

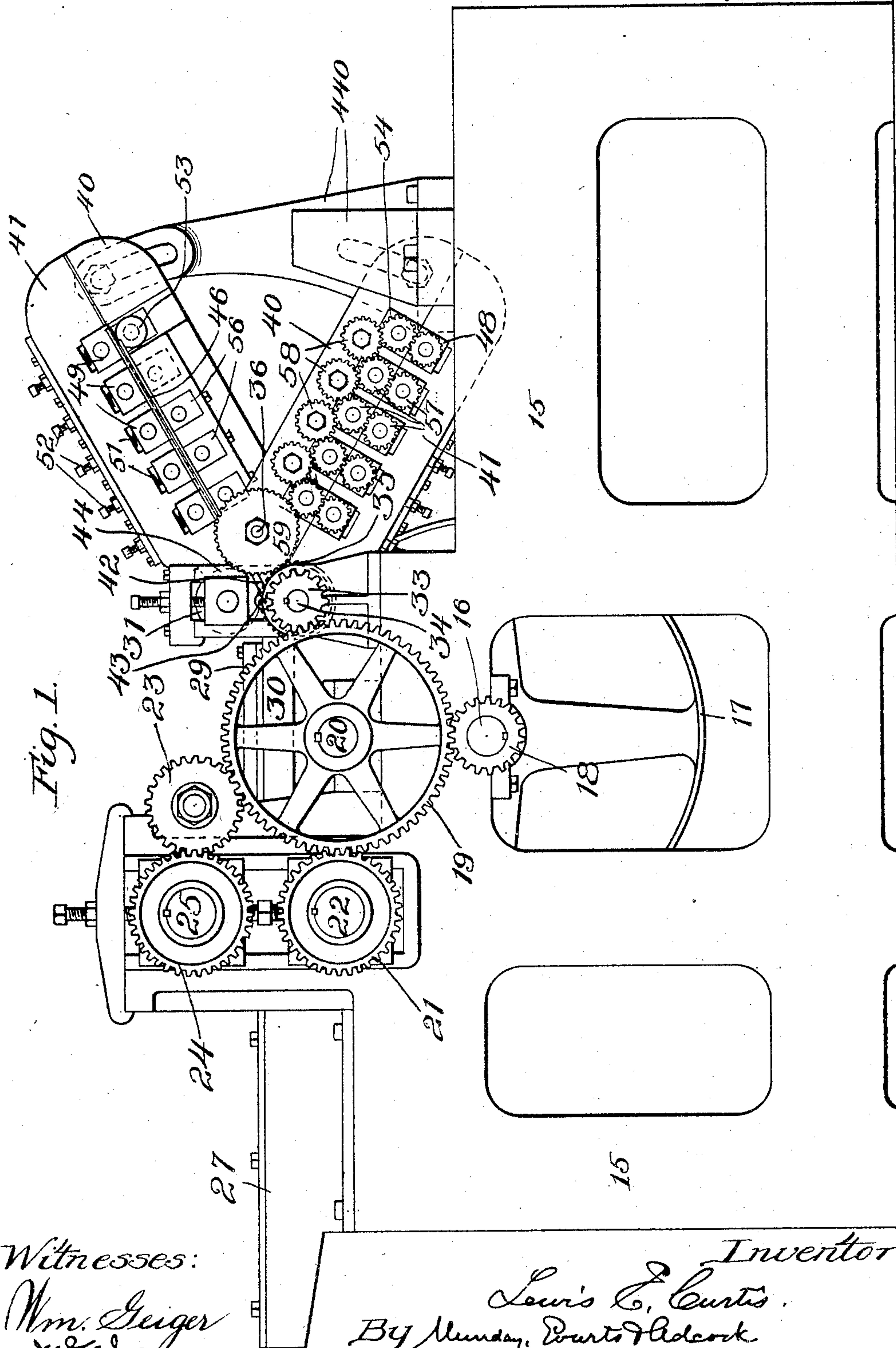
No. 796,402.

PATENTED AUG. 1, 1905.

L. E. CURTIS.
MACHINE FOR EXPANDING SHEET METAL.

APPLICATION FILED MAY 29, 1902.

5 SHEETS—SHEET 1.



Witnesses:

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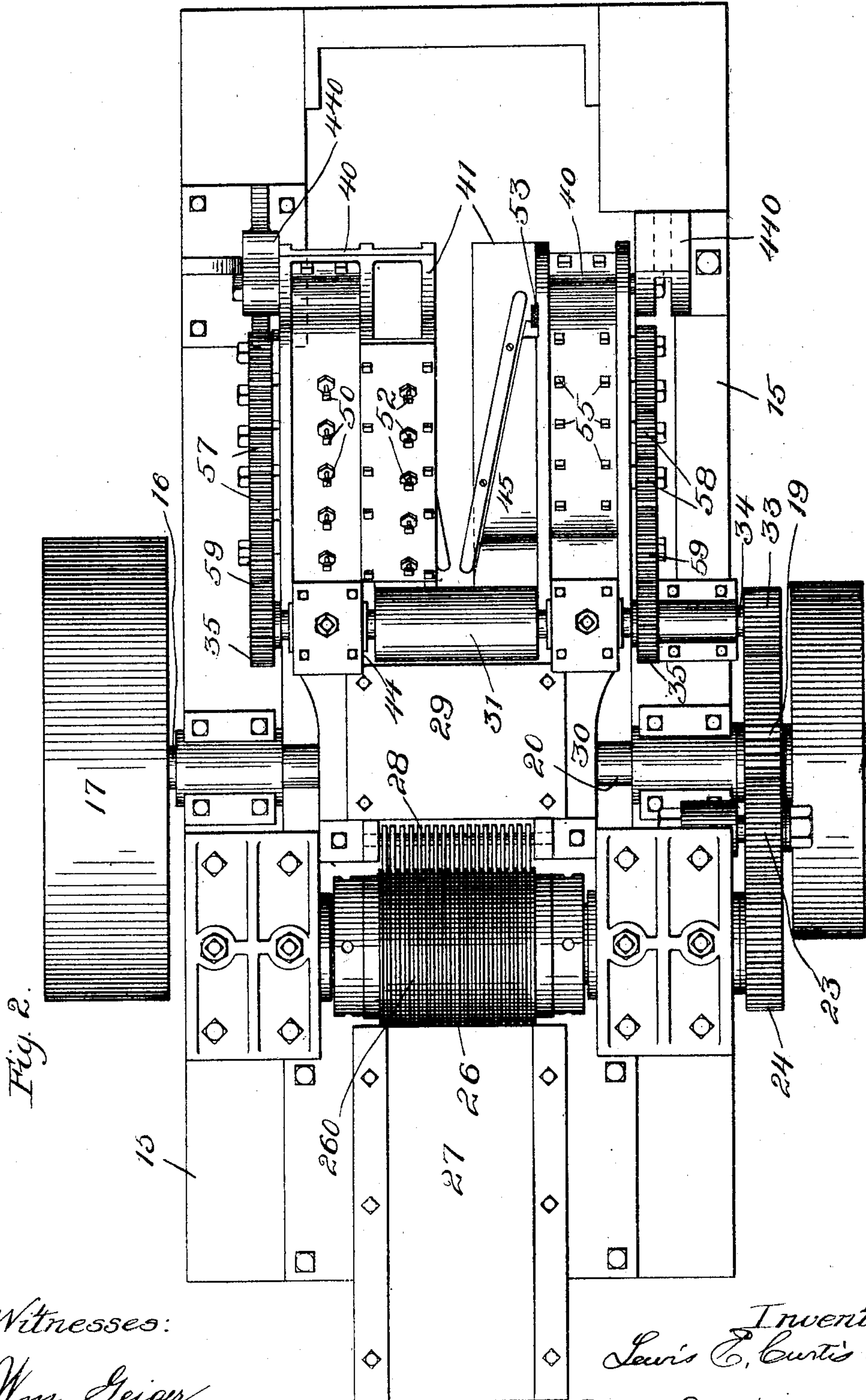
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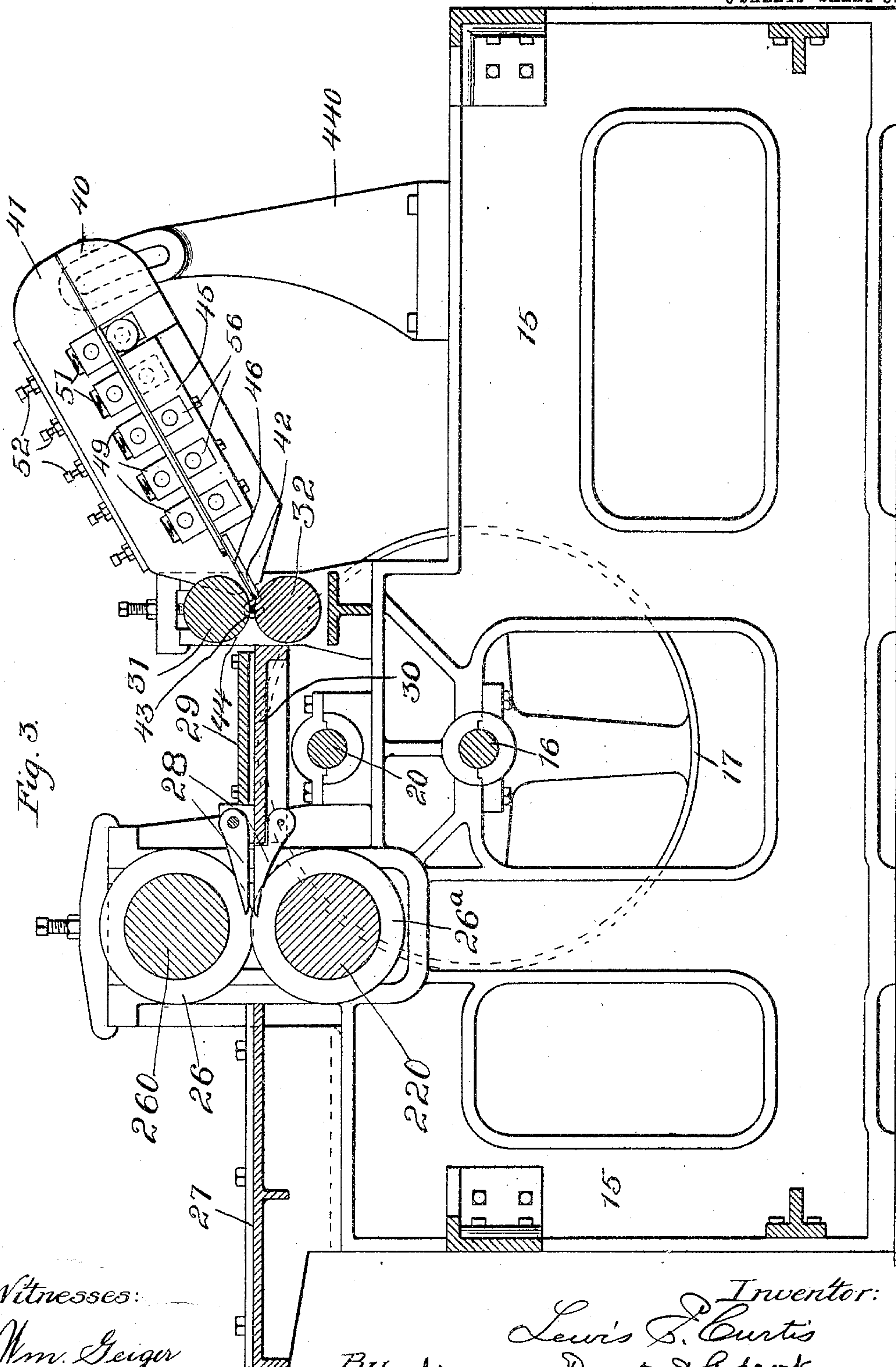
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5 SHEETS—SHEET 3.



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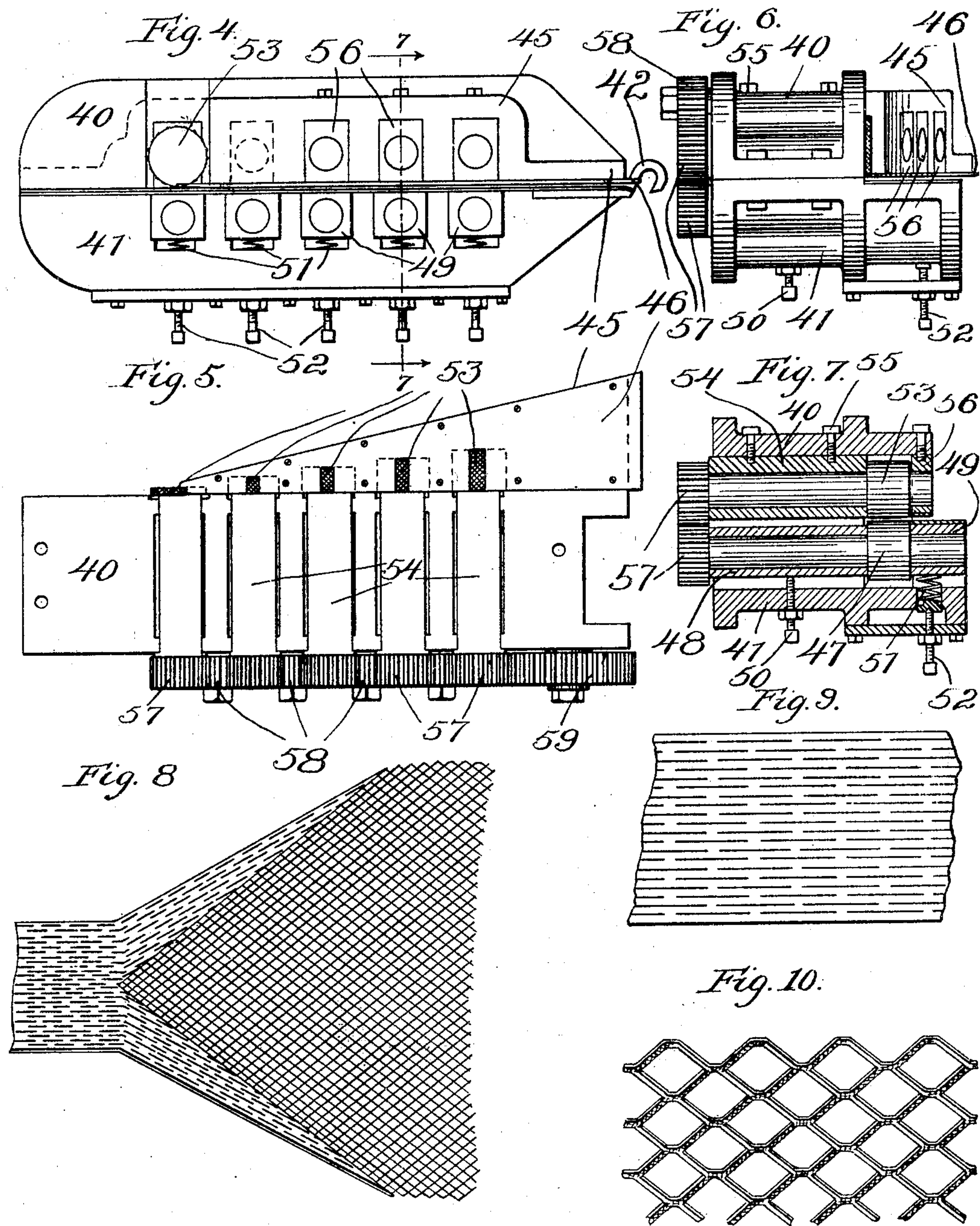
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5 SHEETS—SHEET 4.



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5 SHEETS—SHEET 5.

Fig. 11

Fig. 12

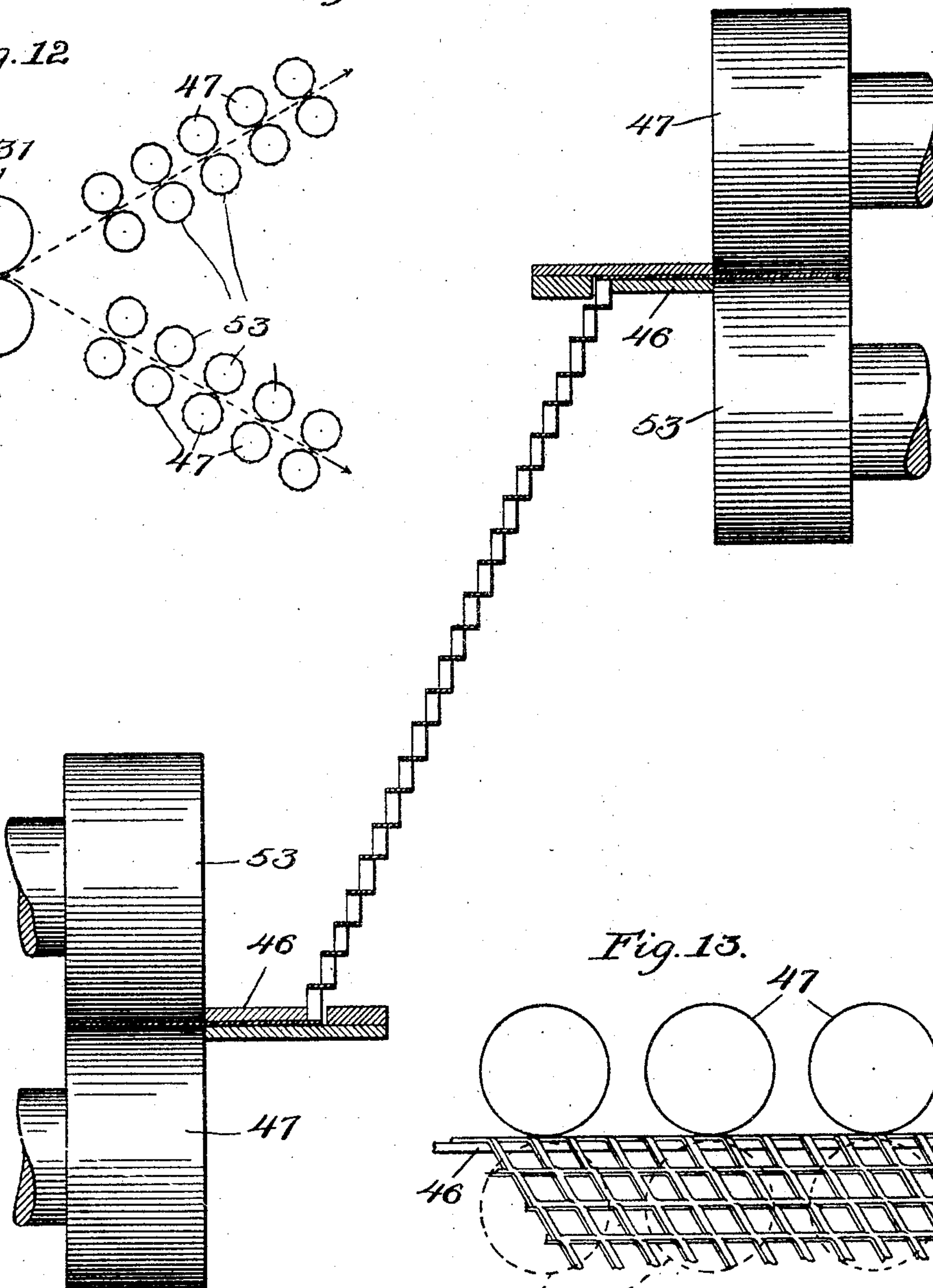
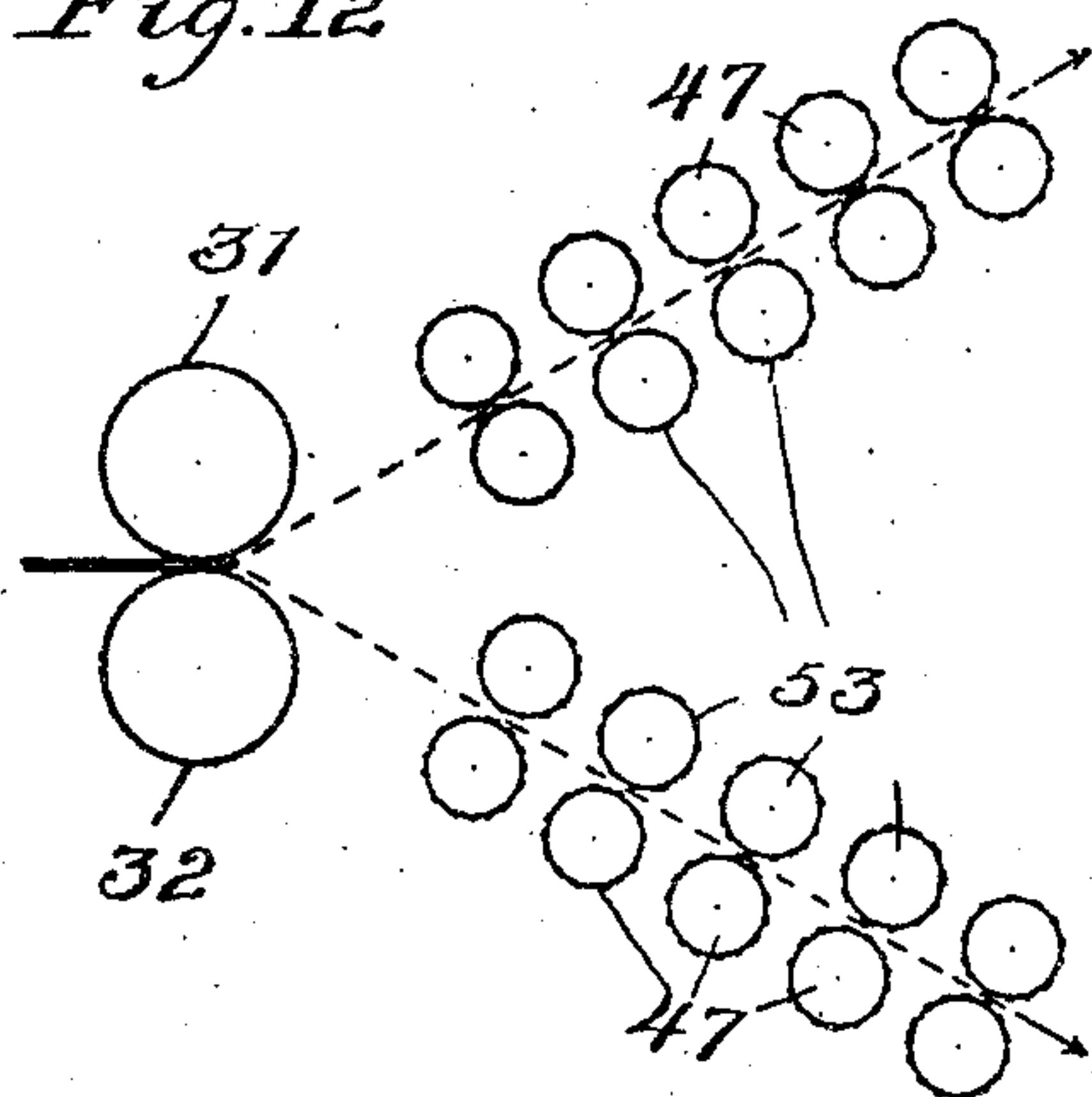
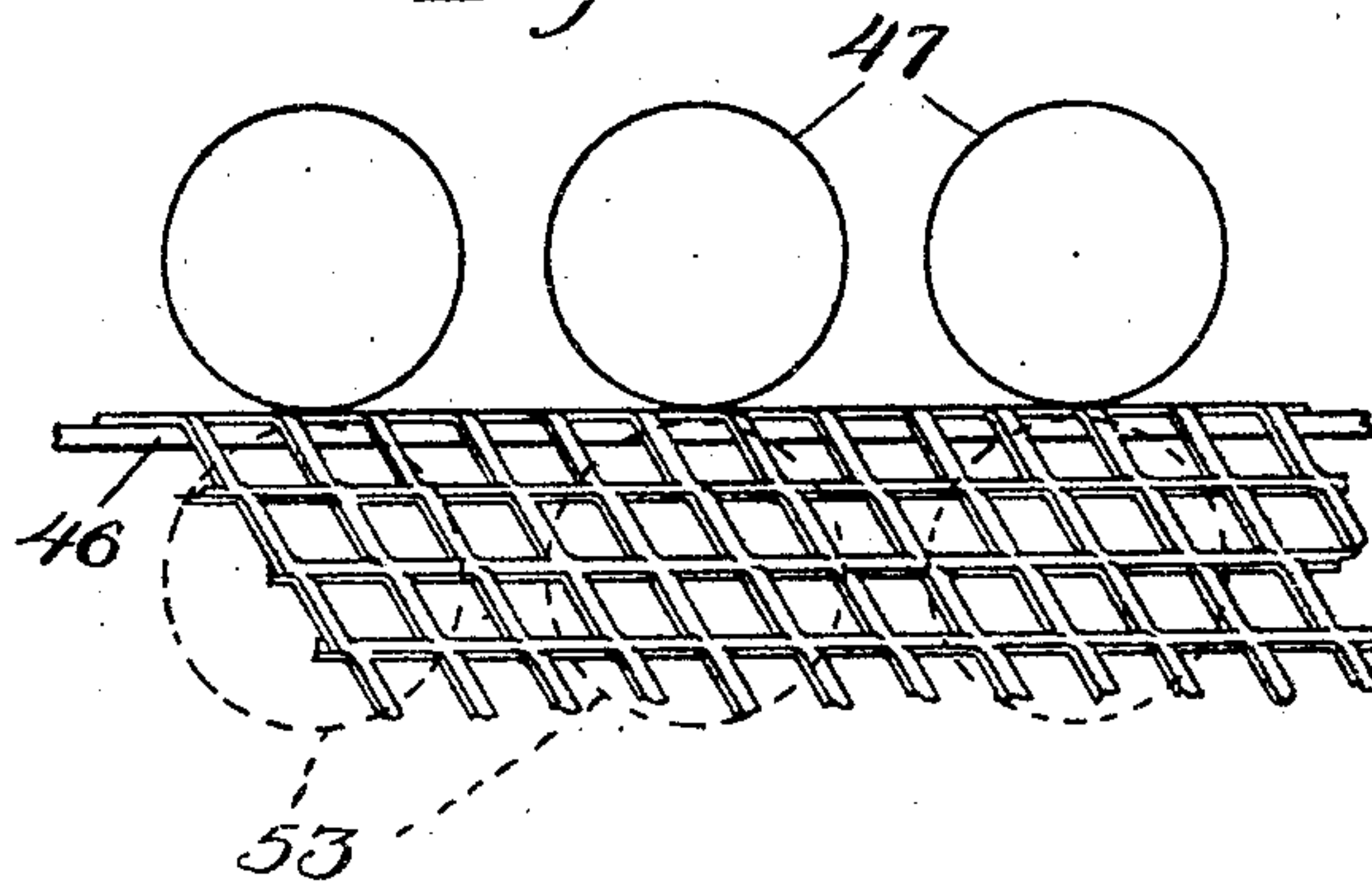


Fig. 13.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR EXPANDING SHEET METAL.

No. 796,402.

Specification of Letters Patent.

Patented Aug. 1, 1905.

Application filed May 29, 1902. Serial No. 109,421.

To all whom it may concern:

Be it known that I, LEWIS E. CURTIS, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Machines for Expanding Sheet Metal, of which the following is a specification.

This invention relates to the construction of machines for manufacturing what is generally known as "expanded metal," and more especially to the parts whereby the sheet metal is expanded or opened after it has been cut or slitted. It embodies the leading feature of my Patent No. 670,606, of March 26, 1901—that is to say, it contains means for deflecting the edge of the slitted sheet from its plane while the other edge is held, and in the preferred form of the invention both edges of the slitted sheet are deflected in opposite directions from the plane of the sheet; but it differs from the patented machine in that instead of supporting the sheet while it is being expanded solely from the edges and effecting the expansion by drawing the edges apart I now support the sheet upon a flat table or plate or other support and draw it over the edge of the support, deflecting it as it moves off the same at an angle to the plane of the sheet, and thereby open the slits in the different rows in successive order. The edge of the support is also preferably arranged in a direction diagonal to the direction of the feed, and during the movement I retain full control of such portions of the sheet as are on the support, so that no portion of the sheet can open or depart from its original plane or flat condition until it reaches the edge of the support.

In the preferred form of the present invention I feed the sheet to two plane-surfaced supports, one inclined upward from the plane of the sheet and guiding one side or portion thereof in an upward direction and the other inclined below the plane of the sheet and guiding the other side or portion of the sheet in a downward direction. Along these supports are feeding devices acting to feed the sheets and also to hold the portions of the sheet on the supports flat while they remain thereon. The supports are wide and come close enough together at the receiving ends to permit only a narrow zone of the sheet to pass between them; but the space between the supports gradually widens toward the point of dis-

charge, the proximate edges of the supports being arranged at angles diverging laterally away from the line of motion. With this construction the sheet moves over the supports and gradually flows over the angling faces thereof, and as those portions remaining on the supports are firmly held by the feed devices and as the supports themselves gradually diverge from each other it will be seen that in this movement the sheet is strained between the supports, and this strain is sufficient to deflect and open the sheet mesh by mesh in the different rows as the latter move beyond the supports. The sheet is thus opened, beginning at the center of one end and gradually widening out until the entire width of the sheet is opened.

The details of this invention will be fully understood from the accompanying drawings, in which—

Figure 1 is a side elevation, and Fig. 2 a plan, of the invention. Fig. 3 is a longitudinal vertical section. Fig. 4 is a side elevation of one of the expanding devices. Fig. 5 is a longitudinal horizontal section showing a portion of said expanding device in plan, and Fig. 6 an end elevation of the same. Fig. 7 is a section on the line 7 7 of Fig. 4. Fig. 8 shows a partially-expanded sheet. Fig. 9 shows the sheet before it is expanded. Fig. 10 shows a portion of the sheet after expanding. Fig. 11 is a cross-section of the sheet undergoing the expanding operation. Figs. 12 and 13 are detail views showing the operation of the machine.

In said drawings, 15 represents the side frame of a machine embodying my invention and adapted both to slit the metal and to expand it after it is slitted. The drive-shaft is shown at 16, receives power from the pulley 17, and communicates power to the machine through pinion 18, meshing with a gear 19 on shaft 20. Gear 19 meshes with gear 21 on the journal 22 of the lower slitting-roll 220 and also with intermediate 23, meshing with gear 24 on the journal 25 of the upper slitting-roll 260. The sheets are fed to the slitting-rolls from table 27 and emerge therefrom into the space between upper and lower guide or stripping fingers 28, pivoted at their rear ends. From the fingers 28 the slitted sheet moves between plates 29 and 30 into the bite of a pair of feed-rolls 31 and 32, by which it is fed to the expanding devices. Gear 19 also meshes

with pinion 33 on the journal 34 of the lower one of said feed-rolls. Said journal 34 also carries gears 35, which mesh with gears 59, mounted on journals 36, as hereinbefore mentioned. The cutting-rings on the slitting-rolls are shown at 26 and 26". The feed-rolls 31 and 32 deliver the slitted sheets to the expanding mechanisms now to be described. At one side of the path of the sheet and close to the feed-rolls is an inclosing frame composed of two castings 40 and 41, bolted together and supported at the initial end by the engagement of its hook 42 with the horizontal stud 43 upon the uprights 44, supporting the feed-rolls at the same side of the machine. At the other end the frame is supported upon the slotted arm 440. The slot in the arm permits the adjustment of the inclination of the frame, as will be readily understood. This frame is given a downward inclination, and the casting 41 is provided on the side toward the sheet with a triangular projecting ledge, table, or plate 45. This ledge is flat on the bottom and is intended to support the unexpanded portions of the sheets against the upward strain from the other side of the sheet as it moves through the machine. This ledge has the same inclination as the frame, and at its initial or receiving end it extends nearly to the center of the sheets and gradually diminishes to the discharge end, where it almost vanishes. It is positioned at the receiving end so the sheet will be sure to enter below it, and is preferably faced with a hardened sheet of steel 46. In the frame 40 41 are the sheet feeding and controlling devices, which in the machine illustrated consist of five pairs of driven rolls. Of these the series of lower rolls 47 may be uniform and all be furnished with journals having long boxes 48 at one side of the rolls and with short boxes 49 at the other side of the rolls. The long boxes are supported on the points of centrally-located adjusting-screws 50 and the short boxes on springs 51, the tension of which is regulated by screws 52. The rolls opposing rolls 47 are shown at 53 and are graduated in width, as plainly shown at Fig. 5, and their journals are supported in long boxes 54, secured to the frame member 40 by screws 55, and some of them are also provided with short boxes 56 on the outside of the rolls, as seen at Fig. 7. All of the rolls are preferably knurled. The first roll 53 takes hold of the sheet when it first enters and bears upon the margin for the full width of the roll, while the following rolls bear upon successively narrower portions of the margin, thus allowing the expansion of the sheet to approach the edges gradually. The hold maintained on the unexpanded portions of the sheet by the rolls 47 and 53 is sufficient to prevent the sheet from buckling or departing from its flat condition until it has passed off the support 45 46. A second

inclined expanding device substantially like the one already described acts upon the other longitudinal half of the sheet—that is to say, it has a frame consisting of two castings 40 and 41, provided with a similar ledge, table, or plate 45 and facing 46 and with feed-rolls 47, similarly supported in boxes, and with graduated opposing rolls 53, similar in all respects to those already described. This second expander is, however, inclined upward instead of downward, and its table or ledge is arranged so that one side of the slitted sheet is guided upward and over it, and the parts of the expander are reversed from the position first described, the rolls 47 being above and the rolls 53 below the sheet.

The marginal feed-rolls are all driven, and a suitable manner of actuating them is shown at Figs. 1 and 2. Each of the rolls is furnished with a drive-pinion 57, and the pinions of each pair mesh together, and power is carried from one pair to the next pair by intermediate pinions 58. The first pair receive power from gear 35 through the gear 59. The arrangement shown at Fig. 1 for driving the rolls of the downwardly-inclined expander is substantially a duplicate of that employed for driving the rolls of the upwardly-inclined expander.

As will be understood from what has already been said, the sheet as it is delivered from the feed-rolls 31 and 32 encounters first the tables or ledges of the expanders, one of which deflects one side of the sheet upward and the other of which deflects the other side of the sheet downward. The margins of the sheet are next seized by both the first pairs of rolls and are held thereafter by them and the succeeding rolls, so that the longitudinal edges of the sheet move in lines which are continuations of their original vertical planes, while the inner portions of the margins are continually passing off the tables and gradually diminishing the width of the margins as the sheet travels. By the time the sheet is in the bite of the first pair of rolls the central portion of the sheet between the diverging tables will have been drawn over the proximate edges of the tables and been deflected from the original plane of the sheet, part in one direction and part in the other, and at the same time some strain will have been put upon such portion by reason of the divergence between the paths of the margins as fixed by the tables and marginal feed-rolls. This causes the opening of the slits in the central portion, and as the sheet progresses a continually-widening portion thereof is drawn over the angling edges of the two tables, and the held margins are being continually reduced in width at the same time, so that finally the whole sheet from edge to edge becomes expanded. The operation will be understood from Fig. 8, where a partially-expanded sheet is shown.

It will be noticed that the edges of the tables or supports over which the slitted sheet

flows are arranged obliquely to the line of motion and also to the direction of the slits. This is very desirable and insures the opening of the slits in successive order as they pass off the supports, and a uniform article is produced and with much less power than is required in opening the sheet in any of the ways heretofore practiced.

The adjustability of the inclined expanders permits variations in the extent of the opening given the slits and also in the shape of the opening.

I do not wish to be limited to a construction in which only one zone or portion of the sheet is expanded at a time, nor to a construction in which the expanding commences at the center of the sheet, nor to a construction in which the feeding is done by feed-rolls, nor to a construction in which the unexpanded portions of the sheet are held in a strictly flat condition, and while the construction shown is the best now known to me in its essential parts I do not wish to be limited thereto, as obviously variations can be made therein without departing from the spirit of the invention.

I claim—

1. In a machine for expanding previously-slitted sheets, the combination with a support over which the slitted sheet is moved, of means for continuously drawing the sheet over the edge of the support and thereby opening the slits, substantially as specified.

2. In a machine for expanding previously-slitted sheets, the combination with a support over which the slitted sheet is moved, of means for continuously drawing the sheet over the edge of the support and thereby opening the slits, the edge of the support being arranged at an angle to the direction of the feed, substantially as specified.

3. In a machine for expanding previously-slitted sheets, the combination with a support over which the slitted sheet is moved, of means for continuously feeding the sheet lengthwise along said support and means for drawing it away from the plane of the support as it passes off the same, substantially as specified.

4. In a machine for expanding previously-slitted sheets, the combination with a support over which the sheet may be fed, means for continuously feeding the sheet taking hold of its margin, and means for drawing the sheet over the edge of the support and at an angle to its plane, substantially as specified.

5. In a machine for expanding previously-slitted sheets, the combination with a support over which the slitted sheet is moved, of means for continuously drawing the sheet over the edge of the support and thereby opening the slits, and means for keeping the sheet flat while on the support, substantially as specified.

6. In a machine for expanding previously-slitted sheets, the combination with a support over which the slitted sheet is moved, of means

for continuously drawing the sheet over the edge of the support and thereby opening the slits, the edge of the support being arranged at an angle to the direction of the feed, and means for keeping the sheet flat while on the support, substantially as specified.

7. In a machine for expanding previously-slitted sheets, the combination with a support over which the slitted sheet is moved, of means for feeding the sheet along said support and means for drawing it away from the plane of the support as it passes off the same, said feeding means being adapted to keep the marginal portions of the sheet on the support in a substantially flat condition, substantially as specified.

8. The machine for expanding previously-slitted sheet metal wherein are combined means for holding a marginal longitudinal portion of the unexpanded sheet in a fixed plane, and means for drawing the longitudinal portion of the sheet adjacent to the held portion from said plane and simultaneously expanding it.

9. The machine for expanding previously-slitted sheet metal wherein are combined means for feeding the sheet longitudinally and continuously, with means for holding a longitudinal marginal portion of the unexpanded sheet in a fixed plane and means for deflecting the adjacent longitudinal portion of the sheet from said plane and simultaneously expanding it.

10. The machine for expanding continuously-moving previously-slitted sheet metal, wherein are combined means for holding the unexpanded marginal portion of the sheet in a fixed plane and means for drawing the sheet over a supporting edge at an angle to said plane, substantially as specified.

11. In a machine for expanding previously-slitted sheet metal, the combination of a support for the sheet having one edge arranged at an angle to the line of motion of the sheet, feed devices holding one side of the sheet flat to said support, and means for drawing the sheet at right angles across said edge as it passes over the same, substantially as specified.

12. The combination in a machine for expanding slitted sheet metal, of two diverging supports, one for each side of the sheet which is passed over one and under the other, and a separate feed mechanism taking hold of the unexpanded portions of the sheet on each of said supports, substantially as specified.

13. In a machine for expanding slitted sheet metal, the combination of two diverging supports each supporting a portion of the sheet and each having an inclined edge across which the sheet is expanded, and two feed mechanisms each acting on a marginal unexpanded portion of the sheet, substantially as specified.

14. In a machine for expanding slitted sheet metal, the combination of two supports for

the sheet diverging from each other both vertically and horizontally, and means for feeding the sheet along said supports and holding the unexpanded portions thereof in a flat condition, substantially as specified.

15. The machine for expanding slitted sheet metal, wherein are combined two supports one for each side of the sheet and along which it is moved, said supports diverging in opposite directions from the plane of the sheet, and their proximate edges being also inclined away from each other so as to, widen the space between them, and means for feeding the sheet along said supports, substantially as specified.

16. The machine for expanding slitted sheet metal, wherein are combined two supports one for each side of the sheet and along which it is moved, said supports diverging in opposite directions from the plane of the sheet, and their proximate edges being also inclined away from each other so as to widen the space between them, and means taking hold of the unexpanded margins of the sheet supported by said supports, substantially as specified.

17. The machine for expanding slitted sheet

metal, wherein are combined two supports one for each side of the sheet and along which it is moved, said supports diverging in the line of the feed and in opposite directions from the plane of the sheet, and their proximate edges being also inclined away from each other so as to widen the space between them, and means for feeding the sheet along said supports, said feeding means consisting of pairs of feed-rolls grasping the unexpanded margins of the sheet, said rolls being graduated so that they may act on diminishing margins, substantially as specified.

18. The machine for expanding previously-slitted sheet metal, the combination with the support for the sheet having an edge over which the sheet may be drawn, of means for drawing the sheet over said edge at an angle to the plane of the sheet, said means exerting sufficient strain on the sheet to cause the opening of the slits, substantially as specified.

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