No. 752,853. PATENTED FEB. 23, 1904.

F. G. NIND & C. F. STRASBURGER.

PAPER FOLDING MACHINE.

APPLICATION FILED FEB. 6, 1903.

NO MODEL. 6 SHEETS—SHEET 1.

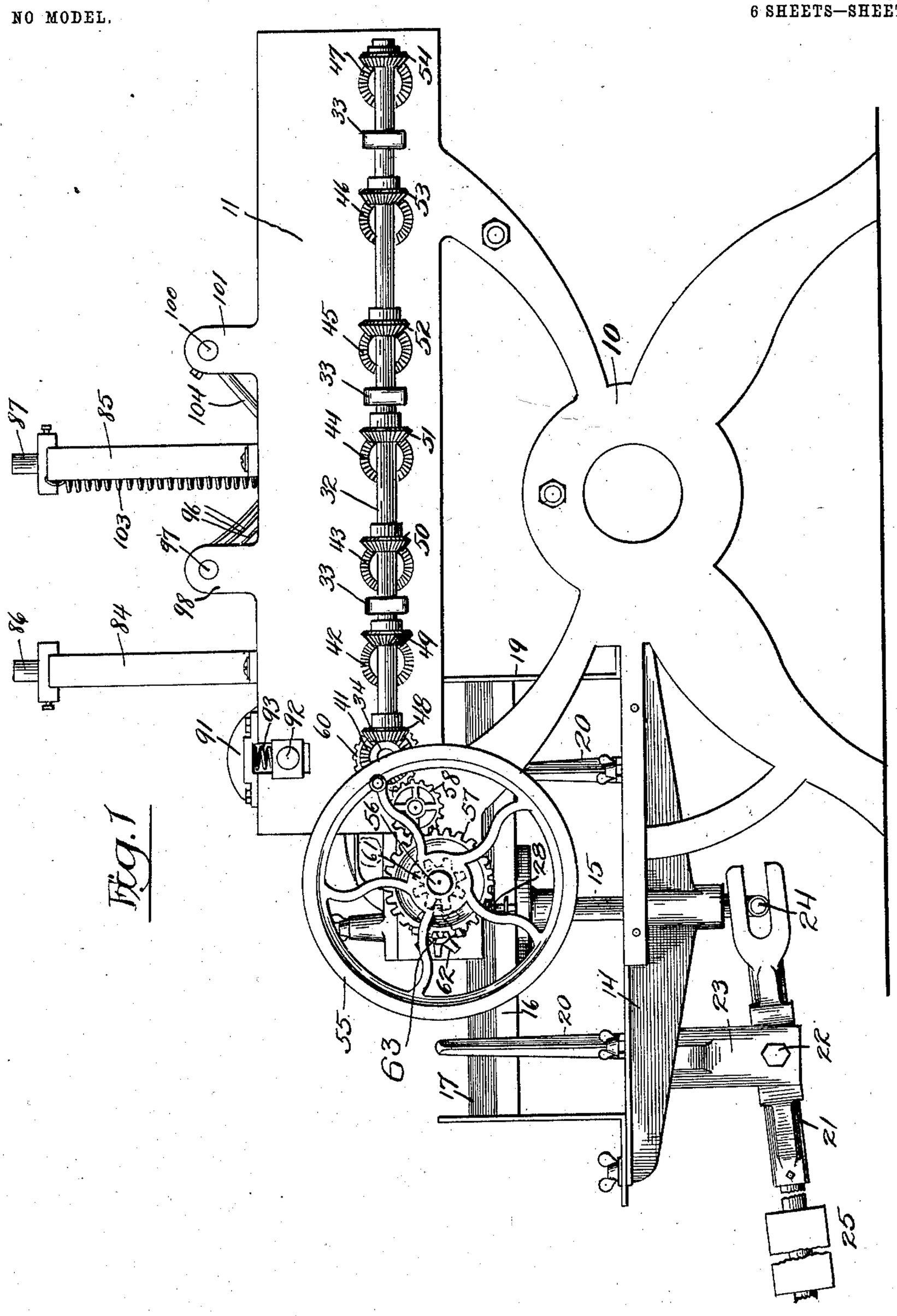

Fig. 1

Witnesses
Edward A. Enfield
J. B. Weir

Inventors:
Frederick G. Nind
Charles F. Strasburger
by Bond, Adams, Pickard & Jackson
Attys

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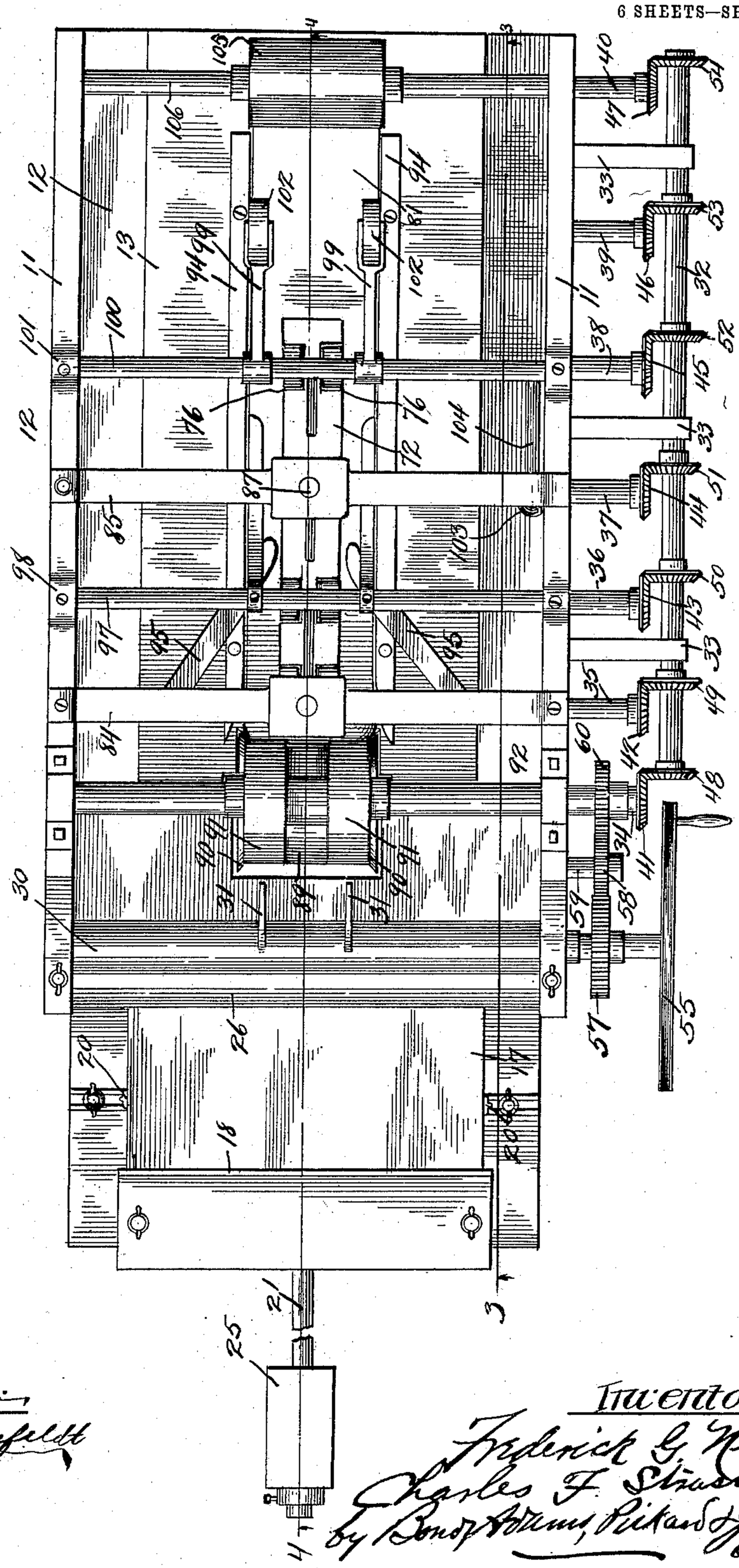

FIG. 2.

Witnesses:—
Edward A. Tinsfeldt
J. B. Weir

Inventors:
Frederick G. Nind.
Charles F. Strasburger
by Bond Adams, Pickard & Jackson
Attys

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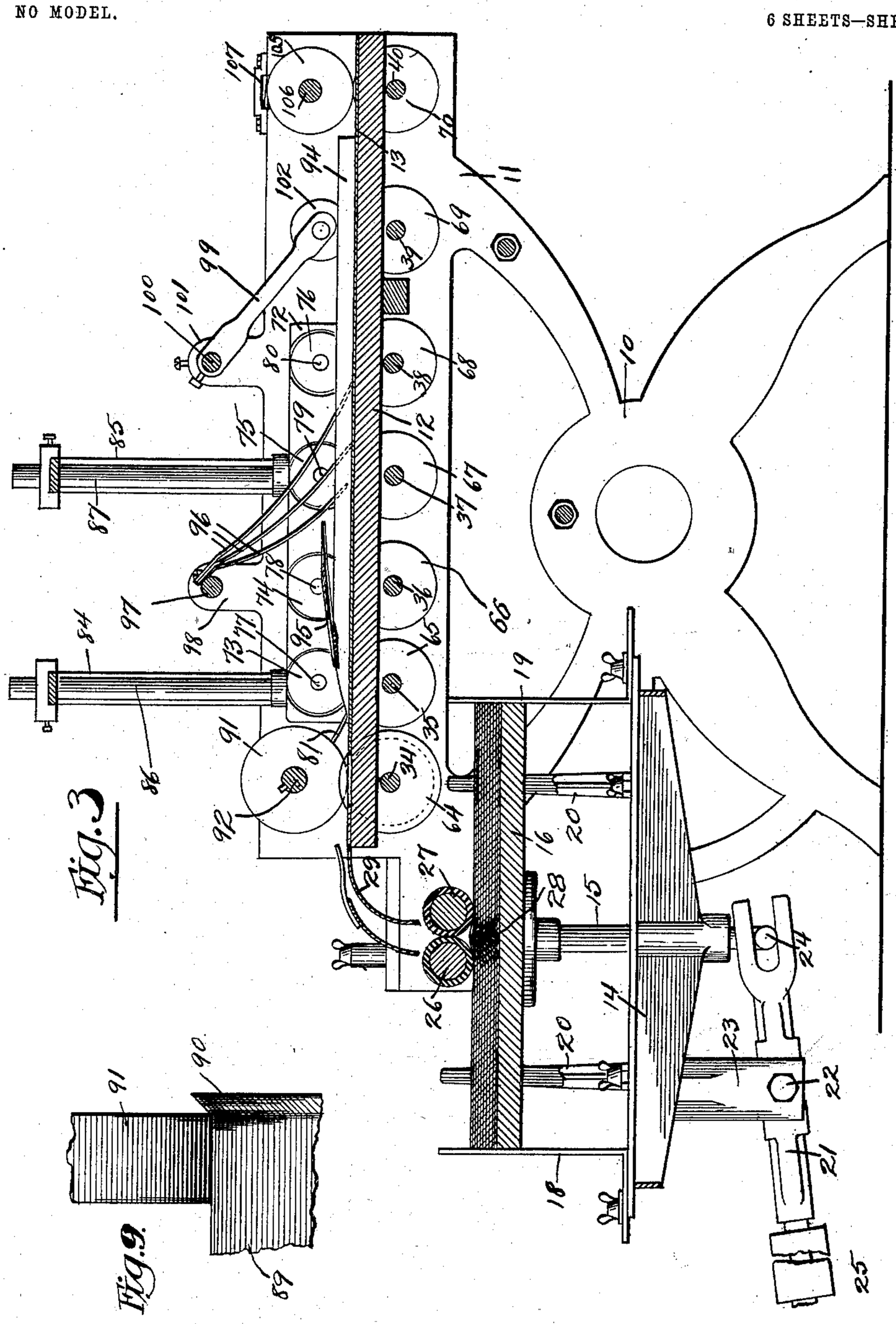

Fig. 3

Fig. 9.

Witnesses:-
Edward M. Eisfeldt
J. B. Weir

Inventors
Frederick G. Nind
Charles F. Strasburger
by Bowers, Williams, Pickard & Jackson
Attys.

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NO MODEL. 6 SHEETS—SHEET 4.

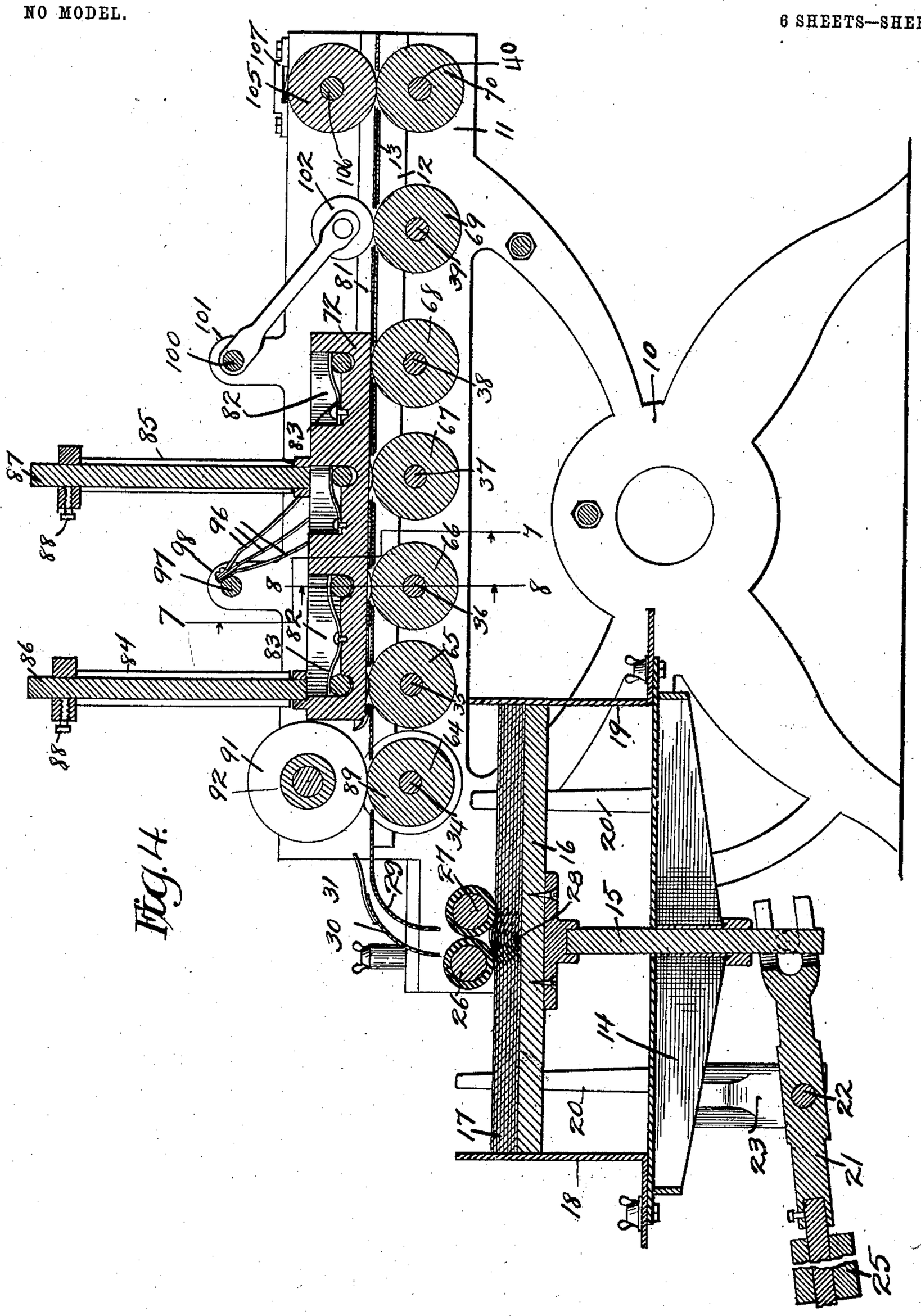

Fig. 4.

Witnesses:
Edward A. Tiefeldt
J. B. Weir

Inventors:
Frederick G. Nind
Charles F. Strasburger
by Bond, Adams, Pickard & Johnston
Attys.

No. 752,853. PATENTED FEB. 23, 1904.

F. G. NIND & C. F. STRASBURGER.

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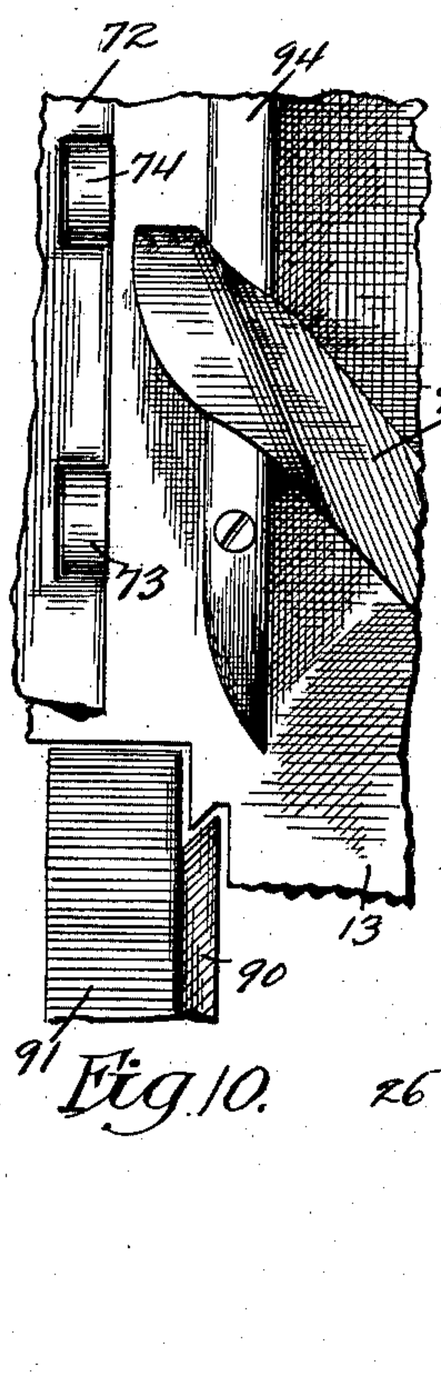
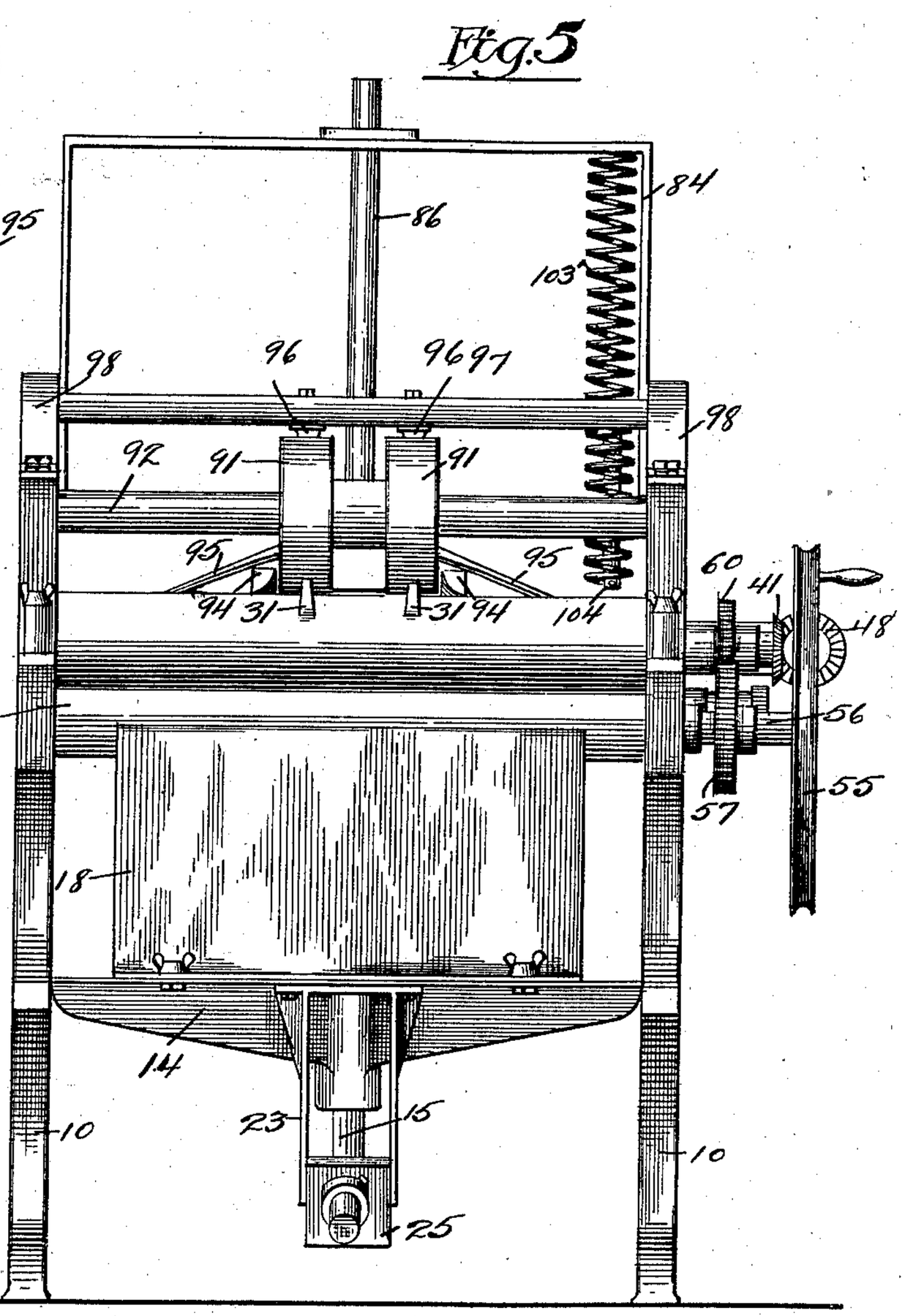


Fig. 10.

Fig. 5



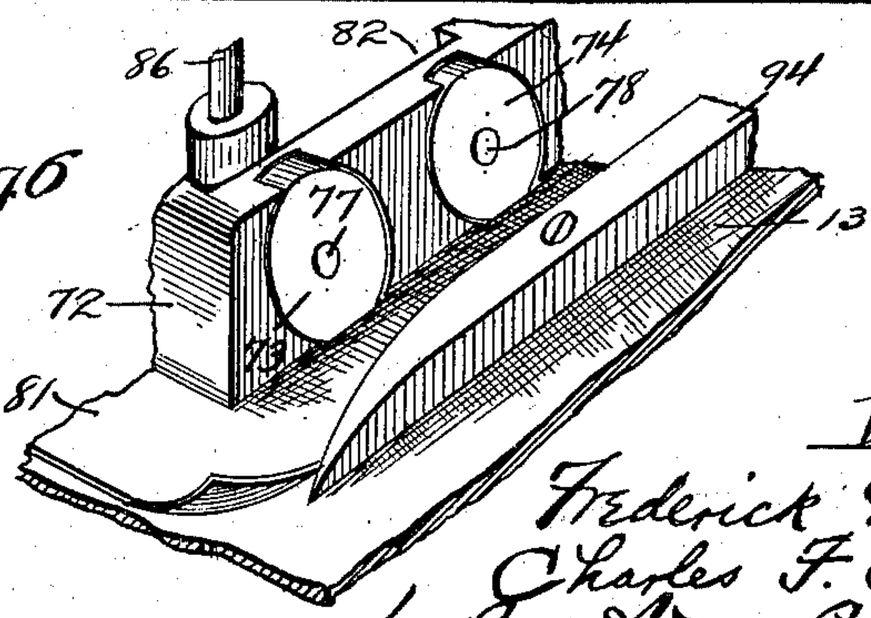


Fig. 6

Witnesses:-
Edward A. Fairfield
J. B. Weir

Inventors:-
Frederick G. Nind
Charles F. Strasburger.
by Bond Adams, Pickard & Jackson
Attys.

No. 752,853. PATENTED FEB. 23, 1904.

F. G. NIND & C. F. STRASBURGER.

PAPER FOLDING MACHINE.

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NO MODEL. 6 SHEETS—SHEET 6.

Fig. 7.

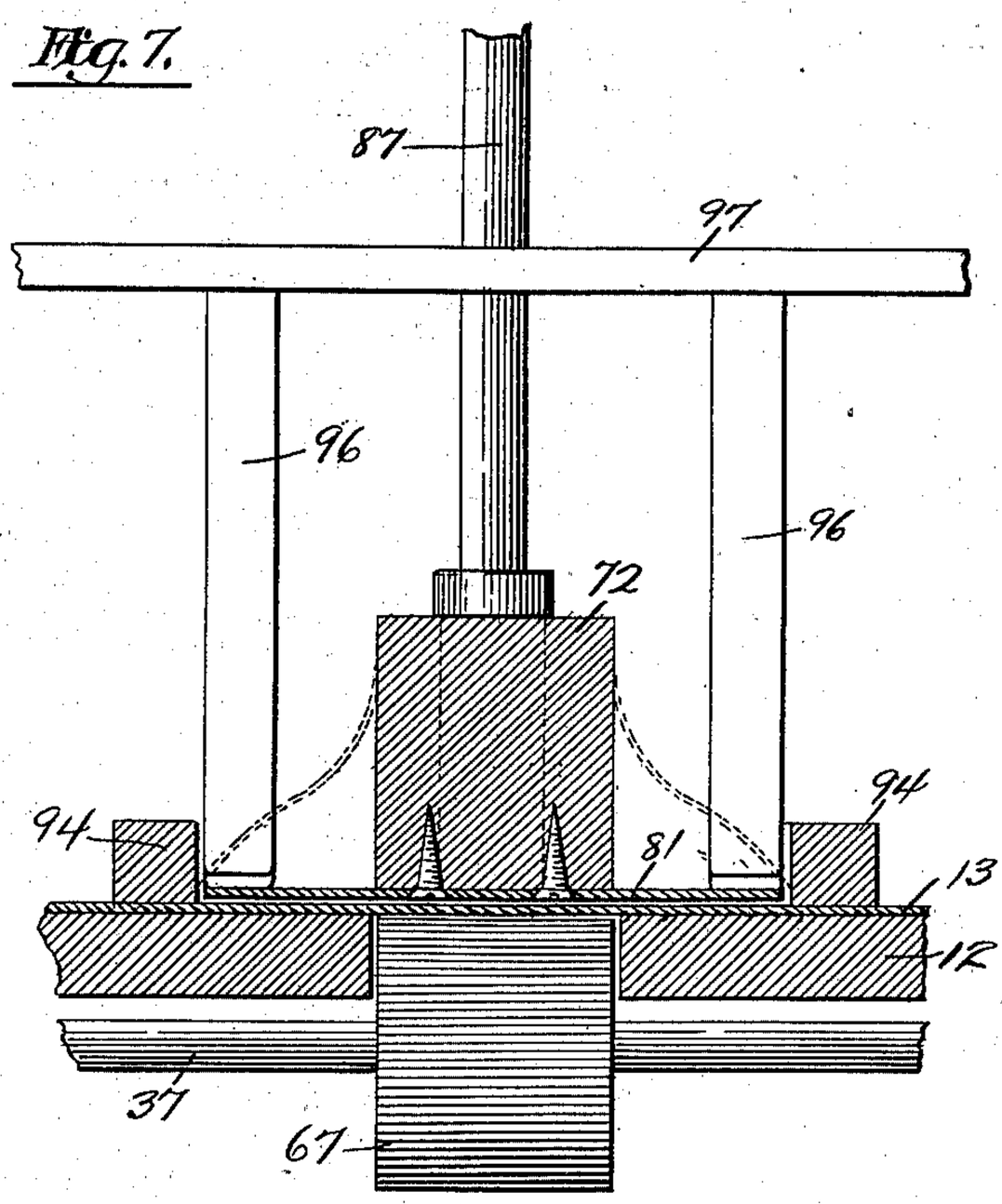
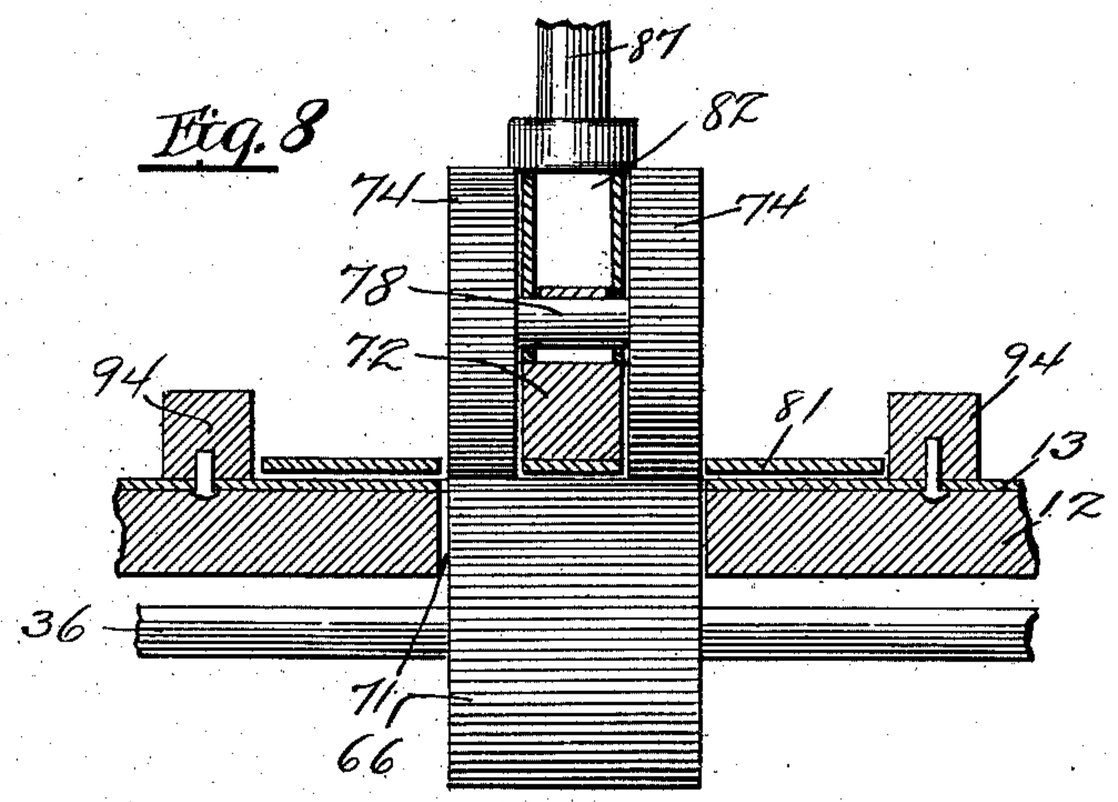


Fig. 8



Witnesses:-
Edward G. Eastfield
J. B. Weir

Inventor:-
Frederick G. Nind
Charles F. Strasburger
by Bakewell, Adams, Pickard & Hudson
Att'ys

No. 752,853. Patented February 23, 1904.

UNITED STATES PATENT OFFICE.

FREDERICK G. NIND AND CHARLES F. STRASBURGER, OF CHICAGO, ILLINOIS, ASSIGNORS TO GEORGE FULLER, OF CHICAGO, ILLINOIS.

PAPER-FOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 752,853, dated February 23, 1904.

Application filed February 6, 1903. Serial No. 142,157. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK G. NIND and CHARLES F. STRASBURGER, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Paper-Folding Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to machines for folding sheets of paper, and is primarily designed for use in folding small sheets, such as printed circulars, and has for its objects to provide means for taking in quick succession sheets of paper from a pile and quickly and uniformly imparting to such successive sheets a plurality of folds, so that when the sheets have passed through the machine they will be in condition for insertion in an ordinary envelop. We attain these objects by the devices and combinations of devices shown in the drawings and hereinafter specifically described.

That which we regard as new is set forth in the claims.

In the accompanying drawings, Figure 1 is a side elevation. Fig. 2 is a plan view. Fig. 3 is a longitudinal vertical section on line 3 3 of Fig. 2. Fig. 4 is a longitudinal vertical section on line 4 4 of Fig. 2. Fig. 5 is an end elevation. Fig. 6 is a detail, being a perspective view of a portion of the front part of the bed of the machine and of the plate or former between which the sheets of paper pass. Fig. 7 is a cross-section through the central portion of the machine, taken at line 7 7 of Fig. 4. Fig. 8 is a cross-section taken at line 8 8 of Fig. 4. Fig. 9 is a detail, being a front elevation of a portion of the roll and one of its coacting rollers between which the paper passes on its way to the plate or former; and Fig. 10 is a detail, being a plan view of a portion of the bed of the machine and the plate or former thereover, and showing also the construction and arrangement of the finger at that side of the machine for turning inward the upturned projecting portion of the sheet of paper that passes beneath the plate or former.

Referring to the several figures of the drawings, 10 indicates the supporting-framework, carrying at its upper end the two longitudinal side walls 11 11 of the machine, which side walls are preferably cast with the supporting-framework 10, but which of course may be separate therefrom and suitably secured thereto.

12 indicates the bed, to the upper face of which is attached in the construction shown a thin sheet of polished metal over which the paper to be folded travels. This part 13 forms, as a matter of fact, a portion of the bed 12.

14 indicates a frame located at the forward or receiving end of the machine, which frame is provided with a central opening through which passes a rod 15 movable therein, said rod supporting at its upper end a table 16, upon which is adapted to be placed a pile of sheets of paper, as indicated by 17 in the drawings.

18 19 indicate plates at the forward and rear ends, respectively, of the frame 14, which are made adjustable in any ordinary manner, so as to conform to the length of the sheets placed upon the table 16. Adjustable side guides 20 are also provided, as indicated.

21 indicates a lever pivoted at 22 to a bracket 23, depending from the frame 14, said lever being forked at one end, as shown, to suitably embrace a pin 24, extending laterally from the lower end of the rod 15.

25 indicates a weight slidingly mounted upon the lever 21 and adapted to hold in a raised position the movable table 16 and the pile of sheets thereon. This weight is made adjustable on the lever 21, so that the pile of sheets may be held up with the proper degree of pressure against the rollers that pick up the sheets successively from the pile and impart to them their first fold. These rollers just referred to are indicated by 26 and 27 and have their ends suitably journaled in the side walls 11. Each of these rollers in the construction shown is provided with a rubber covering, whereby sufficient friction between them and the top sheet of the pile 17 is had to insure such sheet being moved upward between the rollers as such rollers rotate. In order that the pile of sheets on the table 16 may be given a slight buckling, so

as to insure the sheets being successively picked up and carried through the rollers 26 27, we provide said table 16 with a slight ridge 28, which extends centrally across the table immediately below and parallel with the line of contact of said rollers 26 27.

29 indicates a curved metallic guide secured in the construction shown between the side walls 11, the lower end of such guide extending down close to the rollers 26 27 and in position to receive thereon a sheet of paper as it issues from such rollers. The forward and upper edge of this guide 29 extends over the end of the bed 12 in position to direct a sheet of paper upon the smooth polished surface of the plate 13, that is secured to the surface of the said bed 12.

30 indicates a curved plate over the guide 29, said plate being also secured in the construction shown between the side walls 11 of the machine and acting to properly direct a sheet of paper as it passes over such guide 29. Secured to the upper edge of such curved plate 30 are a couple of fingers 31, placed at each side of the longitudinal center of such plate 30 and acting to insure a sheet of paper being held down after it issues from beneath the plate 30, so that its proper presentation to the succeeding set of rolls to be hereinafter described will be insured.

32 indicates a shaft extending lengthwise of the machine at one side thereof and suitably journaled in brackets 33, extending out from one of the side walls 11.

34 35 36 37 38 39 40 indicate shafts extending across the machine and suitably journaled in the side walls 11, each of said shafts projecting at one end from the machine and being provided with a beveled gear numbered, respectively, 41 42 43 44 45 46 47, which mesh, respectively, with beveled gears 48 49 50 51 52 53 54, secured upon the shaft 32. The various shafts enumerated are operated by the turning of a wheel 55, mounted upon the end of a shaft 56, which latter shaft carries the roller 27. Mounted upon this shaft 56, as clearly shown in Fig. 2, is a gear-wheel 57, which meshes with another gear 58, mounted on the end of a stub-shaft 59, that projects from one side wall 11, which in turn meshes with another gear 60, secured to the shaft 34. It will thus be seen that the rotation of the wheel 55 will, through the various gears described, operate to turn all of the shafts numbered from 34 to 40, inclusive, in the same direction, and through the meshing of two pinions 61 and 62, located, respectively, on the shaft 56 and the projecting end of a shaft 63, formed with the roller 26, the rollers 26 and 27 will be properly rotated so as to direct between them a sheet of paper from the pile 17. Secured upon the said shafts numbered from 34 to 40, inclusive, are a series of rolls, indicated, respectively, by 64 65 66 67 68 69 70, which project through an opening 71, extending through the longitudinal center of the bed 12, and each projecting through one of a series of small openings in the smooth polished plate 13 on the bed 12, as clearly shown in Fig. 4, so that the surface of each of these rolls is but very slightly above the surface of the plate 13.

72 indicates a block arranged centrally over the machine and extending longitudinally thereof and provided with annular recesses in its sides in which are located several pairs of rollers—four of such pairs being shown, which are indicated by 73 74 75 76—the rollers of each pair being connected by axles, numbered, respectively, 77 78 79 80.

81 indicates a plate secured by screws, as shown in Fig. 7, or otherwise to the under face of the block 72, which plate in the construction shown is considerably wider than the width of the block 72 and somewhat longer than such block. This plate, like the plate 13, has a smooth polished surface to enable a sheet of paper to pass over it readily, and from its function, as hereinafter defined, may properly be termed a "former." It is provided with a number of openings through which the rollers carried in the block 72 can project, as best shown in Fig. 8 and as also shown in Fig. 4, such rollers being thereby permitted to come in contact with the surface of the rolls 65 66 67 68, located immediately beneath. The surfaces of said rolls and rollers are preferably slightly roughened or corrugated to better grip a sheet of paper being passed through the machine.

In the upper face of the block 72 are formed recesses 82, in which are secured springs 83, which bear upon the axles of the rollers carried in the block, so as to properly hold them in nipping contact with the under rolls which they engage. As shown in Fig. 4, one of the recesses 82 is large enough to accommodate a long spring that is secured at its center and has each end bearing upon one of the axles, while the other recesses are smaller and accommodate but a short spring which bears upon one axle only. It is immaterial which form is employed.

84 85 indicate a couple of arches secured to the side walls 11.

86 87 indicate rods secured at their lower ends to the block 72 and at their upper ends passing through the horizontal portion of the arches 84 85, respectively, and adjustably secured in position by set-screws 88. By this means the block 72 can be adjusted so that a sheet of paper can be properly passed between the plate 13 and the plate or former 81, that is carried by the block.

89 indicates a roll at the forward end of the machine, which is secured upon the shaft 34, so as to turn therewith. At each end this roll 89 is provided with an upwardly-beveled portion 90, as best shown in Fig. 9, and immediately above such roll and in contact therewith are a pair of rollers 91, the outer edges

of which are in line with the inner ends of the beveled portion 90 of the roll 89. These rollers 91 are mounted on a shaft 92, journaled in suitable bearings in the side walls 11.

93 indicates a spring acting upon each bearing for the shaft 92, so as to hold the surfaces of the rollers 91 against the surface of the roll 89.

94 indicates two parallel bars extending longitudinally of the machine and secured in any suitable manner upon the surface of the plate 13, each of such bars being located very close to one edge of the plate or former 81. The forward ends of these bars 94 are beveled downward, and their inner faces are at such ends also beveled, so that a comparatively wide space is left at this point between such bars and the plate 81, which beveling of the ends is for the purpose of preventing the tearing of a sheet of paper as it passes from between the rollers 91 and roll 89 in under the plate or former 81 and between such plate or former and said bars 94,

95 indicates two fingers secured to the bed of the machine and each projecting diagonally over one of the parallel bars 94, so that its forward or free end lies close to the block 72. The edge of each of these fingers that lies in proximity to the block is rounded, so as not to tear or injure a partially-folded sheet of paper that is forced against it, but will act to bend such sheet in toward the block.

96 indicates a series of flat curved springs of different lengths—a series being provided for each side of the machine and each series having its free ends in contact with the plate 13, immediately along the side of one of the bars 94. Each series of springs 96 is suitably secured to a cross-bar 97, secured in the upper end of the vertical ears 98, formed with the side walls 11.

99 indicates a pair of arms suitably secured to a shaft 100, journaled in vertical ears 101, that are formed with the side walls 11, each of said arms carrying at its forward end a roller 102, said rollers being located immediately in front of the two series of springs 96 and bearing against and turning with the roll 69, which, as stated, projects through the bed of the machine and also slightly through the plate 13 on such bed. These rollers 102 are held in contact with the roll 69 through the action of a coiled spring 103, the upper end of which is fastened to the forward arch 85 and the lower end of which is fastened to a bar 104, that is attached at one end rigidly to the shaft 100 and extends diagonally downward. The spring exerts a pulling action upon this inclined bar, with the result, of course, of turning the shaft, so as to keep the rollers 102 always in close contact with the roll 69.

105 indicates a roll secured to a shaft 106, which is suitably journaled in the side walls 11 near the forward end of the machine and which is in contact with the roll 70, being held in such contact by springs 107 in a manner similar to the way in which the rollers 91 are held in contact with their coacting roll.

In operation a pile of sheets of paper is to be placed upon the table 16 and the weight 25 adjusted along the lever 21 to bring such pile of sheets with the required degree of force against the rollers 26 27. The wheel 55 is then to be rotated either by hand or other power, which will cause the rollers 26 27 to be turned, as before explained, so as to cause the top sheet of the pile to be buckled across its center, whereupon the buckled portion will be caught between the rollers 26 27 and forced upward between the parts 29 30. The passage through the rollers 26 27 will of course impart to the sheet a central fold, and this folded portion will constitute the leading portion of the sheet thereafter through the machine. The sheet thus folded will be presented between the rollers 91 and the roll 89, and as the roll 89 has its ends beveled rather sharply upward the sheet will be turned up somewhat at the outer edge of each roller 91 and slightly creased, such slight creasing being due to the outer edges of the rollers 91 being located in line with the point where the beveling on the roll 89 commences. Passing from between these rollers 91 and the roll 89 the central portion of the once-folded sheet passes between the plate 13 and the plate or former 81, the sides of the sheet being turned up slightly by reason of the crease formed in it, as just explained. As the sheet advances under the plate or former 81 the side portions of the paper are gradually turned up more and more as the space between the side edges of the plate or former 81 and the parallel bars 94 decreases, and after the inclined or beveled end of said parallel bars has been passed there will be just enough space between said bars and the plate or former 81 for the double thickness of the paper to pass along in, and the result is that the side portions of the paper will be turned up at almost a right angle to the central portion, such turning being at the creases mentioned, which creases come at the edges of said plate or former 81. As the sheet continues to advance the inwardly projecting and inclined fingers 95 will contact such vertically-standing portions of the paper, bending them in toward and against the block 72 and holding such portions in such position, so that they will be guided in between the inner sides of the springs 96 and the sides of the block 72, and upon the further movement of the paper each spring of the series will successively contact the paper, so as to cause it to fold more and more sharply over each edge of the plate or former 81, the longest and last spring of each series acting with the greatest force to accomplish this folding, such last and longest spring being of the stiffest material and the first and shortest of the springs being the weakest.

After passing from the springs the folding of the paper is further accomplished by the pressure of the rollers 102, carried by the arms 99, and as it passes from beneath these rollers the sheet, which has now imparted to it three well-defined folds, passes between the rolls 70 and 105, where the final pressure is applied, so that the sheet discharged at the end of the machine from between these two last-named rolls is perfectly folded to adapt it for insertion in an envelop.

It will be understood from the description of the several parts that through the gearing described the several rolls carried by the shafts journaled in the side walls of the machine will be all positively driven and that by reason of the various sets of upper rollers being held in contact with such positively-driven rolls these rollers will also be turned and that a sheet of paper passed between the various under and upper rolls and rollers will be carried rapidly through the machine.

As shown in the drawings, the forward end of the plate or former 81 has its corners rounded off and the edge turned up slightly, so as to more readily admit a sheet of paper beneath it and obviate any danger of tearing the sheet.

By our invention we provide a machine that is compact and simple, that will occupy but little space, and that will with great rapidity and accuracy fold sheets of paper into the ordinary shape to adapt them for inclosure in envelops.

That which we claim as our invention, and desire to secure by Letters Patent, is—

1. In a paper-folding machine, the combination with means for creasing a sheet of paper of a plate or former having parallel side edges, means for folding said sheet over the said parallel edges of said plate or former and along said previously-formed creases, two series of opposing rolls adapted to move the sheet of paper while being folded, one series projecting through said plate or former, and means for driving said rolls, substantially as specified.

2. In a paper-folding machine, the combination with means for imparting a fold to a sheet of paper, of means for creasing said sheet along two parallel lines at right angles to said fold, means for thereafter folding said sheet along said creases, and means for moving the sheet while being creased and folded, substantially as specified.

3. In a paper-folding machine, the combination with means for imparting a fold to a sheet of paper, of means for creasing said sheet along two parallel lines at right angles to said fold, a plate or former having parallel sides, means for folding said sheet, after being creased, over the side edges of said plate or former, and means for moving said sheet while being creased and folded, substantially as specified.

4. In a paper-folding machine, the combination with means for imparting a fold to a sheet of paper, of a plate or former provided with parallel side edges, means for moving said folded sheet beneath said plate or former, and means for folding projecting lateral portions of said sheet over and against said parallel side edges, said last-mentioned folds being at substantially right angles to the first-mentioned fold, substantially as specified.

5. In a paper-folding machine, the combination with means for imparting a fold to a sheet of paper, of a device having an outwardly-extending inclined portion, means for passing the sheet over said device, and means for applying pressure to said sheet near the inner end of said inclined portion to form a crease in the sheet, substantially as specified.

6. In a paper-folding machine, the combination with means for imparting a fold to a sheet of paper, of a roll having at one end an outwardly-extending inclined portion, means for directing the folded sheet over said roll, and means for pressing said sheet near the inner end of said inclined portion as it passes over the roll, substantially as specified.

7. In a paper-folding machine, the combination of a roll having at its end an outwardly-extending inclined portion, means for passing a sheet of paper over said roll, means for applying pressure to said sheet near the inner end of said inclined portion to form a crease in the sheet, and means for thereafter folding said sheet along said crease, substantially as specified.

8. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from and parallel with said bed, means for moving a sheet of paper between said bed and plate or former with the side portions of the paper projecting beyond the side edges of said plate or former, and means for turning said projecting portions of the paper inward toward each other over and against the side edges of the plate or former, substantially as specified.

9. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from said bed, means for moving a sheet of paper between said bed and said plate or former with the side portions of the paper projecting beyond the side edges of said plate or former, means for turning said projecting portions of the paper inward, and other means for applying pressure to the paper to fold it around and against the edges of said plate or former, substantially as specified.

10. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from said bed, means for moving a sheet of paper between said bed and said plate or former with the side portions of the paper

projecting beyond the side edges of said plate or former, means for turning said projecting portions of the paper inward, and other means for applying a varying pressure to the paper to fold it around the edges of said plate or former, substantially as specified.

11. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from said bed, means for moving a sheet of paper between said bed and said plate or former with the side portions of the paper projecting beyond the side edges of said plate or former, means adjacent to the side edges of said plate or former for turning up the said projecting portions of the paper, means for turning said upturned portions inward, and means for applying pressure to the paper along the edges of said plate or former, substantially as specified.

12. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from said bed, means for moving a sheet of paper between said bed and said plate or former with the side portions of the paper projecting beyond the side edges of said plate or former, a bar adjacent to each side edge of the plate or former against which the projecting sides of the sheet of paper come in contact and are thereby caused to be turned up, and means for pressing said paper closely over and around the edges of said plate or former, substantially as specified.

13. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from said bed, means for moving a sheet of paper between said bed and said plate or former with the side portions of the paper projecting beyond the side edges of said plate or former, means for turning said projecting portions upward and inward, and a spring-strip over the plate or former at each side thereof adapted to fold the paper over the edge of the said plate or former, substantially as specified.

14. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from said bed, means for moving a sheet of paper between said bed and said plate or former with the side portions of the paper projecting beyond the side edges of said plate or former, means for turning said projecting portions upward and inward, and a series of spring-strips over the plate or former at each side thereof, the spring-strips of each series pressing against the paper with different degrees of force, substantially as specified.

15. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from said bed, means for moving a sheet of paper between said bed and said plate or former with the side portions of the paper projecting beyond the side edges of said plate or former, means for turning said projecting portions upward and inward, a spring-strip over the plate or former at each side thereof adapted to fold the paper over the edge of the said plate or former, and another pressure device adapted to further press the sheet after having been pressed by said spring-strip, substantially as specified.

16. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from said bed, means for adjusting said plate or former toward or from said bed, means for moving a sheet of paper between said bed and said plate or former with the side portions of the paper projecting beyond the side edges of said plate or former, means for turning said projecting portions inward and folding them over the sides of the said plate or former, substantially as specified.

17. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a plate or former supported a short distance from said bed, a series of rolls projecting through said bed and another series projecting through said plate or former, the rolls of the two series being in contact, means for driving the rolls of one series, and means for turning and pressing the projecting side portions of a sheet of paper passing between said two series of rolls to cause said projecting side portions to be folded over the side edges of said plate or former, substantially as specified.

18. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a block, a plate or former carried by said block and extending at each side thereof, means connected with said block for holding said plate or former a short distance above said bed, a series of rollers carried by said block and projecting through said plate or former, another series of rollers projecting through said bed and in contact with the first-named series, means for driving the rollers of one of said series, means for turning the projecting side portions of a sheet of paper as it passes between said rolls around the side edges of said plate or former, and means for pressing said sheet at said side edges of the plate or former, substantially as specified.

19. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a block, a plate or former carried by said block and extending at each side thereof, means connected with said block for holding said plate or former a short distance above said bed, a series of rollers secured in recesses in the sides of said block and projecting through said plate or former, another series of rollers projecting through said bed and in contact with the first-named series, means for driving the rollers of one of said series, means for turning the projecting side portions of a

sheet of paper as it passes between said rolls around the side edges of said plate or former, and means for pressing said sheet at said side edges of the plate or former, substantially as specified.

20. In a paper-folding machine, the combination with a frame, and a bed supported thereby, of a block provided with side recesses and with a recess in its upper side, a pair of rollers located in said side recesses and connected by an axle that passes through the recess in the upper side of the block, a spring located in said last-named recess and bearing upon said axle, a plate or former secured to the under face of said block and having an opening through which said rollers project, means for supporting said plate or former a short distance above said bed, a roll projecting through said bed and in contact with said pair of rollers, means for driving said roll, and means for turning and pressing the projecting side portions of a sheet of paper passing between the said bed and said plate or former so as to cause said projecting portions to be turned inward and folded around the side edges of said plate or former, substantially as specified.

21. In a paper-folding machine, the combination with a frame and a bed supported thereby, of a plate or former having parallel side edges, supporting means attached to the upper face of said plate or former to permit a sheet of paper to pass beneath the plate or former from end to end thereof, means for moving a sheet of paper, and means for turning laterally-projecting portions of the sheet over the said parallel side edges of the plate or former, substantially as specified.

22. In a paper-folding machine, the combination with a frame, of a plate or former, a series of rolls supported in said frame and another series projecting through said plate or former, the rolls of the two series being in contact, means for driving the rolls of one series, and means for turning the projecting side portions of a sheet of paper passing between the two said series of rolls over the side edges of said plate or former, substantially as specified.

FREDERICK G. NIND.
CHARLES F. STRASBURGER.

Witnesses:
HELEN M. COLLIN,
MINNIE A. HUNTER.