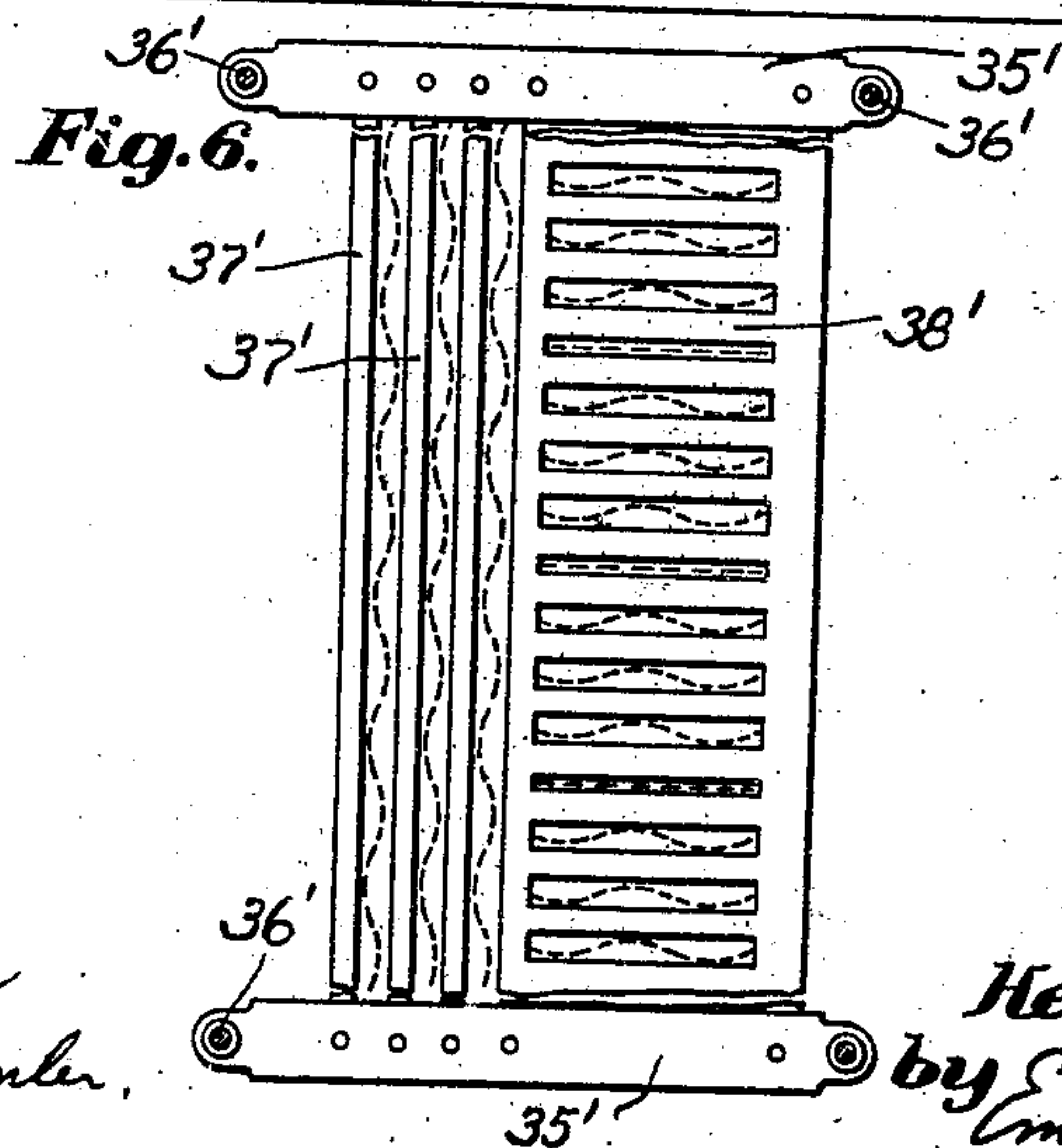
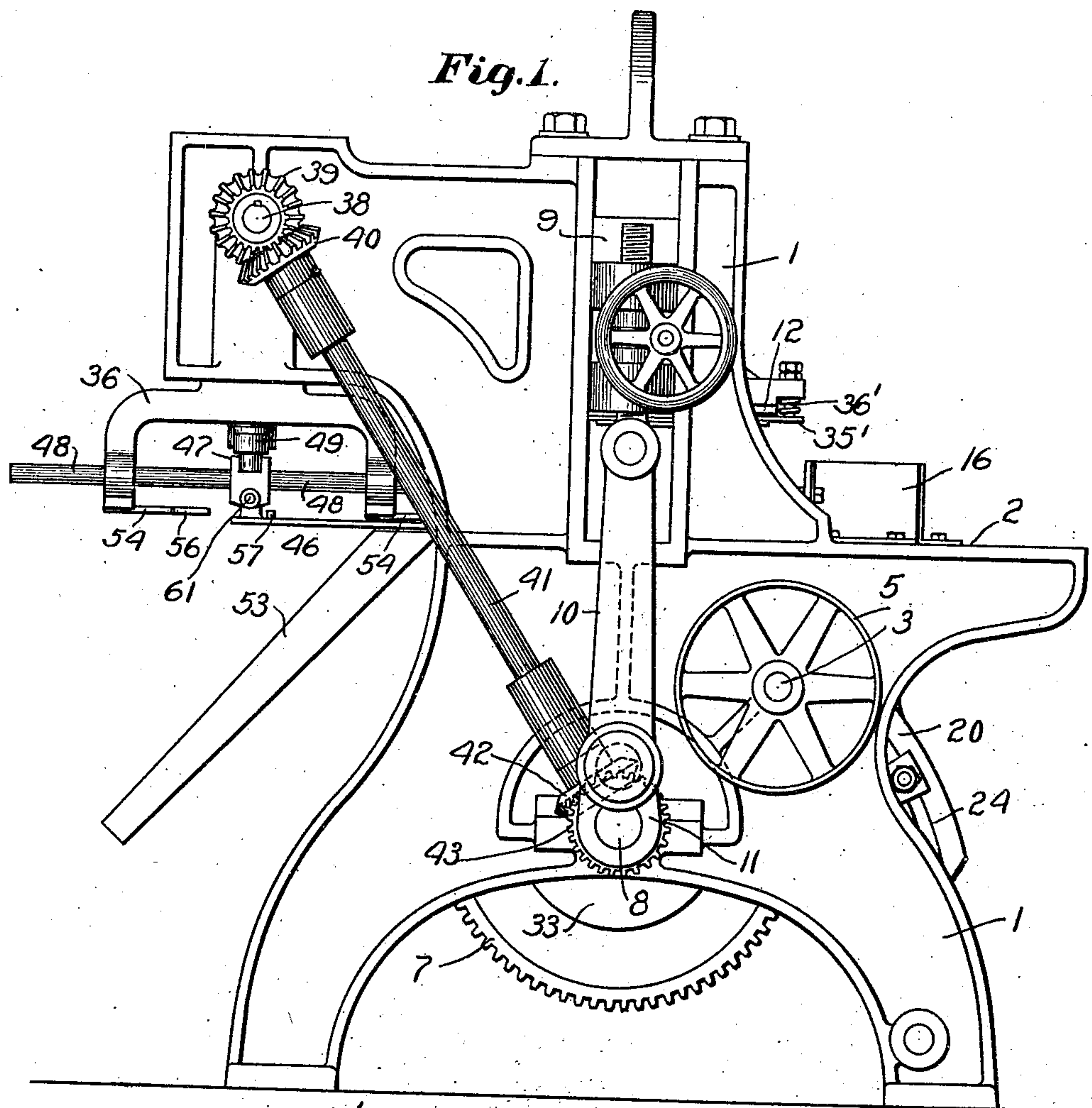


H. C. HARRIS.  
MECHANISM FOR CUTTING SHEET PUZZLES.  
APPLICATION FILED JAN. 2, 1909.

928,969.

Patented July 27, 1909.

4 SHEETS—SHEET 1.



**Witnesses:**  
Edwin T. Luce  
Robert H. Hamner.

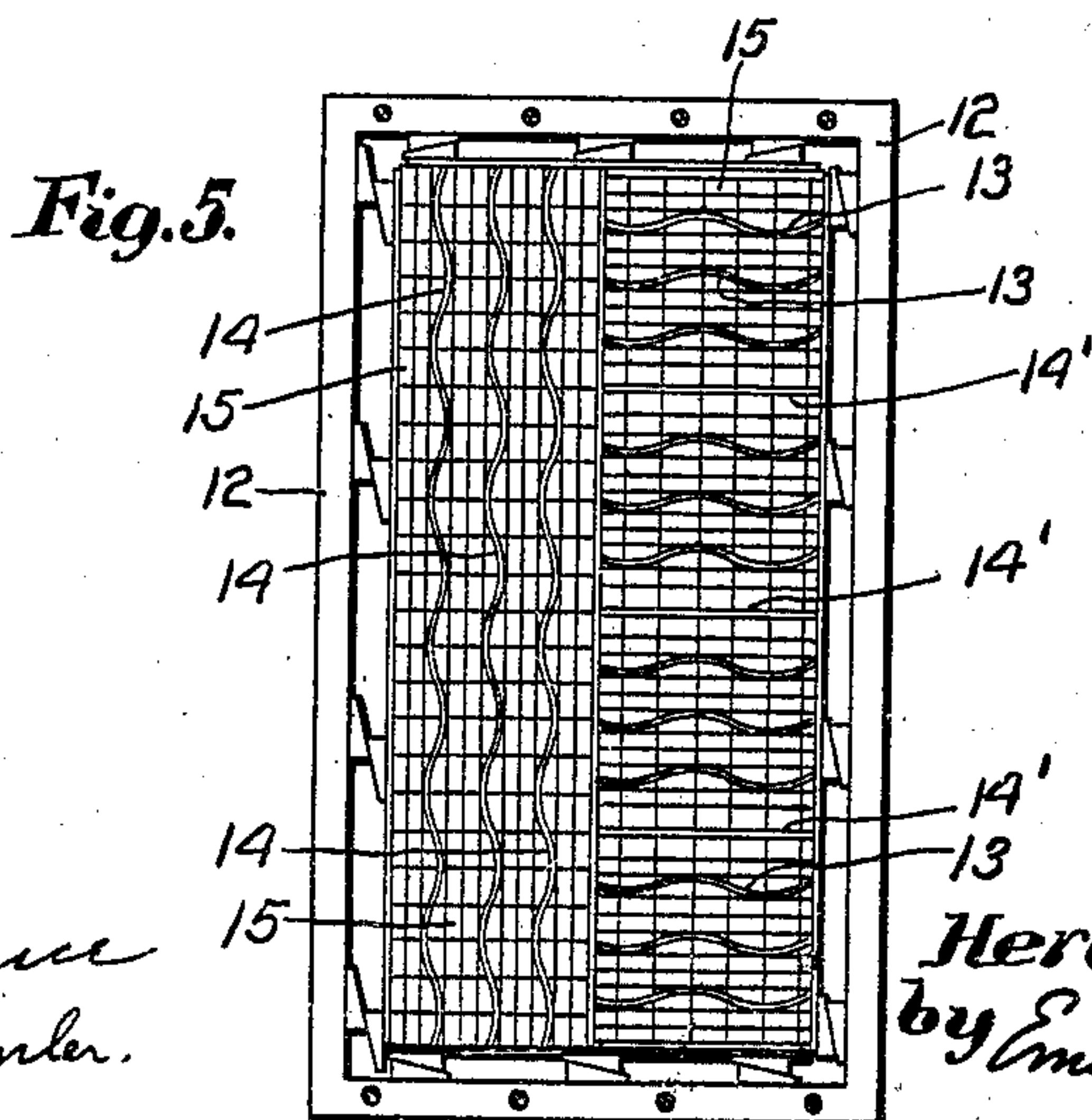
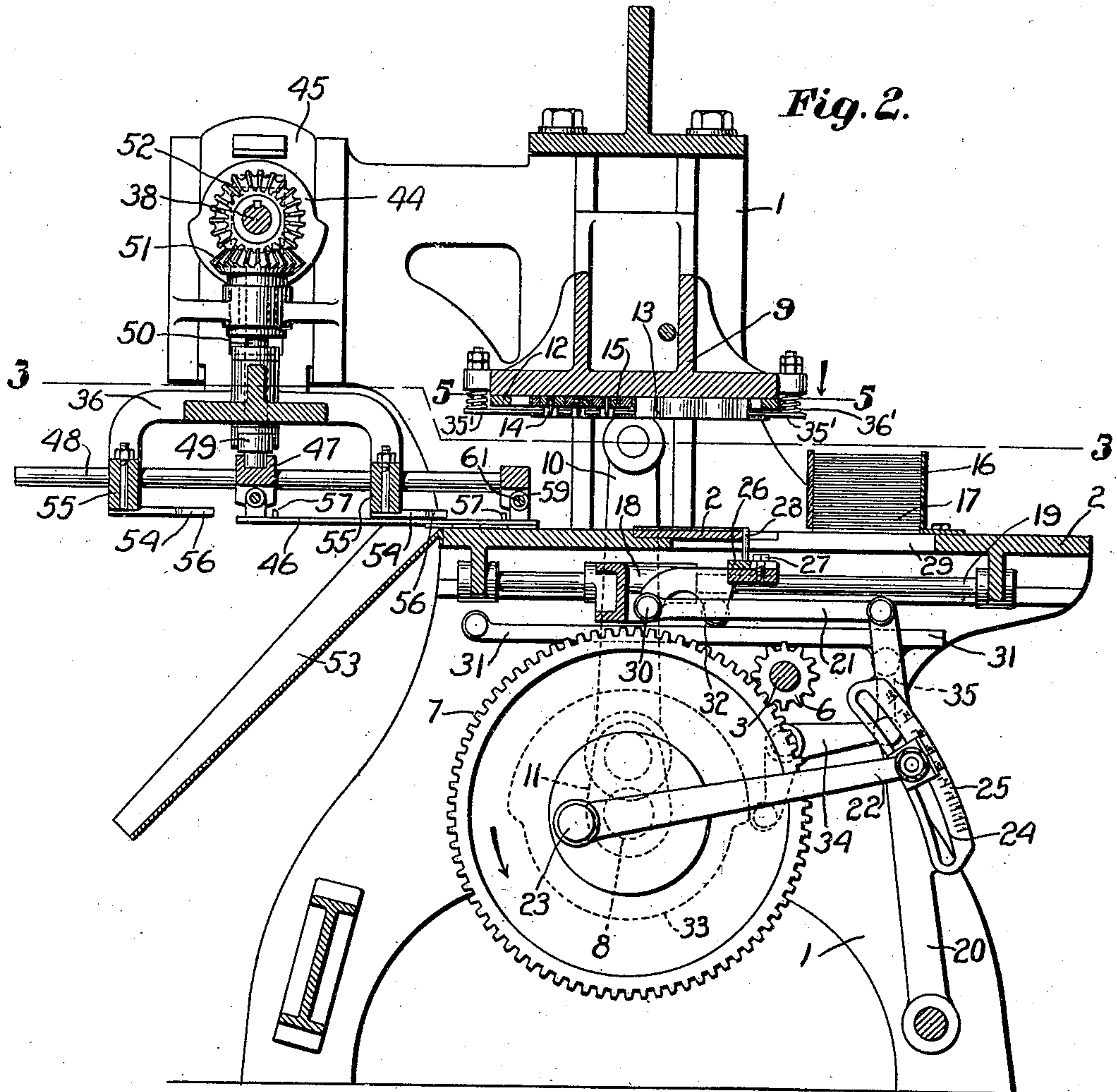
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4 SHEETS—SHEET 2.



*Witnesses:*  
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4 SHEETS—SHEET 3.

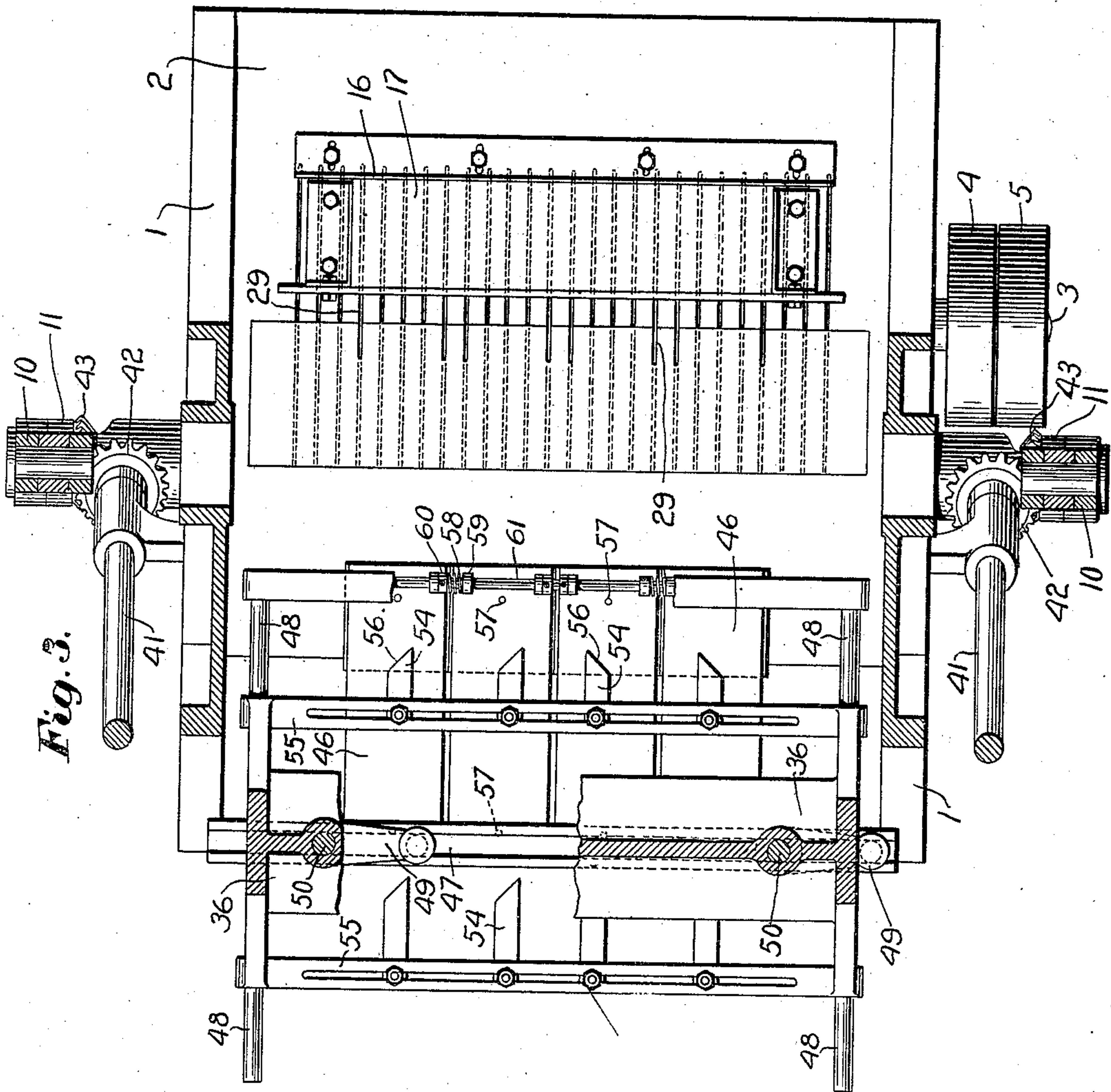


Fig. 3.

Fig. 9.

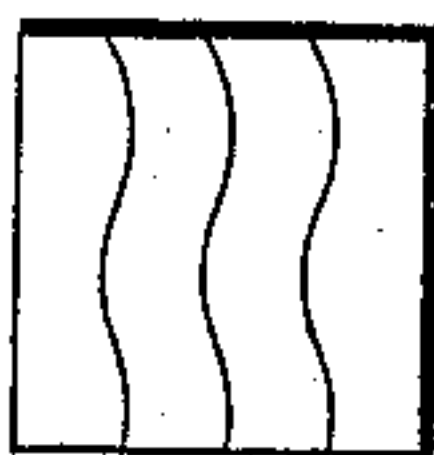
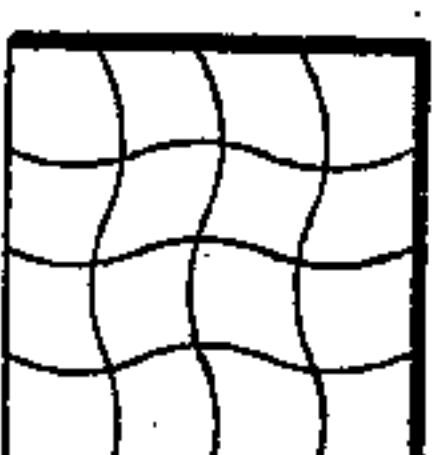


Fig. 10.



Witnesses:  
Edwin T. Luce  
Robert H. Hammler

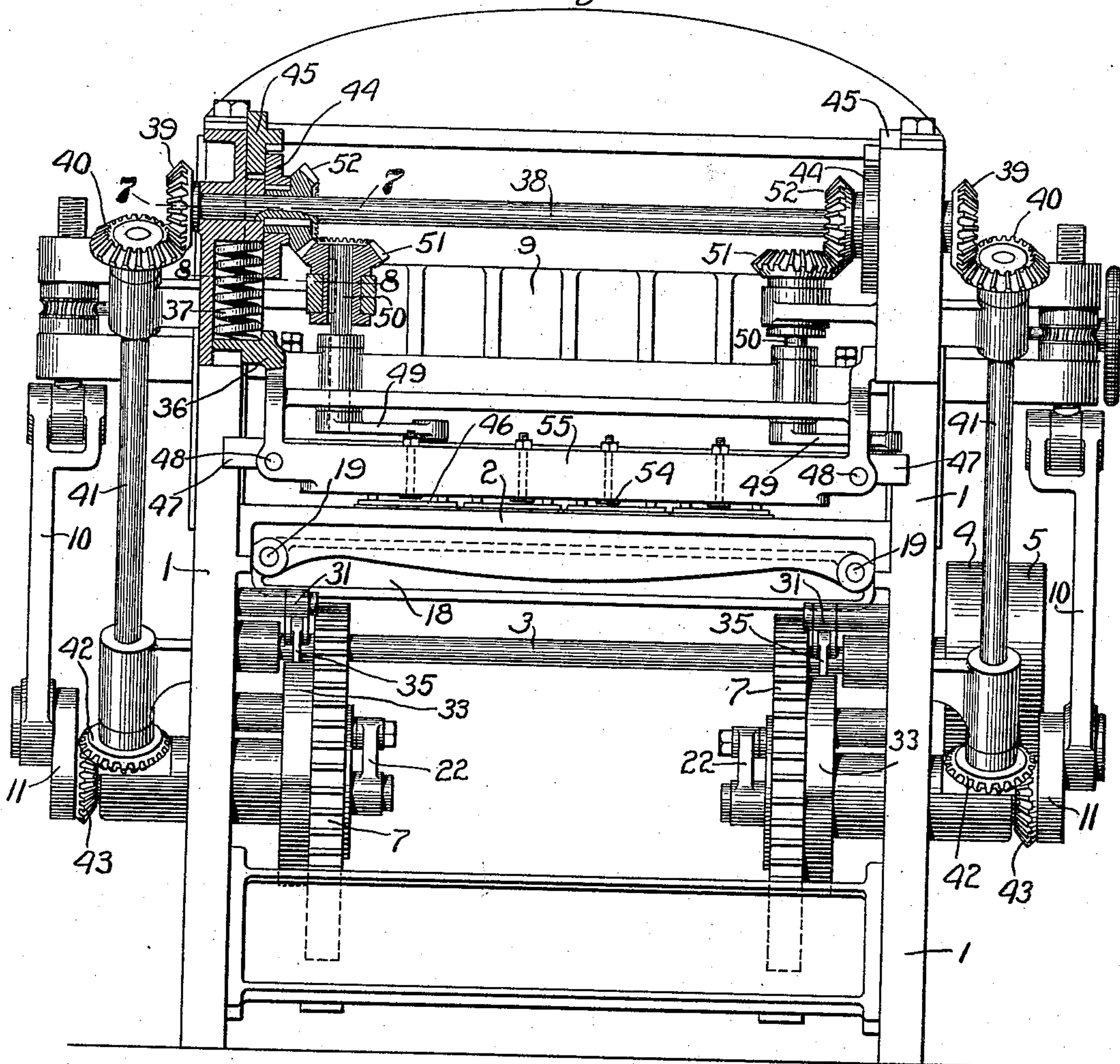
Inventor:  
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H. C. HARRIS.  
MECHANISM FOR CUTTING SHEET PUZZLES.  
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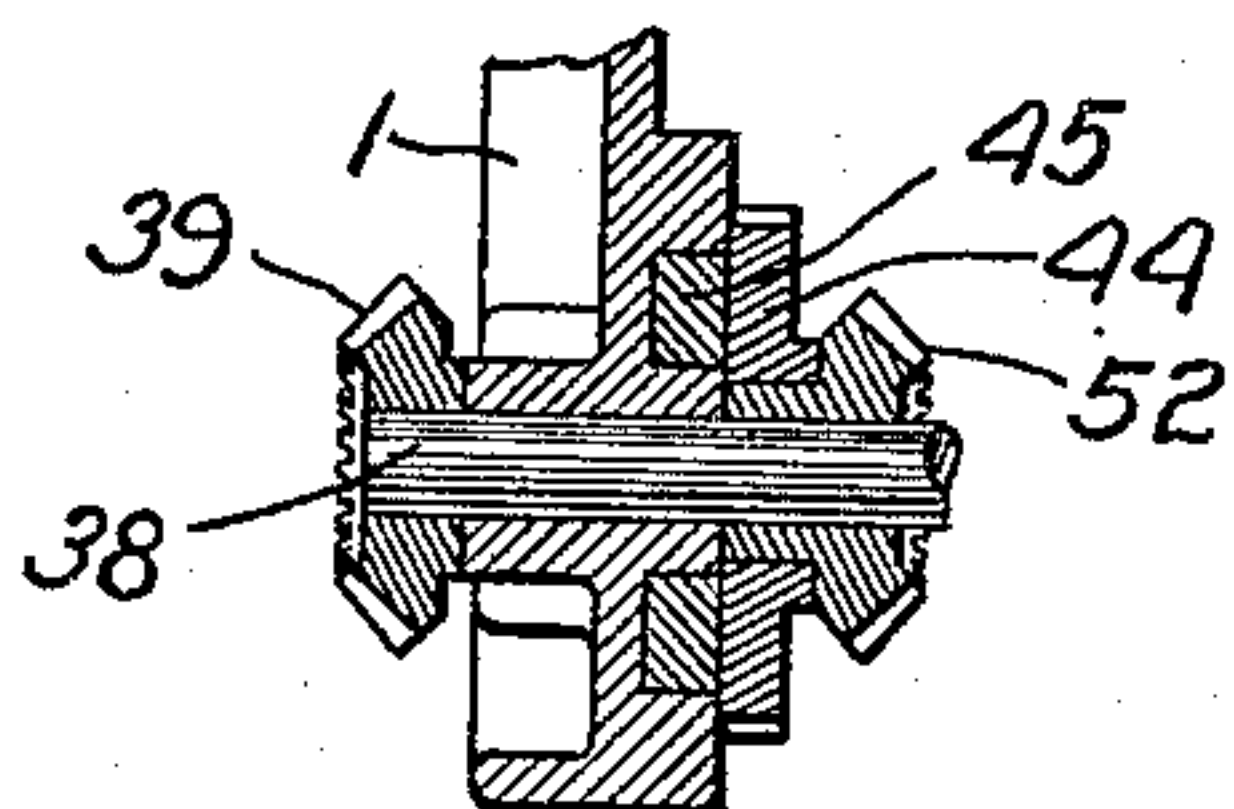
928,969.

Patented July 27, 1909.  
4 SHEETS—SHEET 4.

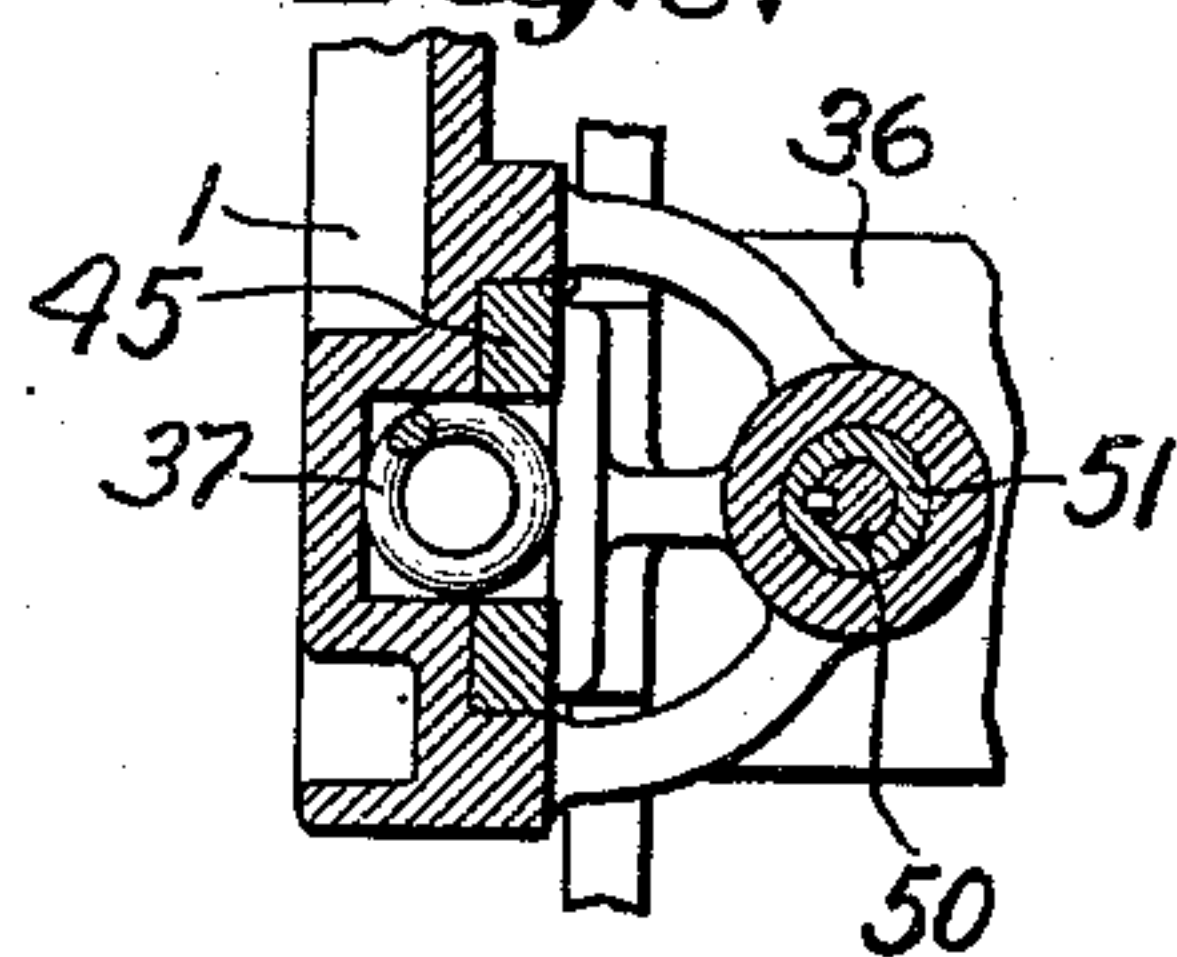
*Fig. 4.*



*Fig. 7.*



*Fig. 8.*



*Witnesses:*  
Edwin T. Luce  
Robert H. Kammeler.

*Inventor:*  
Herbert C. Harris,  
by Emory and Bond, Attys.



# UNITED STATES PATENT OFFICE.

HERBERT C. HARRIS, OF PROVIDENCE, RHODE ISLAND.

## MECHANISM FOR CUTTING SHEET-PUZZLES.

No. 928,969.

Specification of Letters Patent.

Patented July 27, 1909.

Application filed January 2, 1909. Serial No. 470,303.

*To all whom it may concern:*

Be it known that I, HERBERT C. HARRIS, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented an Improvement in Mechanism for Cutting Sheet-Puzzles, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

This invention relates to mechanism for cutting puzzles from sheets of card or other paper board, thin wood, and the like.

In order that the principles of the invention may be readily understood, I have illustrated one embodiment thereof in the accompanying drawings, wherein—

Figure 1 is a side elevation of a puzzle cutting machine embodying my invention; Fig. 2 is a vertical longitudinal section of the construction shown in Fig. 1; Fig. 3 is a horizontal section upon the irregular line 3—3 of Fig. 2; Fig. 4 is a rear end elevation of the mechanism, partially in section; Fig. 5 is a transverse section upon the line 5—5 of Fig. 2 and looking down. Fig. 6 is a plan view of stripping mechanism that may be employed in the practice of my invention; Figs. 7 and 8 are details in transverse section upon the lines 7—7 and 8—8 of Fig. 4; and Figs. 9 and 10 represent the sheet puzzle in its successive stages of formation.

It is the object of my invention to cut puzzles from card board or other suitable material with great rapidity by a plurality of intersectingly aligned sets of spaced blades, by which each sheet shall be cut into preferably four sided pieces of regular or irregular form.

In carrying out my invention, I in this embodiment thereof provide means to feed each sheet or sheet area in succession to two sets of blades which operate respectively to cut the sheet or sheets into strips and then to cut the strips transversely, each sheet puzzle after having been cut being ejected by mechanism which prevents the intermingling of the cut portions of one sheet puzzle with those of an adjoining one. Preferably, I provide means for cutting simultaneously a plurality of puzzles, in which event the cut puzzles are so discharged or ejected as to prevent intermingling of their members or portions.

Referring specifically to the drawings, the

framing of the machine is indicated at 1, it being composed of suitable end uprights supporting or having formed therewith a horizontal bed 2. However, any suitable work support may be provided. Mounted in the framing is a driving shaft 3 having thereon fast and loose pulleys 4 and 5. The said shaft is provided with a plurality of pinions 6 (see Fig. 2) meshing with and driving a pair of gears 7—7 fast upon stud shafts 8 at opposite sides of the framing. Mounted in preferably vertical slideways above the bed is a suitable platen 9 adapted to be vertically reciprocated to and from the bed in any desired manner, as by means of links 10 pivoted to the platen and to cranks 11 mounted upon and operated by the stud shafts 8. It is apparent that a plurality of platens may be employed, each carrying one or more sets of blades. In the present embodiment of the invention, however, the several sets of blades are carried by a single platen.

I provide two sets of blades for cutting each sheet or puzzle area, one set of blades being arranged in general parallelism and suitably spaced to cut the sheet into strips which may have parallel edges or irregularly shaped edges of preferably curved contour. The other set of blades is intersectingly aligned with respect to the first set, being preferably normal thereto. The blades of the second set are located at one side of, but preferably closely adjacent the first set, so that the sheet is acted upon first by one set and then by the other set of blades, the sheet being by suitable mechanism or otherwise brought successively into operative relation to the two sets of blades. Inasmuch as the blades of each set are outside or beyond the blades of the other set, the said sets of blades have distinct boundaries. In this manner, more perfect angles or corners are formed upon the puzzle members. If the machine be designed to cut a series of puzzles simultaneously, the first acting blades may be arranged as a single set extending the entire width of a single large sheet from which several puzzles are to be cut, or said first acting blades may be arranged in several sets or sections, in which case a separate sheet is fed to each set.

While the blades may be secured in any suitable manner to the platen or platens, I have in Figs. 2 and 5 shown a frame 12 removably secured to the underside of the



platen. Within the frame are arranged the two sets of blades 13 and 14, the blades being wedged or clamped in position by spacing blocks 15 placed between the blades and about them as shown. Each blade is preferably wholly distinct and independent of the others and is made of suitable material, such as tempered steel. Each blade may be straight or curved, depending upon the shape that is to be given the puzzle pieces. It is apparent that a series of sheets or a single large sheet may be operated upon simultaneously, in which event a single frame may contain the necessary sheets or blades, or a plurality of frames may be secured to the platen or platens. Herein I have represented the blades 13 as of sufficient length to act simultaneously upon the several puzzle areas that are subsequently cut transversely by the several sets of blades 14. If a single sheet be used for several puzzle areas, I preferably provide straight intermediate puzzle edge cutters 14'.

The puzzle sheets may be fed by hand or otherwise into cutting relation to the platen or platens. Preferably and as here shown I employ one or more holders 16 to receive a stacked sheet pile or piles 17, said holder or holders being suitably secured to the upper face of the bed of the machine in such position that the lowermost sheet or sheets may be fed into position beneath the platen. I have here shown a single holder to contain elongated sheets, each presenting several puzzle areas. While any suitable feeder may be employed, I have herein represented a carriage 18 supported upon horizontally arranged guides 19 mounted in the framing beneath the bed 2 and upon which the carriage is reciprocated in any suitable manner, as for example by levers 20 pivoted in the framing and connected by links 21 to said carriage, said levers being oscillated by links 22 mounted upon and operated by crank pins 23 carried by the gears 7. Preferably I provide means for varying the limit of inward movement of the carriage 18, so that it may always be brought to rest at precisely the desired point. This I accomplish herein by providing the levers 20 with segmental slotted portions 24, preferably graduated as indicated at 25, thus permitting the connection of the links 22 at any desired distance from the fulcrum of said levers, thereby varying the throw of the latter and consequently the limit of inward travel of the carriage 18 without, however, affecting the limit of outward travel.

The carriage 18 is provided with preferably a series of plates 26 adjustably secured thereto in any suitable manner, as by bolts 27 passing through transverse slots in said plates. Each of said plates carries one or more vertically arranged pins 28 positioned and reciprocating in longitudinal slots 29 in

the bed 2 in such manner as to permit the engagement of said pins with the outer edges of the lowermost sheet of the stacked pile 17. The capacity for adjustment of the pins 28 upon the carriage 18 permits the accurate positioning of the pins with relation to the outer edge of the stacked sheets without varying the outward limit of travel of the carriage 18.

In order to permit the carriage upon its inward stroke to feed the lowermost sheet and upon its outward stroke to pass beyond the stacked pile without engaging the same, I may employ any suitable mechanism but have found the following construction to be efficient for the purpose. The outer portion of the carriage is pivoted upon transverse pins 30 to the fixed portion thereof in such manner that it may rock vertically between and with relation to the guides 19, it being guided in its travel by suitable guiding members 31 pivoted upon the framing of the machine and receiving rollers 32 carried by said pivoted portion of the carriage. When said guiding members are maintained in a horizontal position, as during the inward travel of the carriage, the pins 28 contact with and move a sheet before them into position beneath the platen in the manner indicated in Fig. 2. By depressing the outer ends of said guiding members, as for example during the outward movement of the carriage, the fingers 28 pass beneath the stacked pile of sheets into position to engage the outer edge of the lowermost sheet. The guiding members 31 are rocked in any suitable manner, as for example by means of cams 23 carried by or formed upon the gears 7 and operating at the proper time upon bell crank levers 34 connected by links 35 to the outer ends of said guiding members 31, thus elevating and depressing them in the manner described.

The timing and construction of parts are such that each sheet is in turn fed from the holder 17 beneath the first set of blades 13, as indicated in Fig. 2. After the sheet has been sliced by the blades 13, the carriage 18 feeds a second sheet into position beneath the blades 13, and in so doing the last sheet pushes before it the first sheet, which has been already sliced, thereby bringing the said first sheet into position beneath the blades 14, so that when the platen next descends the blades 13 act upon the second sheet and the blades 14 upon the first sheet, thereby completing the cutting of the said first sheet into preferably four sided pieces. Thus at each operation of the platen two sheets from each stack of sheets are operated upon, one for the preliminary and the other for the final cutting. If a plurality of stacked sheets and a corresponding number of sets of blades be employed, it is apparent that any desired number of sheets may be cut simultaneously in the manner described.



Any suitable means may be provided to strip the strips or puzzle members from the blades. Herein for the purpose, I have represented in Fig. 6 bars 35' supported upon vertical rods or bolts 36' depending from the lower face of the platen and normally downwardly spring pressed by coiled springs, not shown. Upon the descent of the platen the springs are compressed, permitting the blades to complete their cutting action. Suitably supported by the bars 35' are strip-  
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preferably I provide means for ejecting or discharging each sheet after it has been cut in the manner described. While any suitable mechanism may be employed for this purpose, I have in Figs. 1, 2 and 4 represented an ejector frame 36 mounted for vertical sliding movement in the side members of the main framing of the machine, the said ejector frame being normally downwardly spring pressed by suitable coiled springs 37 positioned between said ejector frame and any suitable part of the main framing.  
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To impart vertical movement to the ejector frame toward and from the exposed face of the cut sheets, I have in the present embodiment of the invention mounted a transverse shaft 38 in the framing and have provided the same with beveled gears 39 meshing with and driven by similar gears 40 upon inclined shafts 41 mounted at opposite ends of the framing and carrying at their lower end similar gears 42 meshing with and driven by beveled gears 43 upon the stud shafts 8. Keyed upon the shaft 38 and adjacent opposite ends thereof are cams 44, which in their rotation engage overhanging portions 45 of said ejector frame and lift said frame against the stress of the springs 37, thus lifting the ejector frame after each ejecting movement thereof. When depressed by the springs 37 the ejector frame engages the upper or exposed face of the completely cut sheet. The said ejector frame is provided with a suitable ejector or ejectors movable relative thereto and transverse to the vertical path of movement of the ejector frame in such manner as to permit the ejector or ejectors to engage, as the ejector frame is depressed, the completely cut sheet beneath the blades 14 as the platen is elevated. Upon ejecting movement of the ejectors while the ejector frame is still depressed, the completely cut sheet or sheets, while the cut sections or pieces thereof are retained in their original position with relation to each other, are moved by frictional engagement of the ejector toward or to the point of discharge where the said cut sections or pieces of each sheet may be dumped *en masse*, it being understood that if a plurality of sheets are simultaneously cut, the sections or pieces of each sheet are dumped *en masse*.  
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Any suitable type of ejectors may be em-  
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ployed for this purpose. In Figs. 2, 3 and 4, I have represented the ejector frame as having mounted therein one or more ejectors 46 carried by brackets 47 secured to rods 48 mounted for sliding movement in the ejector frame, the said ejectors 46 being preferably formed as plates adapted when the ejector frame is depressed frictionally to engage the exposed face of the finally cut sheet and by movement of the ejector to discharge the same by sliding it along the bed 2. I have herein represented the ejectors as reciprocated by means of cranks 49 engaging certain of the brackets 47, the said cranks being carried by the lower ends of vertical shafts 50 mounted in suitable bearings in the ejector frame and having suitably splined thereon, in such manner as to permit sliding movement of the shafts with respect thereto, beveled gears 51 meshing with and driven by similar gears 52 fast upon the shaft 38. The construction and arrangement of parts are such that in the rotation of the shaft 38 the ejectors 46 move inward during the descent of the ejector frames, and while the platen is elevated into position over the completely cut sheet or sheets so as frictionally to engage their exposed faces when the ejector frames reach their lowermost point of travel. Upon continued movement of the shaft 38, the completely cut sheet or sheets are moved rearwardly and discharged through chutes 53, the number of which depends upon the number of puzzles simultaneously cut.  
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In that type of my invention wherein a series of sheets or series of puzzle areas is simultaneously cut, preferably I provide means to preserve the integrity of each completely cut sheet or puzzle area during its discharge, so as to prevent the intermingling of any severed portion of one puzzle with the neighboring puzzle. During the discharge of the cut sheet, the severed portions retain their original position with relation to each other. By this, I mean that they are maintained in substantially such relative position as thereby to prevent their mixing with another or adjacent cut sheet. While this may be variously accomplished, preferably I provide means laterally to space the various puzzles during their travel toward the chutes 53. For this purpose, I have, as more fully shown in Fig. 3, provided blocks 54 preferably laterally adjustably secured to a transverse portion 55 of the framing and having inclined leading edges 56. The said blocks are positioned above the path of travel of the several ejectors 46 and are adapted to be engaged by pins 57 rising from the upper faces of said ejectors and serving laterally to deflect the several ejectors and to space them during their outward travel. In the construction shown, I employ two sets of blocks to prevent binding of the parts.  
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In the present embodiment of the inven-  
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tion, four ejectors 46 are employed, and the leading faces 56 of the blocks 54 are oppositely inclined in pairs, as represented, so that two of the ejectors are moved toward the left and two toward the right viewing Fig. 3. The position of the several blocks is such that the outermost ejectors at either side are moved respectively toward the left and right to a greater extent than the inner adjacent ejectors, thus effectively spacing said ejectors during their outward travel. The ejectors are returned to their normal position in any suitable manner, as for example by springs 58 coiled between shouldered portions 59 and 60 of a rod 61 mounted in the framing, the said springs being compressed by the deflecting action of the blocks 54 and when expanded serving to restore the ejectors to their normal position.

It will be apparent from the foregoing description that I have provided mechanism by which if desired a single sheet or a series of sheets may be fed into position to be operated upon by sets of blades in such manner that sheet puzzles may be rapidly and economically cut, while preserving at all times the integrity of each puzzle, thus preventing the commingling of any cut portion of one puzzle with its neighbor. By arranging the blades in the manner described, and feeding the sheets to the successive action thereof, the puzzle members have perfectly formed angles or corners, which would not be the case were the blades of the second set arranged between the blades of the first set.

The blades are secured in their holder or holders in such manner as to permit their ready removal and the substitution of different shaped blades or the rearrangement of the blades, so that I can with very slight delay change the pattern of the cutting.

It is a matter of common knowledge that the various pieces of puzzles during assembling become readily displaced, thus distorting the shape of the picture or other representation and requiring vexatious reassembling of the various pieces. I have found that I can prevent this by providing a slight bur upon the lower faces of the various pieces of the cut puzzles, so that when the puzzle is positioned upon cloth, blotting paper or the like, there is little or no tendency to displacement. This bur is preferably provided by forming the face of the bed 2 of softer material than the blades or by placing thereon suitable material of sufficient softness to result in the formation of a surrounding bur upon the lower face of each severed piece of the sheet.

Having thus described one type or embodiment of the invention, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limi-

tation, the scope of the invention being set forth in the following claims.

#### Claims.

1. Mechanism for cutting sheet puzzles and the like into a series of strips which are themselves completely segregated transversely, comprising in combination a work support, and a pair of independent sets of blades, each set of blades cutting at one operation along a plurality of lines, said sets of blades having distinct boundaries, the blades of each set being in substantial alinement and directed to intersect the blades of the other set, all of the plurality of lines of cut made by one set of blades being intersected by one or more of the plurality of lines of cut made by the other of said sets of blades, and means to impart relative movement to said blades and work support to sever the sheet into strips having the same general direction by one set of blades and transversely completely to sever said strips into pieces by the second set of blades.

2. Mechanism for cutting sheet puzzles and the like into a series of strips which are themselves completely segregated transversely, comprising in combination a work support, a platen having a pair of independent sets of blades, said blades having distinct boundaries, the blades of each set being in substantial alinement and directed to intersect the blades of the other set, means to impart relative movement to said platen and work support to sever the sheet into strips having the same general direction by one set of blades and transversely completely to sever said strips into pieces by the second set of blades.

3. Mechanism for cutting sheet puzzles and the like comprising in combination, a work support, a platen movable toward and from said work support, a blade holder removably secured to said platen and two independent sets of blades supported by said holder, said sets of blades having distinct boundaries, the blades of each set being in substantial alinement and directed to intersect the blades of the other set.

4. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a platen movable toward and from said work support and two independent sets of blades secured to said platen, said sets of blades having distinct boundaries, the blades of each set being in substantial alinement and directed to intersect the blades of the other set.

5. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a platen having a pair of independent sets of blades, said blades having distinct boundaries, the blades of each set being in substantial alinement and directed to intersect the blades of the other set, means



to impart relative movement to said platen and work support to sever the sheet into strips having the same general direction by one set of blades and transversely to sever said strips into pieces by the second set of blades, and feeding means to feed a sheet to said blades for their successive action upon said sheet.

6. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a platen movable to and from the same, two sets of spaced blades carried by said platen, and feeding means to feed a sheet in steps to said sets of blades for their successive action thereon.

7. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a blade support, means to impart relative movement thereto, blades carried by said blade support and adapted to act upon adjacent sheet areas, and means for spreading the paths of travel of the cut sheets.

8. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a platen, means to impart relative movement thereto, a plurality of sets of blades to act upon adjacent sheet areas, and means to impart an enforced separation to the adjacent cut sheets.

9. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a relatively movable blade carrying platen, means to cause relative movement thereof, ejecting means movable toward and from and adapted frictionally to engage the exposed face of the cut sheet, and means to impart discharging movement to said ejector along the face of said work support and while maintaining said frictional engagement.

10. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, means movable to and from said work support and carrying a plurality of sets of blades to operate upon adjacent sheet areas, and means to enforce separation of the adjacent cut sheets.

11. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, means movable toward and from said work support and carrying a plurality of sets of spaced blades to operate simultaneously upon adjacent sheet areas, and means to separate the simultaneously cut sheets.

12. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, means movable to and from said work support and carrying sets of blades active upon adjacent sheet areas, and means to separate and discharge the adjacent cut sheets.

13. Mechanism for cutting sheet puzzles and the like comprising in combination a

work support, means movable toward and from said work support and carrying simultaneously cutting sets of blades for adjacent sheet areas, and means to separate and to discharge adjacent simultaneously cut sheets.

14. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a platen movable toward and from said work support, adjacent sets of blades carried by said platen, means simultaneously to feed adjacent sheet areas to said sets of blades, means laterally to separate adjacent cut sheets and ejecting means therefor.

15. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a plurality of simultaneously cutting sets of blades, the blades of each set being in substantial alinement and directed to intersect the blades of the other set, a sheet stack holder, and means to feed a sheet in successive steps from said stack to said sets of blades.

16. Mechanism for cutting sheet puzzles and the like comprising in combination, a work support and a pair of independent sets of blades, said sets of blades having distinct boundaries, the blades of each set being in substantial alinement and directed to intersect the blades of the other set, means to impart relative movement to said blades and work support to sever the sheet into strips having the same general direction by one set of blades, and transversely to sever said strips into pieces by the second set of blades, a sheet stack holder, and means to feed a sheet in successive steps from said stack to said sets of blades.

17. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a blade support, blades carried thereby and movable to and from said work support, a sheet stack holder, a feeder, and means to move the same toward and from the stack holder in different paths.

18. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a blade support, blades carried thereby, means to impart relative movement to said work support and blade support, a sheet stack holder, a feeder to engage the lowermost sheet of said stack, and means to reciprocate the said folder in active and non-active paths.

19. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a platen carrying blades and movable toward and from said work support, a sheet stack holder alined with said work support, and a sheet feeder having a feeding path intercepting the lowermost sheet of said stack and a return movement beneath the then lowermost sheet.

20. Mechanism for cutting sheet puzzles and the like comprising in combination a



work support, a blade support carrying one or more sets of blades, means to impart relative movement to said work support and blade support, an ejector frame, means to  
 5 move the same toward and from the exposed face of said sheet, and one or more ejectors carried by said frame.

21. Mechanism for cutting sheet puzzles and the like comprising in combination a  
 10 work support, a blade support carrying one or more sets of blades and movable toward and from said work support, a vertically movable ejector frame, one or more ejectors carried thereby frictionally to engage the  
 15 exposed face of the sheet or sheets, and means to impart discharging movement to said ejectors.

22. Mechanism for cutting sheet puzzles and the like comprising in combination a  
 20 work support, a blade support carrying one or more sets of spaced blades and movable toward and from the bed, and ejecting means to discharge the severed portions of each sheet while retaining their original po-  
 25 sition with relation to each other.

23. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a blade support, one or more blades carried thereby, means to impart rela-  
 30 tive movement to said work support and blade support, and ejecting means to discharge the severed portions of each sheet while retaining their original position with relation to each other.

24. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a platen carrying one or more sets of spaced blades, means to impart rela-  
 35 tive movement to said support and said platen, and ejecting means to discharge the severed portions of each sheet while preserv-  
 40 ing the relative positions of said severed portions with respect to each other.

25. Mechanism for simultaneously cutting  
 45 a plurality of sheet puzzles and the like com-

prising in combination a work support, a blade support movable to and from the same, a plurality of pairs of intersectingly alined sets of blades carried by said blade support, means to feed sheet areas in steps to the re-  
 50 spective sets of blades, and means to discharge the severed portions of each sheet, while retaining their original position with relation to each other.

26. Mechanism for cutting sheet puzzles  
 55 and the like comprising in combination a work support, a blade support carrying one or more sets of blades, a vertically movable ejector frame, and one or more horizontally movable ejectors carried thereby.

27. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a blade support carrying one or more sets of blades, a yielding ejector frame having means vertically to reciprocate  
 65 the same, and one or more ejectors carried by said frame and movable transversely thereto.

28. Mechanism for cutting sheet puzzles and the like comprising in combination a work support, a blade support carrying  
 70 blades, a feeder movable toward and from the path of movement of the platen, sheet engaging fingers carried by said feeder, and means to adjust said fingers.

29. Mechanism for cutting sheet puzzles  
 75 and the like comprising in combination a work support, a blade support, means to cause relative movement thereof, an ejector adapted frictionally to engage the exposed face of the cut sheet, and means to impart  
 80 ejecting movement to said ejector transverse to the face of the work support.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

HERBERT C. HARRIS.

Witnesses:

IRVING U. TOWNSEND,  
 M. H. LOWRY.