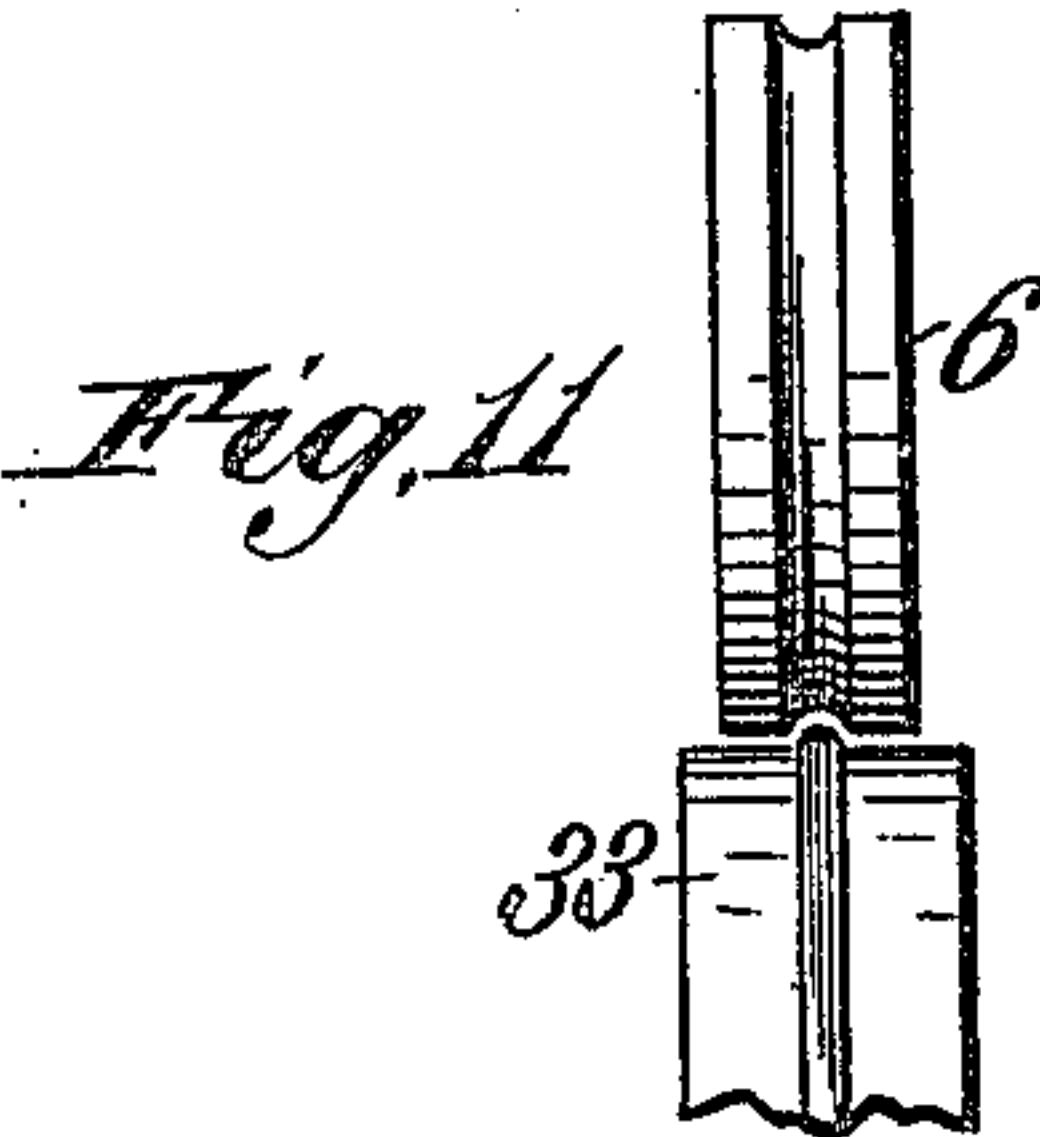
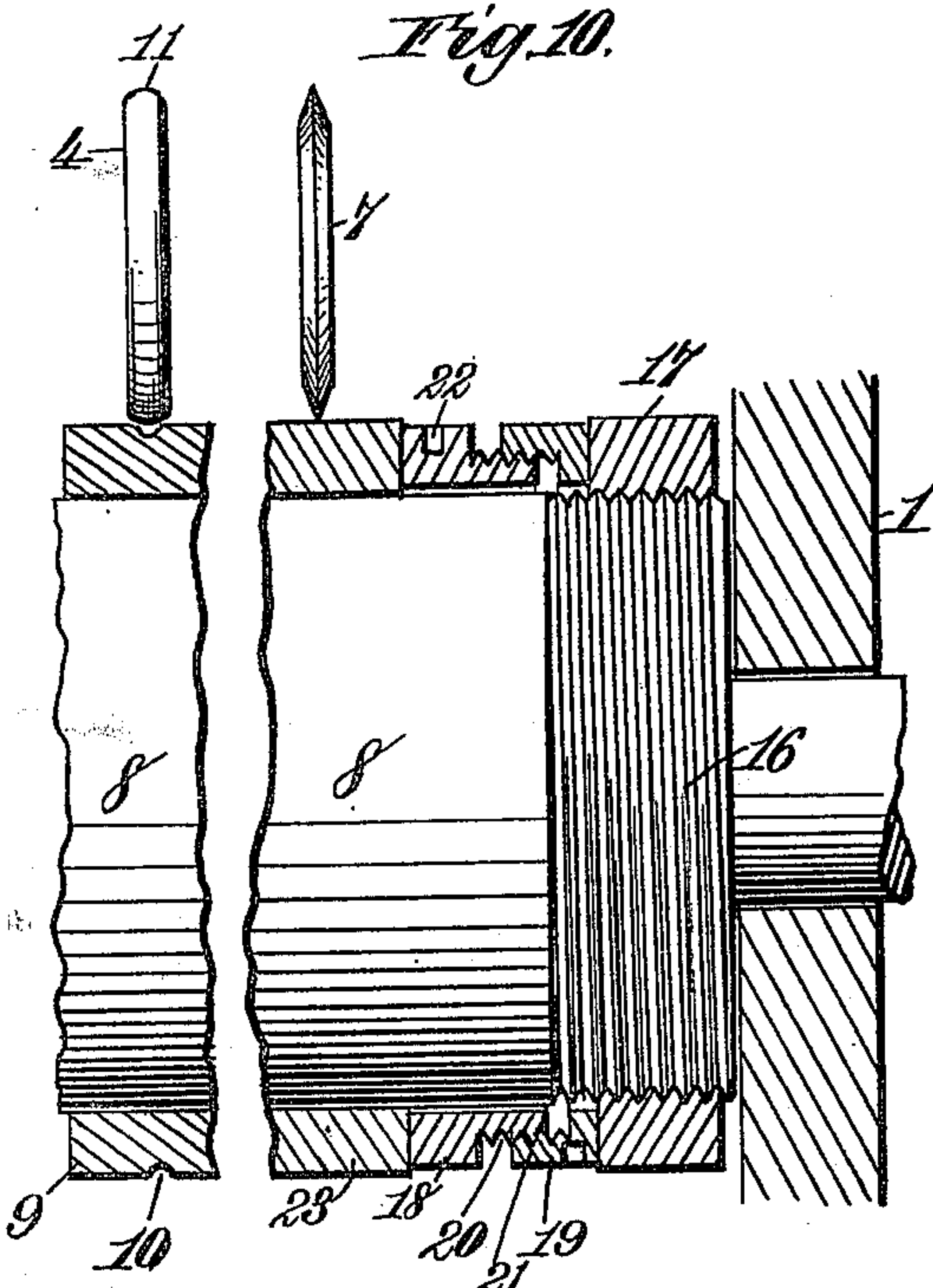
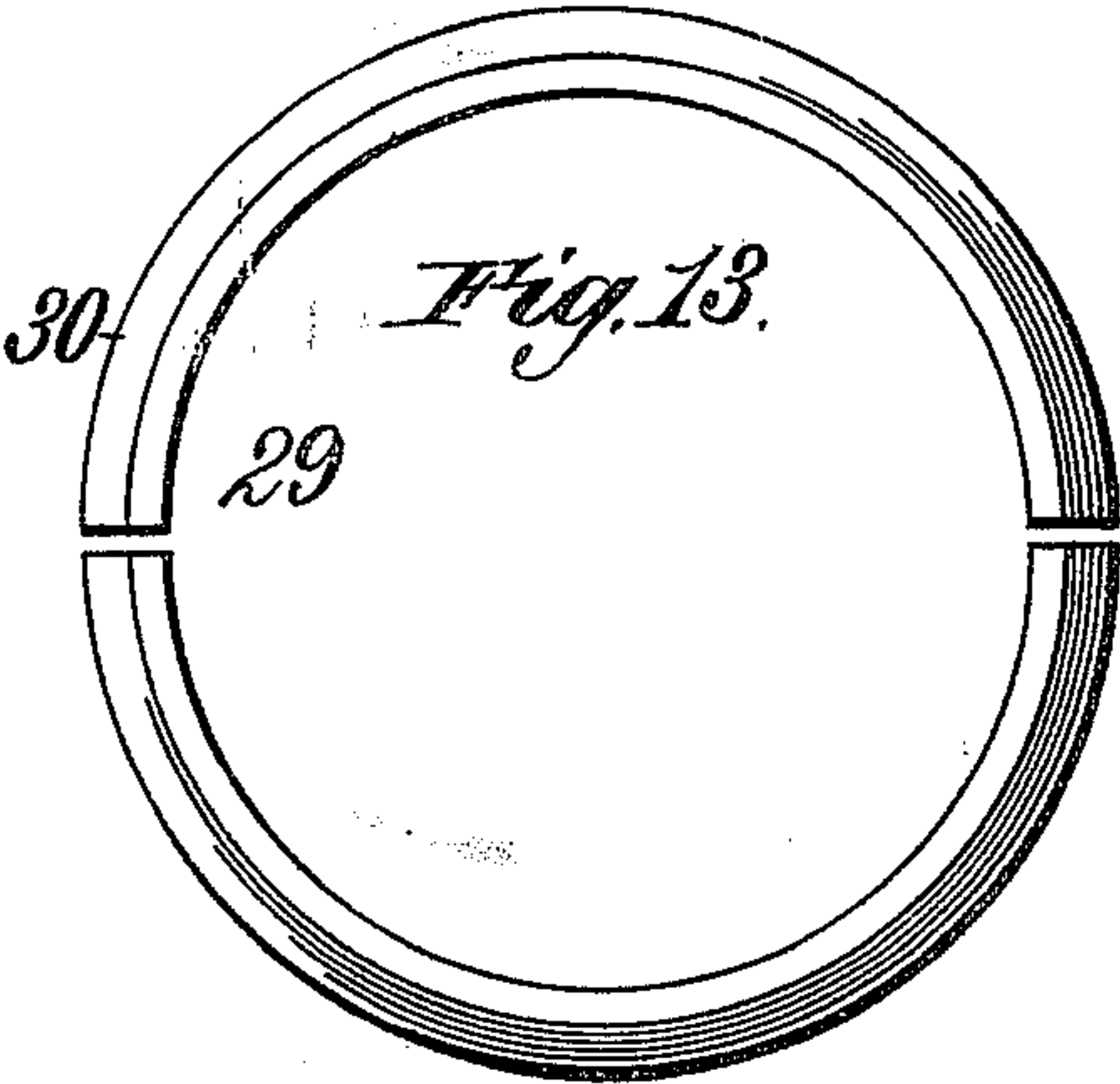
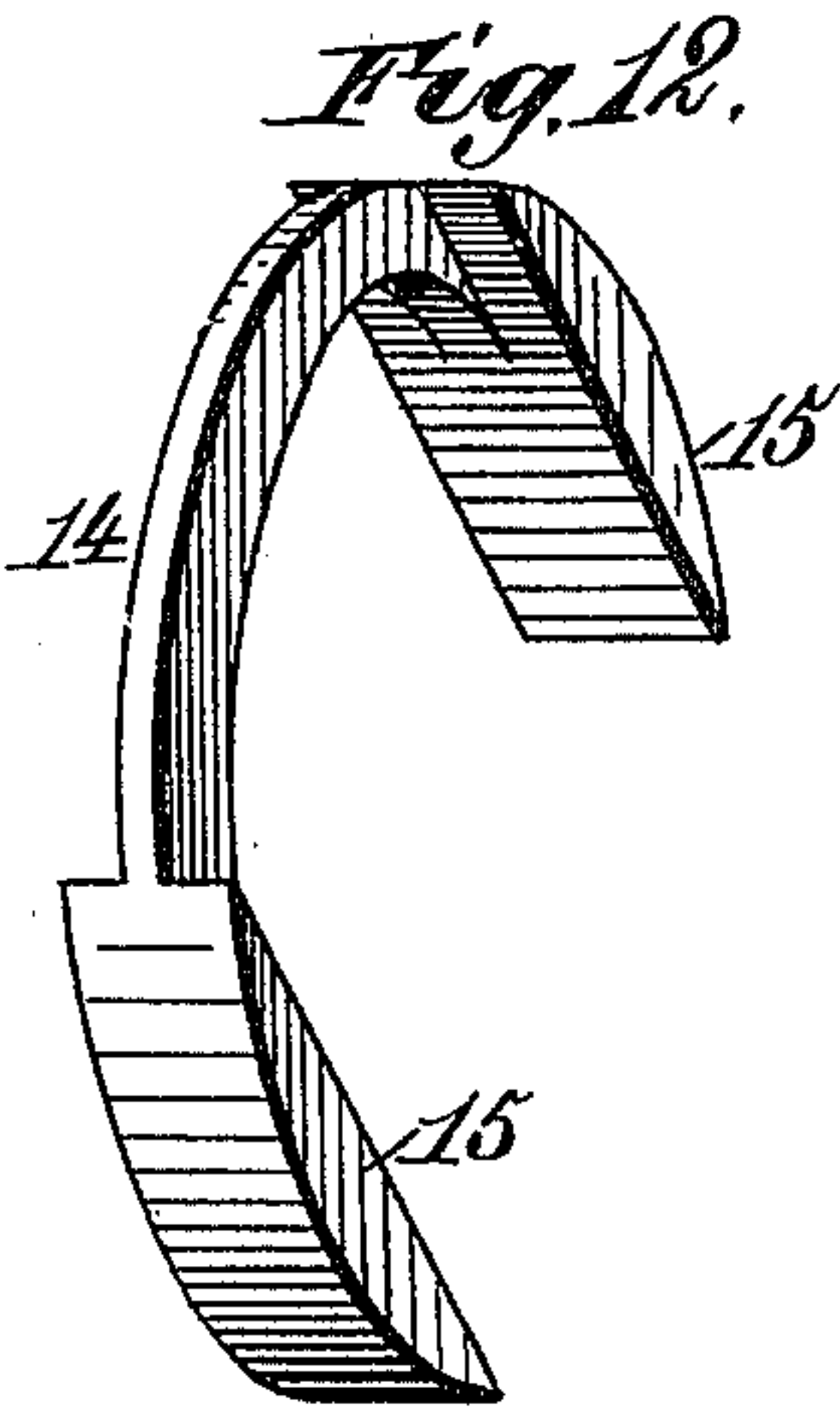
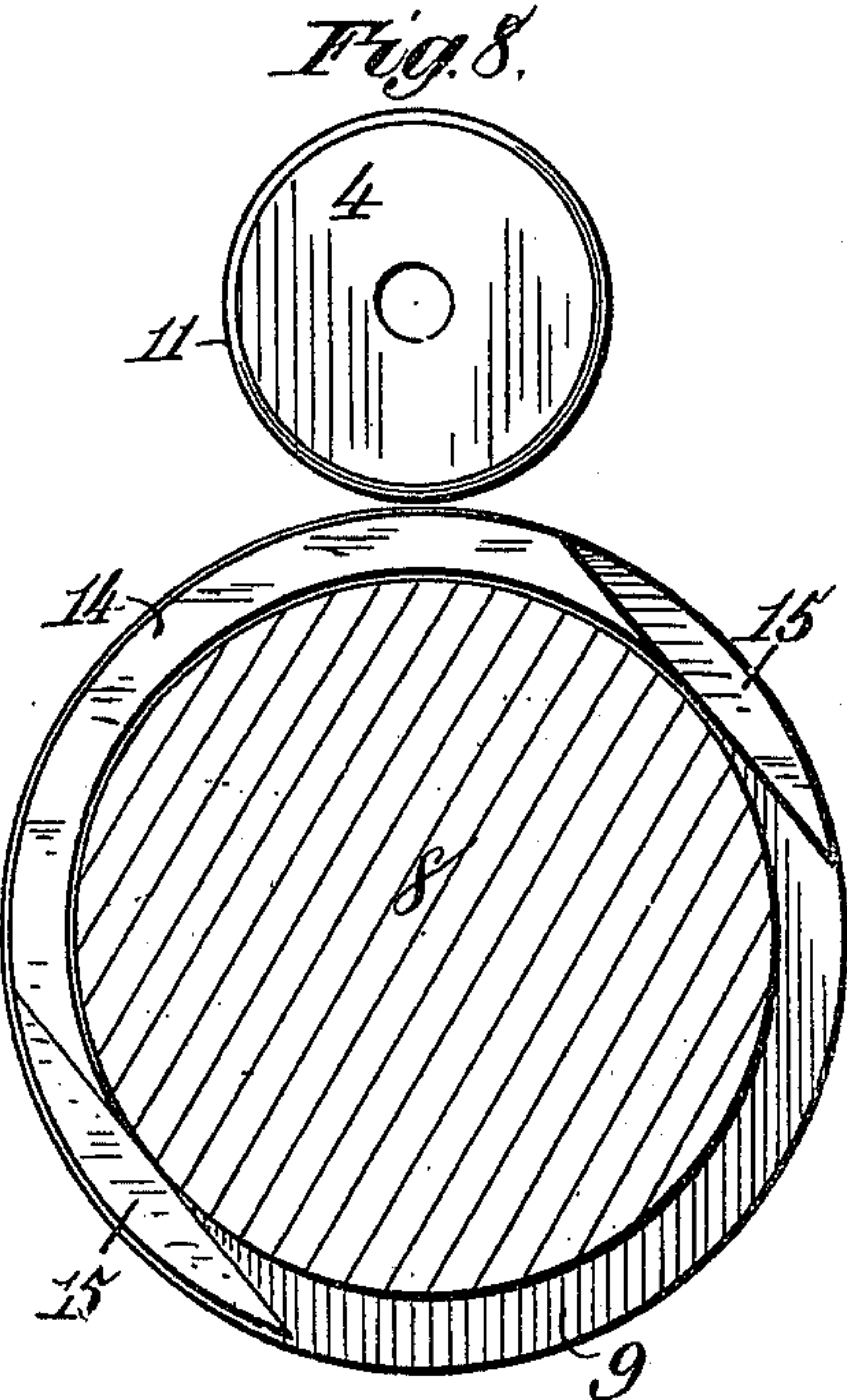
Inventor.  
Harry B. Smith.  
By J. Granville Meyer.

H. B. SMITH.  
DEVICE FOR CORRUGATING AND CREASING PAPER BOARD.

(Application filed Dec. 12, 1899.)

2 Sheets—Sheet 2.

(No Model.)



Witnesses.  
*Robert Everett*  
*Wm. H. K. K. K.*

Inventor.  
*Harry B. Smith*  
By *J. Granville Meyers*  
*Att'y*



# UNITED STATES PATENT OFFICE.

HARRY B. SMITH, OF NEW YORK, N. Y.

## DEVICE FOR CORRUGATING AND CREASING PAPER-BOARD.

SPECIFICATION forming part of Letters Patent No. 658,024, dated September 18, 1900.

Application filed December 12, 1899. Serial No. 740,056. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY B. SMITH, a citizen of the United States, residing at New York, (Brooklyn,) in the county of Kings and State of New York, have invented certain new and useful Improvements in Machines for Corrugating, Creasing, and Ribbing Paper-Board; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a machine for corrugating, scoring, or creasing paper-boards to be used in the manufacture of boxes and similar articles; and it has for one object to provide improved means for forming corrugations, ribs, or creases in the paper-board as contradistinguished from the usual scores or indented lines to form folding-lines upon which the paper-board may be readily and accurately bent and without weakening or breaking the board at such points.

It has for another object to provide improved means for spacing apart the scoring, ribbing, and female corrugating rings.

It has for a still further object to provide an improved arrangement of scoring, ribbing, and corrugating rings by means of which the paper-board may be simultaneously scored, ribbed, and corrugated on opposite sides in parallel lines for the purpose hereinafter set forth.

It has for its further object to so construct and arrange the scoring-disks that they may be set closely together to form blanks for thin boxes, such as handkerchief-boxes and the like.

Finally, it has for its object to improve and simplify the construction and render more efficient this class of machines generally.

To these ends my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, and particularly pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a view in front elevation of a machine embodying my invention. Fig. 2 is a plan view of a strip of paper-board corrugated, ribbed, or creased by my improved ma-

chine. Figs. 3 and 4 are end views thereof, the latter figure showing the strip bent on its folding-lines. Fig. 5 is a similar view to Fig. 2, showing a strip of paper-board both corrugated, ribbed, or creased and scored by the machine. Fig. 6 is an end view of said strip. Fig. 7 is a view in cross-section of the body of a box folded up from the strip shown in Fig. 5 and showing an extended bottom. Fig. 8 is a detail sectional view of the shaft, showing one of the male disks or rolls and female ring and one of the spacer-rings. Fig. 9 is a detail view showing the shape of the corrugation and rib formed by the die-rolls. Fig. 10 is a view of one end of the shaft, showing one set of corrugating and ribbing rings and rolls and one scoring mechanism and the means employed for clamping the parts together on the shaft. Fig. 11 is a detail view of one of the corrugating and ribbing rings and rolls. Fig. 12 is a detail perspective view of one of the spacer-rings. Figs. 13 and 14 are respectively a view in elevation and cross-section of one of the scorers.

Heretofore in making blanks of paper-board and the like from which boxes and similar articles are to be formed it has been a common practice to prepare such blanks for folding by scoring the paper-board on the lines upon which the blanks are to be folded, said scoring being accomplished by forming V-shaped grooves, kerfs, channels, or indentations on the lines where the blank is to be folded. Such grooves, kerfs, channels, or indentations greatly weaken the paper-board, not only making the completed box structurally weak, but having a tendency, especially where a cheap grade of stock is used, to cause the paper-board to break or separate entirely along such scored lines under the bending operation. By forming corrugations and ribs in the paper-board, as shown, as contradistinguished from the V-shaped grooves before referred to the paper-board loses none of its inherent strength and is as strong along its bent edges as at its other portions and may be folded without liability of breaking, cracking, or damaging it along its folded portions. Moreover, the fold made along such corrugations presents a smooth, unbroken, and rounded edge, greatly enhancing the finish and appearance of the box or other article



folded up from the blank. This result, together with the other purposes set forth, I accomplish by the improved means which I will now describe.

5 In the drawings I have shown my improved corrugating and scoring mechanism embodied in a machine of the general type of that shown and described in the patent to J. T. Robinson, No. 273,394, dated March 6, 1883.

10 Referring to the drawings, the numeral 1 indicates the frame of the machine, in the upper portion of which is journaled a shaft 2. On the shaft 2 is a fixed frame 3, in which are rotatably mounted a plurality of disks or rolls 15 4, 5, 6, and 7. The frame 3 is made vertically adjustable, and the disks are adjustable longitudinally on the frame toward and from each other precisely in the manner shown and described in the patent to Robinson before referred to, and the means of effecting such adjustments need not, therefore, be herein described. In the said patent the disks are shown as having V-shaped cutting edges or peripheries for scoring or forming V-shaped 25 grooves or corrugations in the paper-board, as before described; but in the present invention I provide four different sets of disks, only one of them, as 7, having such V-shaped cutting edges, the disk 4 having a rounded periphery, as most clearly shown in Fig. 10, and the disks 5 having true cylindrical faces or peripheries, as and for the purpose hereinafter described. In Fig. 1 I have shown two series of disks carried by the frame 3, an upper and a lower series, either one of which 35 may be brought into operative position by giving the shaft 2 a half-rotation, as described in the patent to Robinson referred to; but a single series of such disks will be sufficient for all practical purposes.

40 Journaled in the frame beneath the shaft 2 is a shaft 8, which may be driven in any suitable manner, and mounted on said shaft is a plurality of corrugating parts or surfaces, 45 each preferably comprising a ring or annulus 9, rectangular in cross-section and provided centrally on its periphery with a circumferential groove 10, as most clearly shown in Fig. 10. One such corrugating-ring is arranged beneath each disk 4 in such manner 50 that the disk 4 lies directly above the groove 10 on the corrugating-ring. As shown, the rounded edge 11 of the corrugating-disk 4 is wider than the groove 10, and said rounded edge is struck on the arc of a circle of greater diameter than that on which the groove is struck, whereby when the paper-board is fed 55 between said disks and rings they operate to form a relatively broad and shallow groove 12 in the upper side of the paper-board and a relatively-narrow rib or bead 13 on the under side thereof, the stock displaced by the corrugating-disk serving to form the rib or bead 13, as most clearly shown in Fig. 9, and 65 for the purpose hereinafter set forth.

In the arrangement shown on the left half or side of Fig. 1 there are four corrugating

rings or parts 9 in each gang, said rings or parts being arranged in two pairs and directly beneath corresponding corrugating- 70 disks 4, and said rings are held in intimate frictional contact with each other and maintained in their adjusted positions at the proper distance apart in the following manner: Arranged on the shaft 8 between the 75 rolls 9 are spacers, each comprising a U-shaped segment or section consisting of a central and relatively-thin portion 14, provided at its ends with thickened portions or laterally-extending projections 15, as most 80 clearly shown in Fig. 12. By forming the spacers in the form of split or divided rings or U-shaped segments they may be quickly placed on and removed from the shaft without removing the shaft from its bearings or 85 disturbing the latter in any manner. In practice each machine will be provided with a number of spacers having projections 15 of varying widths, whereby by inserting different sizes of spacers between the rolls the lat- 90 ter may be adjusted at any required distance apart.

One of the ends of the shaft 8 is threaded, as at 16, and over said threaded end is screwed a threaded collar 17. Between said collar 95 and the adjacent ring hereinafter described are loosely arranged two sleeves 18 and 19, the sleeve 18 being provided with an externally-threaded flange 20, that is adapted to be engaged by an internally-threaded flange 100 21, formed on the sleeve 19. After all the rolls heretofore and hereinafter referred to have been placed on the shaft and properly adjusted apart by the spacers the sleeves 18 and 19 are screwed apart or expanded, 105 whereby the disks are drawn or forced together on the shaft in approximately their adjusted positions. The ring 23<sup>a</sup> on the opposite end of the shaft may be keyed or otherwise suitably fixed thereon, so that when the 110 sleeves are spread apart the rings and spacers on the shaft are tightly clamped together on the latter and caused to rotate therewith. To facilitate turning up the sleeves, sockets or recesses 22 are formed in their peripheries, in 115 which are adapted to be inserted rods, spanners, or similar implements, which are used as levers to turn the sleeves. The sleeves not only operate to effect the accurate adjustment of the rings and clamp them to the shaft, 120 but they also act as lock-nuts to prevent the accidental loosening of the parts during the rotation of the shaft. After the rings have been properly adjusted in the manner above set forth the corresponding disks are adjusted 125 in the frame 3 to register therewith in the manner shown and described in the patent hereinbefore referred to or in any suitable or preferred manner. It will be evident that if the shaft 8 be now set in rotation and a strip 130 of paper-board be fed between the corrugating-rings 9 and disks 4 they will operate to form the shallow and relatively-broad grooves 12 in the upper side of the board



and the corresponding and relatively-narrow beads or ribs 13 on the opposite side thereof, the material displaced from the upper side of the board to form the grooves 12 being forced or projected to the under side thereof to form the beads or ribs 13, whereby the board is practically not weakened or its strength or cohesive qualities otherwise reduced or impaired.

10 In the manufacture of some kind of boxes it is desirable to give to the edges of the box a fanciful or ornamental configuration, and this I accomplish by mounting in the frame 3 disks 7<sup>a</sup>, having fluted or serpentine cutting edges. Said disks are arranged to rotate in contact with the cylindrical or ungrooved surfaces of rings 23, mounted on the shaft 8 adjacent to the end rings 9, whereby when the strip of paper-board is passed through the machine to be corrugated or grooved and ribbed the fluted cutting edges of the disks 7<sup>a</sup>, which rotate in contact with the rings 23, penetrate the paper-board and trim off the edges of the strip in an ornamental manner, as indicated at 24 in Fig. 2. Instead of making the cutting edges of the disks fluted it will be obvious that said edges may be given other fanciful shapes as may be desired, or instead of giving the trimming-disks cutting edges that operate to give to the edges of the strip an ornamental configuration said disks may have straight V-shaped cutting edges, as indicated at 7, on the right of the machine, as shown in Fig. 1, which will operate to trim off the edges of the strip perfectly straight, as indicated at 25, Fig. 4.

The operation of the arrangement of the rings and disks shown on the left half or side of Fig. 1 is as follows: The strip of paper-board is fed between the disks and rings, the disks 7<sup>a</sup> and rings 23 operating to trim off the edges of the strip, as at 24, and the disks 4 and grooved rings 9 operating to longitudinally groove the upper side and simultaneously rib or bead the under side of the strip, as indicated at 26 and 27. After the strip has been run longitudinally between the disks and rolls it is passed edgewise between said disks and rings, which then operate to trim the ends of the blanks, as at 24<sup>a</sup>, and groove and rib or bead the opposite sides of the blank transversely, as at 26<sup>a</sup> and 27<sup>a</sup>. The corners of the blank are then cut away or removed in the usual or in any desired manner, after which the sides of the blank may be turned up vertically on the lines 26 and the ends in like manner turned up on the lines 26<sup>a</sup> to form the body of the box, after which the ornamental sides and ends may be turned in horizontally on the lines 27 and 27<sup>a</sup> and the sides and ends finally secured together in any suitable manner. (See Fig. 4.)

By forming the grooves 12 and ribs or beads 13 in the blank in the manner described the grooved portion is on the outside of the blank and the ribs or beads on the inner side thereof, and as the arc on which the groove is

formed affords a more extended surface than would a straight line or flat surface when the blank is bent up on said grooved line the curved or extended surface of the grooved portion of the blank compensates for the stretching of the stock at this point by the bending operation, somewhat after the manner of the back of a book, thus avoiding breaking or cracking of the paper-board or damaging it from excessive strain. The ribs or beads on the inner side of the blank forms a reinforce and compensates for the displacement of the stock in forming the groove, thus greatly adding to the strength and rigidity of the box along the line of fold or at its edges.

In some styles of boxes it is desirable to provide the boxes with extended bottoms or bottoms having extended portions which project laterally beyond the sides of the box, as at 28, Fig. 7. This is accomplished in the following manner: Arranged on the shaft 8 adjacent to the corrugating-rings 9 are scoring-rings 29, (most clearly shown in Figs. 1, 13, and 14,) each of said rings having a V-shaped cutting or scoring edge 30, and set on the frame 3, opposite said scoring-rings, are plain-faced or perfectly-cylindrical disks 5, the scoring-rings 29 and disks 5 being set at such distances apart that when the paper-board is fed through the machine the scoring-rings 29 will score or indent it on the under side, but not deeply enough to sever the board. By mounting the scoring-rings on the shaft 8 the paper-board will be simultaneously corrugated or grooved and ribbed on its opposite sides by the disks 4 and rings 9 on the lines 26, Figs. 4 and 5, and under-scored or scored on its underside on the lines 31, whereby the blank may be first folded on the lines 26 and 26<sup>a</sup> to form the extended bottom 28 and then bent up vertically on the scored lines 31 and 31<sup>a</sup> to form the sides and ends of the box. In order that the scoring-rings may be quickly placed on and removed from the shaft 8 without disturbing any of the parts, said rings are each formed in two semicircular segments or sections, as shown in Fig. 13, whereby said segments may be slipped on and off the shaft.

In some cases it is desirable to form an outwardly-projecting rib or bead extending horizontally around the sides and ends of the box either to reinforce or give increased strength and rigidity to the box or to serve as abutments or stops on which the bottom of the edges of the lid or cover of the box may rest. In order to form such ribs or beads, I arrange on the shaft 8 adjacent to the cylindrical rings 23 (on the right of the machine, as shown in Fig. 1) circumferentially ribbed or beaded rings 33 and set in the frame 3, directly opposite said rings, disks 6, each having a rounded circumferential groove, the rounded edges of the ribs or beads being approximately the same width as the grooves in the disks, whereby said edges and the curved walls of the grooves lie practically



in parallelism. When the paper board is passed through the machine to groove, rib, score, and trim the blank, as before described, the grooved disks 6 and ribbed rings 33 operate to form ribs 34 on the upper side of the blank and corresponding grooves 35 on the opposite side thereof, whereby when the sides and ends of the blank are turned up to form the box said ribs or beads 35 project outwardly, not only adding strength and rigidity to the sides and ends of the box to resist inward or outward strains, but also serving as stops or abutments against which the lower edges of the sides and ends of the box lid or cover impinge.

I have shown the grooving and ribbing devices as comprising corresponding circumferentially-grooved rings and disks having rounded edges; but it will be understood that instead of such rings and disks the parts may consist of reciprocating male and female dies or equivalent means.

Having described my invention, what I claim is—

1. In a machine for scoring or creasing paper-board to facilitate bending, the combination with a suitable part having a rounded working face, of an opposed part having a groove, the width of said working face being greater than the width of the groove, whereby when said parts are caused to act upon a sheet of paper-board fed between the said parts a relatively-wide depression will be formed in one side of the board and a narrow rib will be formed on the other side of the board opposite said depression.

2. In a paper-board scoring or creasing machine, the combination with a rotating part having a rounded working face, of an opposed cylindrical part having a circumferential groove, the width of said working face being greater than the width of the groove, whereby when said parts are caused to act upon a sheet of paper-board fed between the said parts a relatively-wide depression will be formed on one side of the board and a narrow rib will be formed on the other side of the board opposite the said depression.

3. In a paper-board-corrugating machine, the combination with a rotatable disk having a rounded periphery, of an opposed ring or roll having a circumferential groove, the thickness of the edge of said disk being greater than the width of said groove, substantially as described.

4. In a paper-board-corrugating machine, the combination with a rotatable disk having a rounded periphery, of a rotatable ring arranged parallel to said disk and having a circumferential groove disposed opposite the rounded edge of the disk, the thickness of the edge of the disk being greater than the width of the groove, and said rounded edge being struck on the arc of a circle of greater diameter than that on which the groove is struck, substantially as described.

5. A spacer for the purpose specified, com-

prising a slotted or divided segment having thickened or laterally-extending ends, substantially as described.

6. A spacer for the purpose specified comprising a substantially U-shaped segment having its ends thickened or laterally extended on opposite sides, substantially as described.

7. In a paper-board-corrugating machine, the combination with a shaft, of a plurality of corrugating-rings adjustable longitudinally on said shaft, spacers removably arranged on the shaft between the rings and each provided with laterally-extending projections on its opposite sides engaging the ends of the rings, and means for clamping the spacers and rings together on the shaft, substantially as described.

8. The combination with the shaft, of a corrugating-ring having a rounded circumferential groove, a scoring-ring 29 having a V-shaped scoring edge, both mounted on said shaft in parallelism, a rotatable disk having a rounded periphery arranged to rotate opposite the said grooved ring, and a rotatable disk having a cylindrical periphery arranged to rotate opposite the scoring-ring, whereby said rings and disks operate to groove and rib the opposite sides of a sheet of paper-board and simultaneously score it upon its ribbed side, substantially as described.

9. The combination with the shaft, of a corrugating-ring 33 having a rounded circumferential bead or rib, a scoring-ring 7 having a V-shaped scoring edge, both mounted on said shaft in parallelism, a rotatable disk 6 having a circumferential groove arranged to rotate opposite said ribbed or beaded ring, and a rotatable disk 5 having a cylindrical periphery arranged to rotate opposite the scoring-ring whereby said rings and disks operate to groove and rib the opposite sides of a sheet of paper-board and simultaneously score it upon the ribbed side, substantially as described.

10. The combination with the shaft, of a corrugating-ring having a rounded circumferential groove, a scoring-ring having a V-shaped scoring edge, both mounted on said shaft in parallelism, a rotatable disk having a rounded edge arranged to rotate opposite the said grooved ring, the rounded edge of the disk being of greater thickness than the width of said groove, and a rotatable disk having a cylindrical periphery arranged to rotate opposite the scoring-rings, whereby said rings and disks operate to groove and rib the opposite sides of a sheet of paper-board and simultaneously score it upon its ribbed side, substantially as described.

11. The combination with the shaft, of corrugating-rings 10, adjustably mounted thereon in parallelism, each of said rings having a circumferential groove, and means for locking said rings on the shaft, rotatable disks arranged to rotate opposite the said grooved



rings, the edge of each disk being of greater thickness than the width of the groove in the rings and cooperating trimming knives or cutters, arranged outside the outermost grooved rings, whereby said rings and disks operate to groove and rib the opposite sides of a sheet of paper-board and simultaneously trim off its edges, substantially as described.

12. The combination with the shaft and the rings and spacers loosely arranged thereon, said shaft being threaded at one end, of a ring screwed on the threaded end of the shaft, a ring fixed on the other end thereof, and sleeves loosely arranged on the shaft between the said threaded end ring and the adjacent rings, said sleeves being provided on their adjacent faces with interlocking threaded flanges, substantially as described.

13. In a machine for making box-blanks from paper-stock, the combination with a rotary shaft having mounted thereon a plurality of circumferentially-grooved rings, two scoring-rings mounted on the shaft parallel with the grooved rings and having V-shaped scoring edges, two circumferentially-ribbed rings, mounted upon the shaft, one adjacent to each scoring-ring, and two rings mounted on the shaft outside the said ribbed rings and having cylindrical faces, of disks arranged to rotate opposite the grooved rings, two cylindrical-faced disks arranged to operate opposite the scoring-rings, two grooved disks op-

erating opposite the ribbed rings, and two trimming-disks having cutting edges arranged to rotate in contact with the cylindrical-faced rings, whereby the blank is simultaneously grooved and ribbed on one side, ribbed, scored and grooved on the opposite side and trimmed off at its edges, substantially as described.

14. In a machine for making box-blanks from paper-board, the combination with a rotary shaft having mounted thereon a plurality of circumferentially-grooved rings, two scoring-rings mounted on the shaft parallel with the grooved rings and having V-shaped scoring edges, and two rings mounted on the shaft outside the first-named rings and having cylindrical faces, of disks arranged to rotate opposite the grooved rings and having rounded edges, two cylindrical-faced disks arranged to rotate opposite the V-shaped edges of the scoring-rings and two trimming-disks having cutting edges arranged to rotate in contact with the cylindrically-faced rings on the shaft, whereby the blank is simultaneously grooved on one side, ribbed and scored on the opposite side and trimmed off at its edges, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HARRY B. SMITH.

Witnesses:

K. A. SOUTHWORTH,  
 PERCY J. EGBERT.