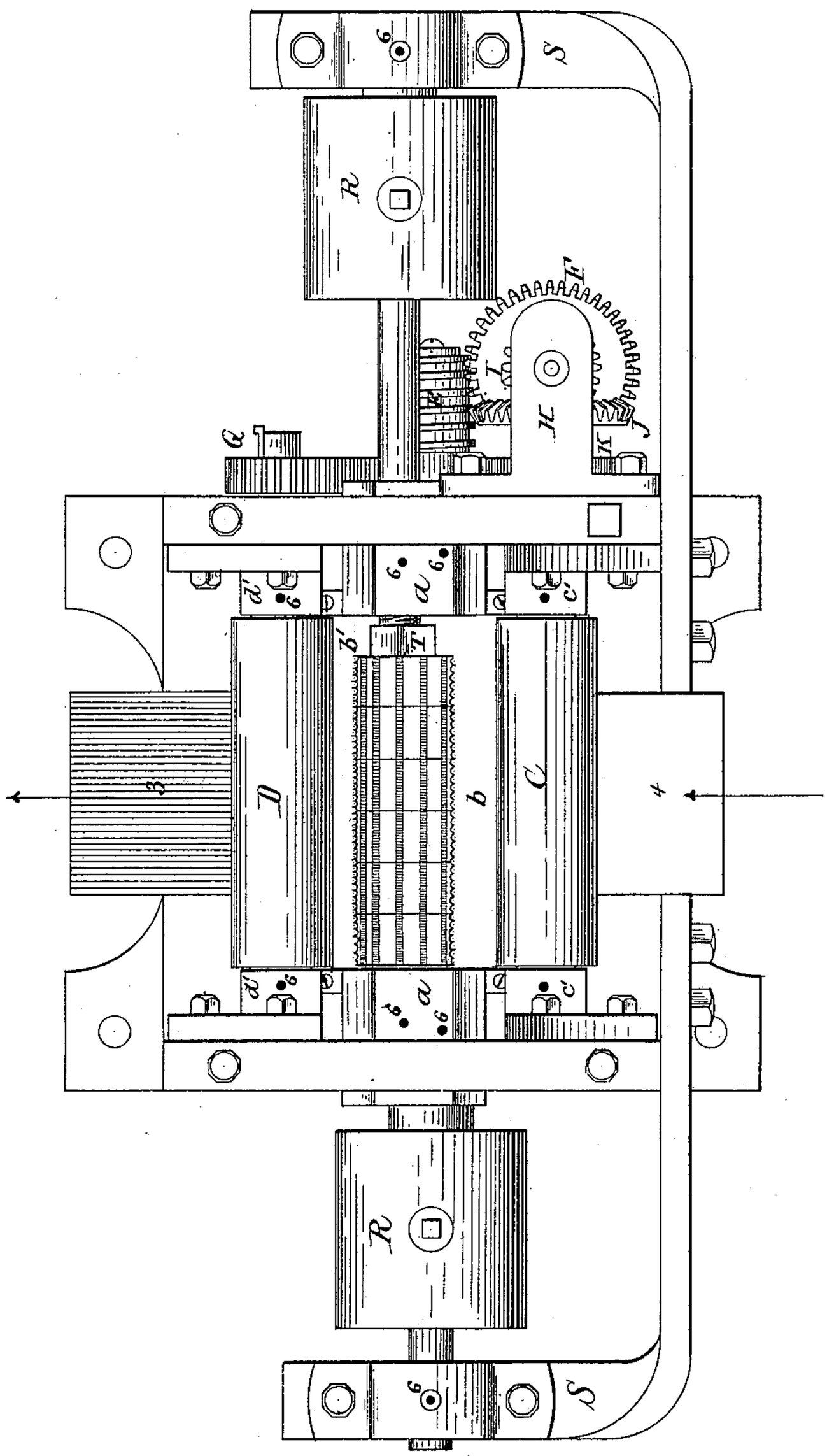
(No Model.) 5 Sheets—Sheet 1.

C. E. RAMUS.

MACHINE FOR MAKING SPLINTS.

No. 266,517. Patented Oct. 24, 1882.



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(No Model.) 5 Sheets—Sheet 2.

C. E. RAMUS.

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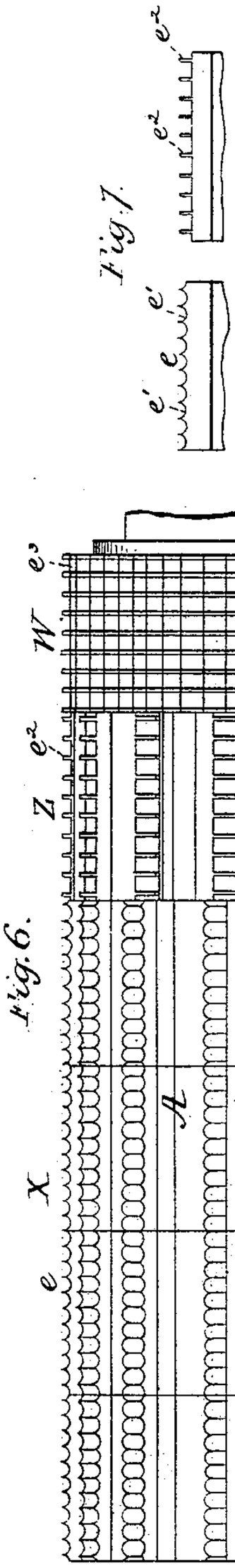

Fig. 6.

Fig. 7.

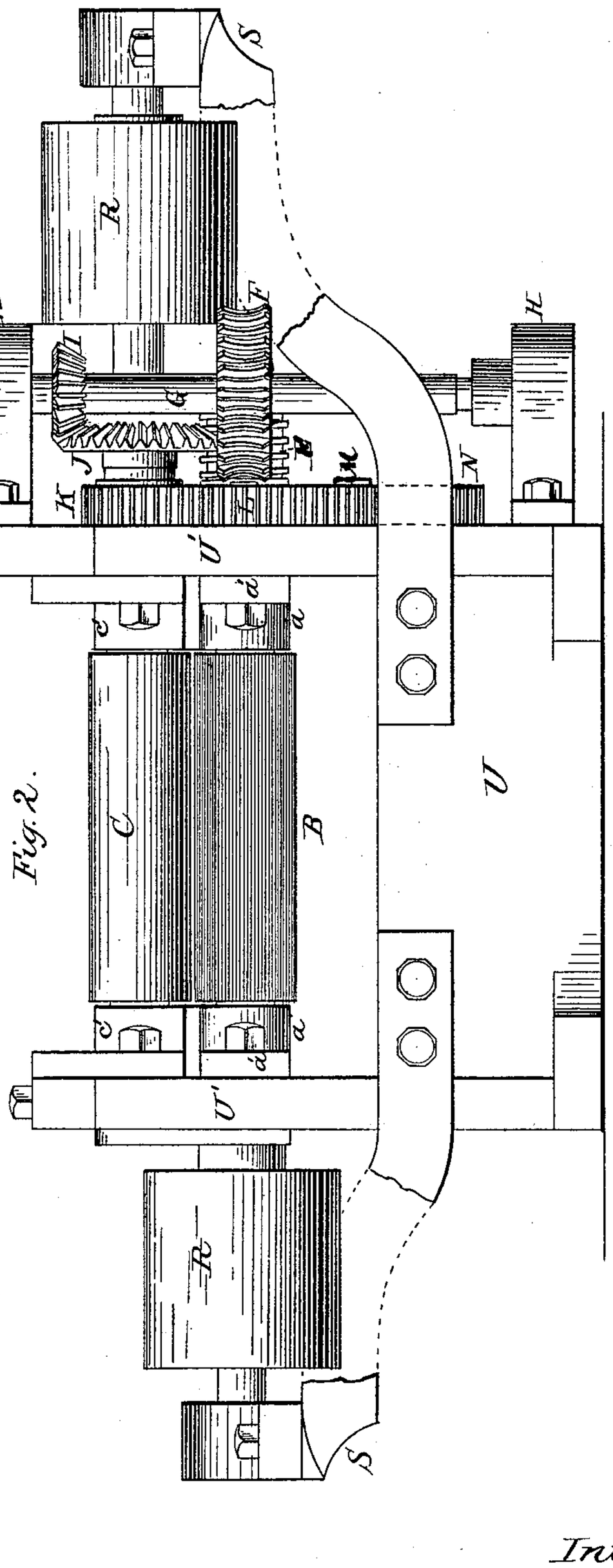

Fig. 2.

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(No Model.)

5 Sheets—Sheet 3.

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MACHINE FOR MAKING SPLINTS.

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Fig. 9.

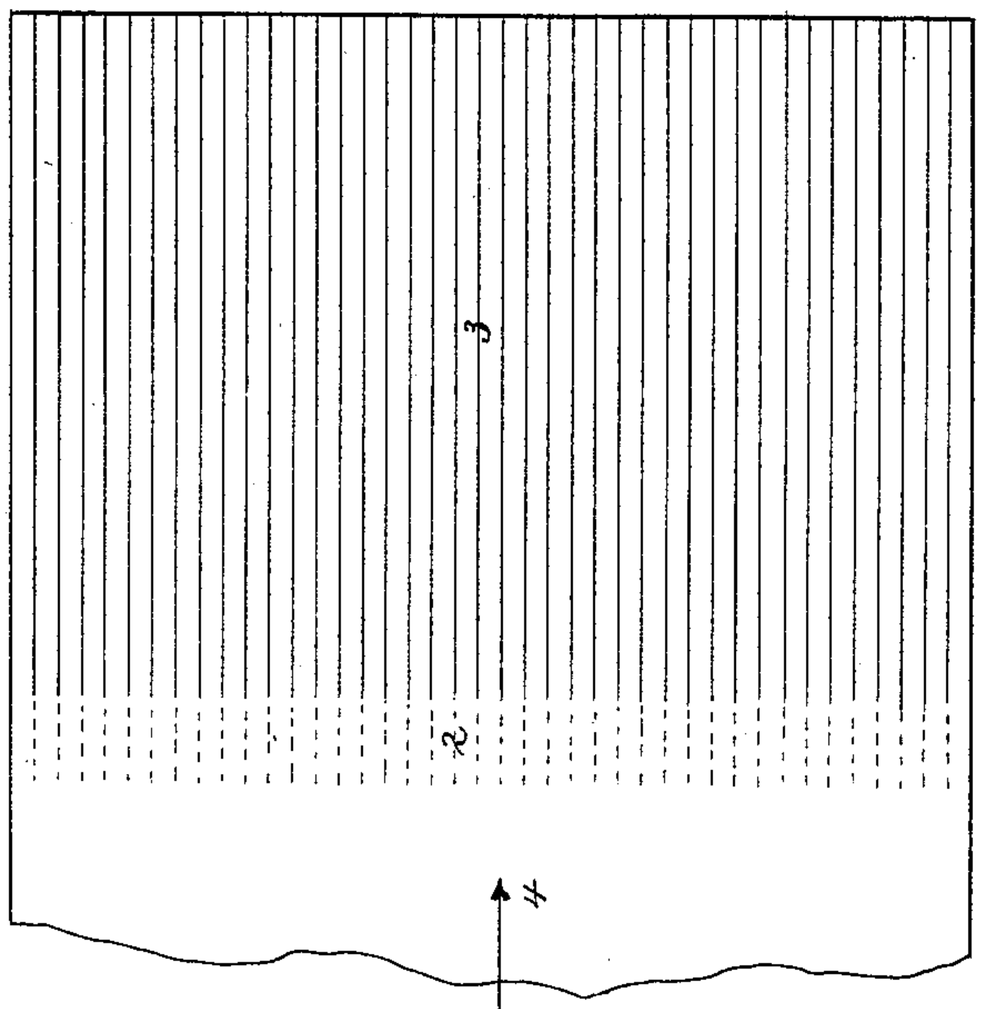


Fig 10.

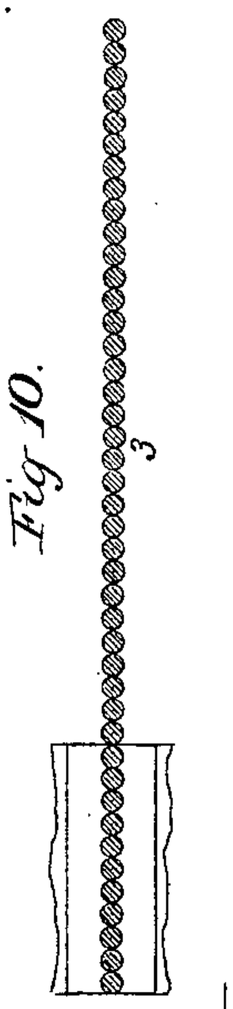
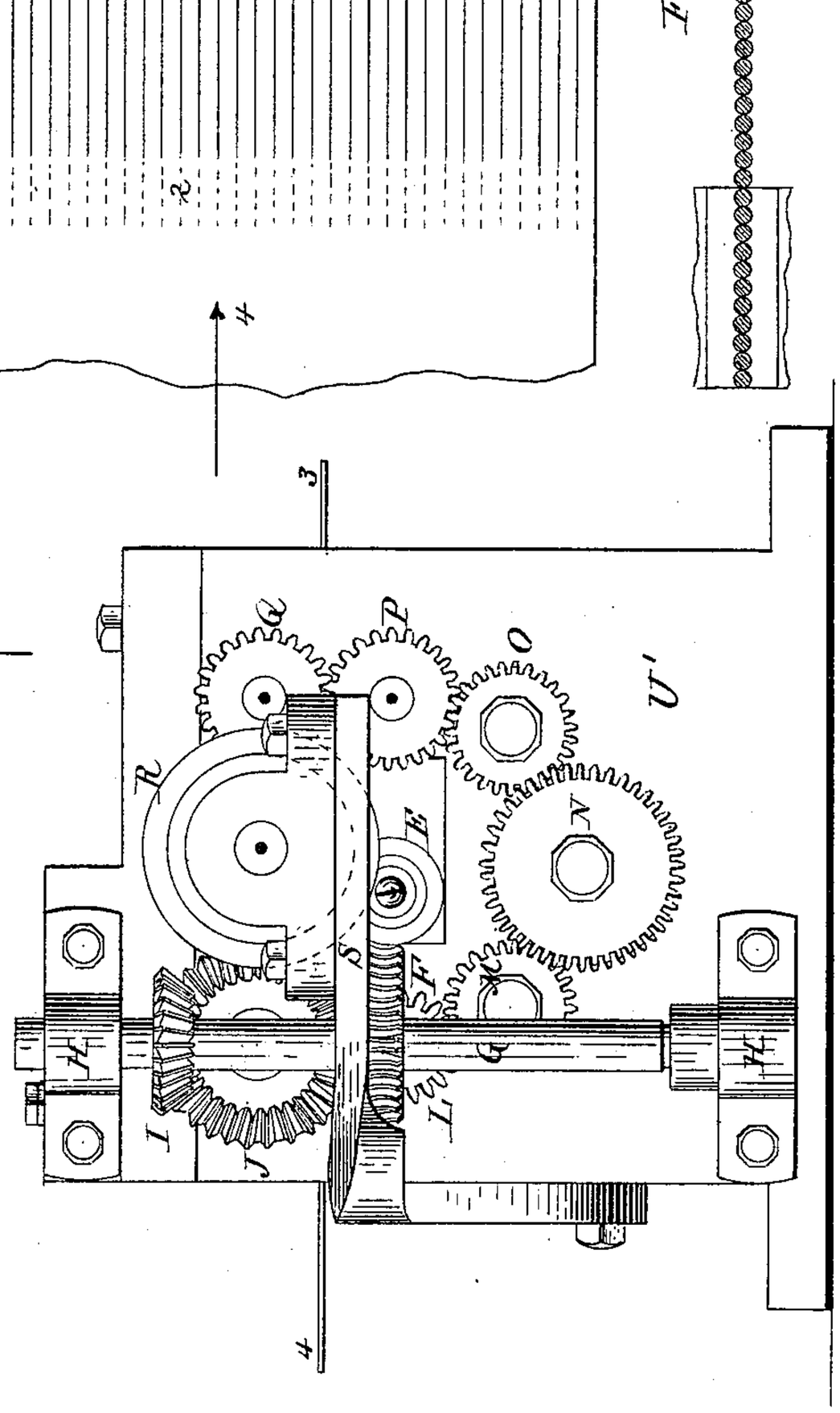


Fig. 8

Fig. 3



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(No Model.) 5 Sheets—Sheet 4.

C. E. RAMUS.

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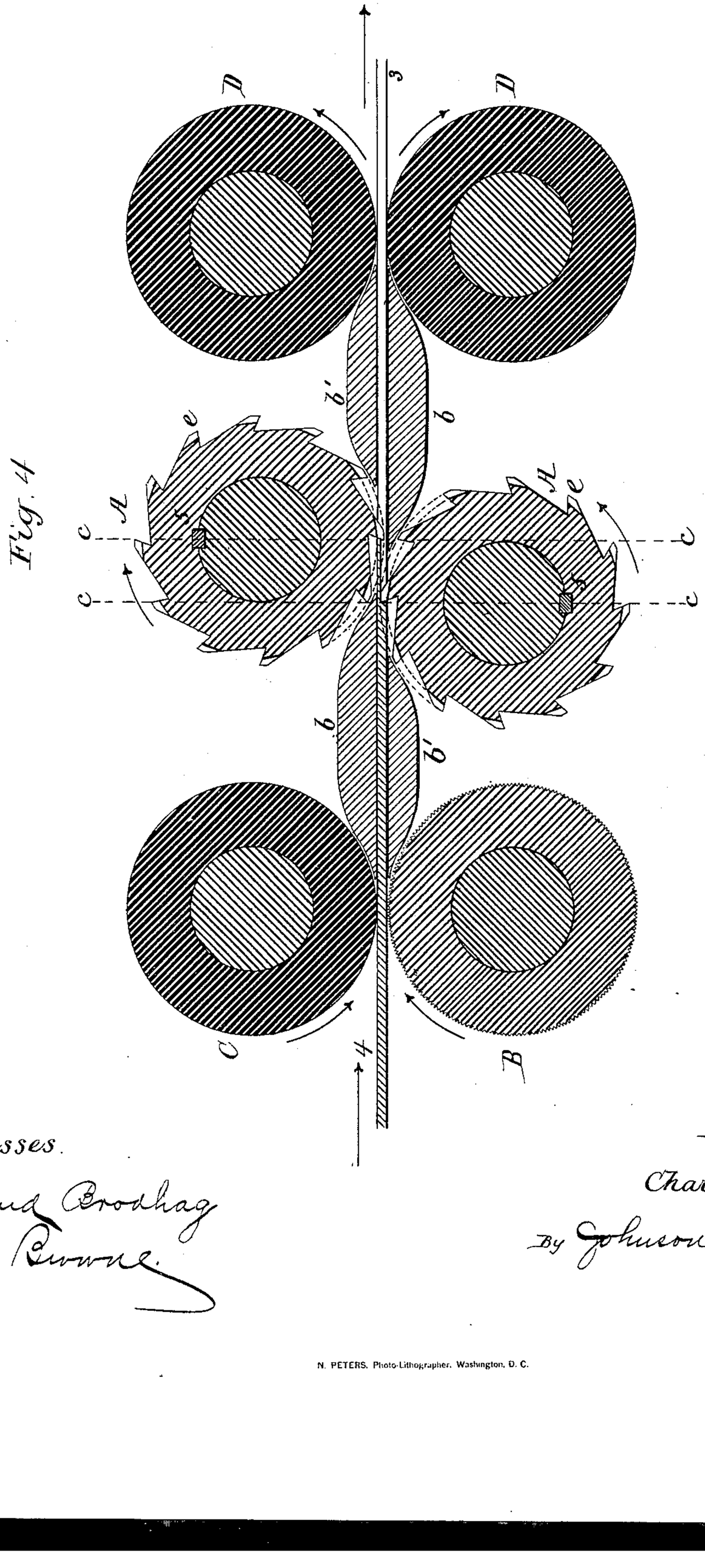

Fig. 4.

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MACHINE FOR MAKING SPLINTS.

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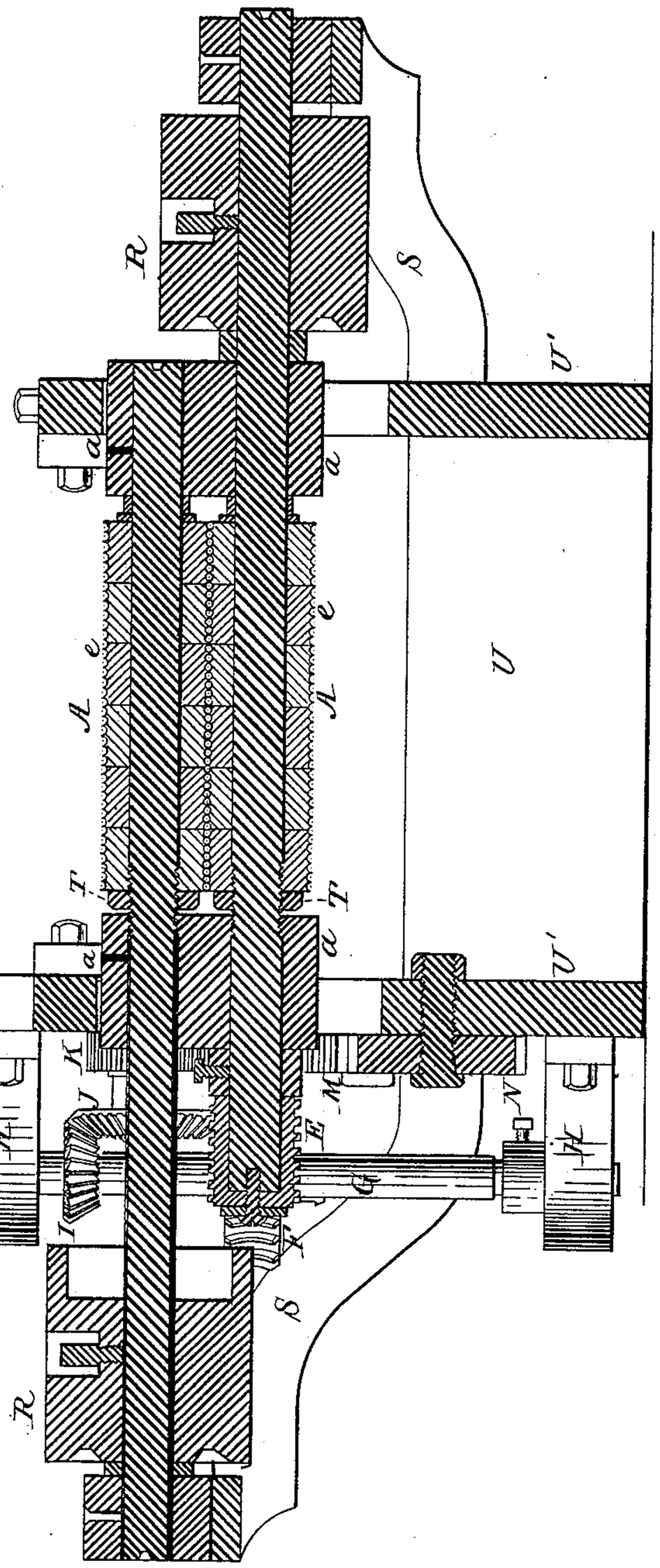
Fig. 5



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UNITED STATES PATENT OFFICE.

CHARLES E. RAMUS, OF CHICAGO, ILLINOIS, ASSIGNOR TO RAMUS, BAKER & CO., OF SAME PLACE.

MACHINE FOR MAKING SPLINTS.

SPECIFICATION forming part of Letters Patent No. 266,517, dated October 24, 1882.

Application filed May 22, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. RAMUS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Machines for Making Splints, of which the following is a specification.

The invention herein relates to the production of splints by machinery for use in match-manufacture and for other purposes for which splints may be used in the arts.

My invention is directed to the production of splints by reducing a thin board in the direction of its length into shaped and separated lengths of splints, for subsequent division into lengths suitable for matches and for other purposes. In this method the material of a log is utilized with the least possible waste and the cost of producing match-splints very materially lessened. A machine for this purpose will hereinafter be described preparatory to a specific designation of the organization and combination of parts or devices claimed as my invention.

Mechanism organized to reduce a thin board lengthwise into shaped splints is illustrated in the accompanying drawings, in which—

Figure 1 represents a top view of the entire machine, in which is exhibited the thin board partly reduced into lengthwise splints as it emerges from the machine; Fig. 2, a front elevation of the same; Fig. 3, an end elevation, showing the train of gearing connecting the feeding-rollers with the lower splint-producing cylinder; Fig. 4, a vertical cross-section, on an enlarged scale, of the splint-producing cylinders and the parts co-operating in the feeding and support of the thin board; Fig. 5, a vertical longitudinal section taken through the splint-producing cylinders. Fig. 6 is an elevation of one of the splint-producing cylinders, showing different styles of splitting and shaping cutters arranged thereon, to illustrate modifications; Fig. 7, detail views of different forms of cutters; Fig. 8, a cross-section of a log, showing the manner in which it is divided into thin boards of different widths for my improved splint-making machine; Fig. 9, a plan view of a thin board, showing how it is splinted longitudinally by my machine; and Fig. 10, a cross-section of the thin board, showing it as divided into shaped and separated splints for use in making matches.

In the manufacture of splints for making matches I prefer to use what is known as "cotton-wood," because it is cheap, because of the tenacious quality of its fiber, and of its combustible nature; but my machine is equally well adapted for splinting other kinds of wood.

An iron frame of any suitable construction is adapted to contain and support the operating parts. As shown, the base U and the ends U′ are cast in one piece, the ends being provided with suitable openings for the reception of boxes or bearings *a a* for the shafts of the splint-producing cylinders. These boxes *a* are bolted to the inner sides of the ends of the frame by projections *a*, Fig. 2, and both the cylinder-shafts are carried in the same boxes, as shown in Fig. 5, so that the splinting-cutters have a non-adjustable relation to each other, because it matters not whether all the boards are of equal thickness. The action of one splint-producing cylinder being in advance of the action of the other, the splints will be both shaped and separated by reason of the lapping relation of the cutting spurs or edges of one cylinder to those of the other. If desired, however, these cylinder-shafts may be mounted in separate adjustable boxes.

The splint-producing cylinders A A are arranged horizontally parallel to each other, one above the other, with their axes in positions to be intersected by different vertical lines shown in Fig. 4. As the splint-producing cylinder has cutting edges or spurs the acting parts whereof describe circles of different diameters, the relation of the cylinders to each other will allow the circles of greatest diameters described by the splitting spurs or edges of each to lap slightly in the path of the board. This gives a cutting action of the cutters of each cylinder into the board a distance greater than half its thickness, and thus effects the complete separation of the splints. By this arrangement the cutting action of the cutters of one cylinder upon the board is independent of the cutting action of the cutters of the other, and one cylinder operates in advance of the other, yet both co-operate in the operation of reducing and shaping the board into splints from both its sides and of splitting

it into splints from both its sides as it is fed between the cylinders. In this method of reducing a thin board into longitudinal splints provision is made for supporting the thin board under the independent action of each reducing-cylinder by separate and distinct supporting-plates *b b*, arranged one above the lower reducing-cylinder and the other below the upper reducing-cylinder, whereby both the thin uncut part of the board and its integral-shaped and split-splint portions are guided and supported under the immediate action of each independent reducing-cylinder at that side of the cylinders at which the thin board enters them and at that side of the cylinders at which the shaped and separated splints emerge from the cylinders and the machine in sheet form. These supporting-plates *b b* extend between the reducing-cylinders, one at each side thereof, so as to cross the vertical lines *c c* intersecting the axis of each cylinder, as shown in Fig. 4. A plate, *b'*, is arranged in such relation to each supporting-plate *b* as to form a guideway for the thin board to and from the reducing-cylinders. These guide-forming plates are arranged horizontally, with their flat faces separated a distance slightly greater than the thickness of the thin board fed between them, and they are secured to the inner side of the boxes *a a* by grooves therein, or to the frame ends in any suitable manner, so that the guideway between them will be in the path of the board between the feed-rollers and the reducing cylinders.

The feed-rollers and their relation to the supporting and guiding plates will be presently described.

The splint-producing cylinders are operated independently of each other by separate belt-pulleys R on the shaft of each, one end of each of which shafts projects beyond the ends of the frame and are supported in bearings on brackets S, bolted to the frame. This independent driving of the splint-producing cylinders allows of their equal or unequal speed, as may be desirable, and of their being operated in the same direction and in a direction against the feed of the board, as seen in Fig. 4. The cutting spurs or edges of both cylinders are alike and revolve in the same vertical plane, as seen in Fig. 5, and they may be of any desired form suitable for the purpose. They are formed in parallel ridges or ranges, with a suitable distance between each ridge or range, as seen in Figs. 4 and 6. Each range has a rib-like projection from the surface of the cylinder, and the cutters proper are formed upon the outer edge of such rib. To produce the least waste in reducing the board and separating the splints, I prefer to form the cutters by a scalloped edge of the rib, each scallop having a semicircular form, producing a cutting-spur, *e*, and a cutting-edge, *e'*, from spur to spur, the action of which both reduces and shapes one side of the splint, while the cutting-spurs effect the splitting of the board into splints. The cutting-ranges of both cylinders reduce, shape, and split the board on both sides and give a cylindrical or other required form in cross-section to each splint at the same time the entire width of the thin board is being cut into longitudinal pieces or splints equal in thickness to the spaces between the cutting-spurs, as seen in Fig. 10. In this way both surfaces of the thin board are not only reduced at every point with a planing action, but the splints are entirely separated lengthwise while being so planed, each cylinder both planing and splitting independent of the other, and each operating upon that portion of the thin board which is passing across the vertical-diameter line *c* of each cylinder, so that by the arrangement shown in Fig. 4 the under cylinder will shape and split the under surface of the board the distance between the vertical dotted lines *c c* before the upper cylinder can complete the shaping and splitting upon the upper surface of the board in the same space. In Fig. 4 this cut and uncut part is shown as being between the inner edges of the supporting-plates, and in Fig. 9 the dotted lines 2 show the undercut part, the full lines 3 the separated splints produced, and 4 shows the uncut part of the thin board. In this operation the thin board has two separate and distinct supports, *b b*, one to sustain the board against the action of the lower cutting-cylinder and one to support the board against the action of the upper cutting-cylinder, and both co-operating to sustain the separated splints in their feed from the machine in sheet form. With the cutting-edges terminating in the points or spurs *e* the separation of the splints will be mere lines or knife-edge slits, and without kerf or waste, as shown in Figs. 9 and 10. The cutters may be formed in ranges upon the surface of a steel cylinder of one piece, or the cylinder may be formed of a series of steel cutter-sections, as shown in Figs. 5 and 6, and secured upon the shaft by a spline or feather, 5, Fig. 4, and a nut, T, screwed upon the shaft, so as to clamp the cutter-sections against a shoulder thereon.

In Fig. 6 I have shown a cylinder with cutters of different forms, those indicated at X being such as I have described, producing under the action of the independent cylinders splints of semicircular form in cross-section, those indicated at Z being adapted to produce under the action of independent cylinders splints of square cross-section in which the spurs or cutting-points e^2 will produce a kerf, while at W the splitting part of the cutter has the form of a saw, also producing a kerf. Between these kerf-cutting parts the cutters have a cutting-edge, *e'*, as in the form of cutter *e*, to reduce and to shape the splint, such cutting part e^3 of the saw form of splitting-cutters being of separate rings clamped between the saw-rings, and such shaping-cutter having a width always equal to the body of the produced splint. Other forms of cutters may be used, and of whatever form the reducing action is, both shaping and splitting on both sides of the board alike. The bottom or shaping part of

each cutter is slightly inclined back of the cutting-edge, so as to clear itself.

The feed-rollers are arranged in pairs to receive the thin board, feed it into the guides and between the revolving splint-producing cylinders, and to receive and deliver the splints in sheet form, as shown in Figs. 1 and 4. The front feeding-rollers consist of a lower steel roller, B, having its surface fluted or grooved longitudinally to form parallel edges or ribs, while the upper roller, C, is of rubber, for the purpose of yielding to inequalities in the thickness of the board and to give a proper biting action of the unyielding fluted roller upon the board. The unyielding roller serves the important purpose of preventing the deflection of the board from a true line as it is fed forward and renders the feed positive against splint-producing cylinders operating to reduce the board into separated and shaped splints under a feed contrary to the rotation of the cylinders. The rollers D D on the delivery side of the splint-producing cylinders are of rubber, and serve to support the splints in their separated relation to each other, and to continue the feed of the board after it has left the fluted roller. The rollers are revolved with equal speed, and are arranged in proper relation to the guideways, so that the board will be fed into the latter at the front of the machine and the sheet of splints from the guideway into and from the rollers at the rear side of the machine. The under feed-rollers, B and D, are mounted in side projections, a', of the boxes a, while the upper feed-rollers, C and D, are mounted in boxes c' c' d' d', bolted to inner sides of the ends U′ of the frame, as shown in Fig. 1, so that these feed-rollers have a fixed relation to each other and to the guideways, as shown in Fig. 4. I prefer to operate these feed-rollers from the shaft of one of the splint-producing cylinders, which in the organization shown is the lower cylinder, the end of the shaft of which outside of the box a is provided with a worm, E, into which meshes a worm-wheel, F, on a vertical shaft, G, supported in brackets H H, bolted to and projecting horizontally from the end of the frame. A bevel-pinion, I, secured upon the upper end of said shaft G, meshes with a bevel-gear, J, secured on the shaft of the upper feed-roller C, which also carries a spur-gear, K, which meshes with a spur-gear, L, of equal size on the shaft of the lower roller B, while the feed-rollers D D are geared in like manner by equal gears P and Q, as seen in Fig. 3. Spur-gears M and O, of equal size, are supported on the end of the frame and mesh with the spur-gears L and P of the lower feed-rollers and with an intermediate larger spur-gear, N, also supported on the end of the frame, whereby the feed-rollers are operated with equal speed from the lower splint-producing cylinder.

Any length of board may be fed through the machine and reduced longitudinally into splints, and boards of different widths may be so reduced. Indeed mere strips of thin boards can be so reduced, whether long or short, thus giving a great advantage in working up waste pieces into match-splints.

I prefer to make the cutter of ring-sections, so that they may be removed from the shaft in the event of the breaking of the cutting-spurs and the wearing out of the cutting-edges.

I have shown and described the splint-producing cylinders as operating against the feed of the board; but the feed of the board may be in the same direction as the revolution of the cylinders, the feeding-rollers being operated in accordance therewith; or I may operate one of the splint-producing cylinders with the feed of the board and the other one against such feed by reversing the position of the cutters upon one of the cylinders. It is immaterial which of the cutting-cylinders is arranged in advance of the other, the supports b b being arranged accordingly.

The sheet of the splints may be delivered from the feed-rollers D D upon a table, so as to support them as they emerge from the machine; but whatever the length of the board the splints will be held together until the board leaves the rear feed-rollers. They are then cut into suitable lengths for matches.

It will be understood that the splint-producing cylinders are revolved by their separate pulleys R with a high speed, while the train of gearing connecting the feed-rollers is such as to give a comparatively slow feed to the board. It will be also understood that the feed-rollers must be revolved in the same direction, and that their connecting-gear for this purpose may be arranged in any suitable manner.

Fig. 8 shows the manner of cutting the log into thin boards by first equally dividing it longitudinally and then cutting each part at right angles to the first cut into thin boards of equal thickness and of a thickness adapted to be fed between the rollers, the guideways, and the splint-reducing cylinders.

Provision is made for oiling the journal-bearing of the cylinders and feed-rollers by oil-holes 6 in their several boxes.

It will also be understood that the parallel relation of the cutting-ranges of each splint-producing cylinder will tend to preserve the direct line of feed, and that the joint action of the cutters of each revolving cylinder, while shaping, reducing, and splitting the thin board equally on its opposite sides, will thereby size the produced splints equally.

In Fig. 10 I have shown a portion of a ring of cutters of each cylinder as having completed the shaping, sizing, and separation of the splints.

In the production of splints in sheets it is important that the board from which they are so produced should be of a thickness as near as possible of the match-splints to be produced from it; and to properly hold and guide such a thin board under the action of the cutting-cylinders it is important that such support should be formed by a passage adapted to con-

fine it in its feed to and from the cutting-cylinders, and to have such confining-support extend between the cutting-cylinders, so as to practically form a continuous support of flat table-surfaces for the board. It is also necessary that the supports *b b*, against which the respective cutting-cylinders work, should extend the one over the lower cutting-cylinder and the other under the upper cutting-cylinder, and both approach the lapping-point of the cutting-spurs, so that their edges will cross the vertical lines *c c* drawn through the axis of the cutting-cylinders. In such construction the upper and the lower plates, *b' b'*, extend only to the circles described by the cutting-spurs, and it is by this disposition of the two sets of table-guides and their relation to the cutting-cylinders and to the feed-rollers that I am enabled to reduce the thin board to separate splints, that the board is prevented from buckling, and that it is supported within a confining-passage, so that the severed splints are maintained in a united sheet. Were it not for this, the splints as formed would, by reason of being made warm and soft by heat from the action of the cutting-cylinders, become broken and pulpy and of irregular shape. In fact, the board must approach the cutting-cylinders within a confining-passage, and the severed splints must be maintained in compact sheet on leaving the cutting-cylinders to produce splints having a uniform and stiff body. The delivery-rollers are covered with rubber to prevent the marring of the splints, and especially to give a feeding-hold upon each separate splint. Otherwise some of the splints of the sheet might double up for want of a proper feeding-hold. So in like manner one of the receiving feeding-rollers must be covered with rubber and the other must be unyielding and ribbed, to prevent marring the thin board and to give it a positive and straight feed into the confining guide-passage.

I claim—

1. The combination, substantially as described, in a machine for making match-splints, of the splint-producing cylinders, arranged with their cutting-edges, describing circles which lap in close proximity in the path of the board, with the feed-rollers and the two sets of fixed table-guides, arranged so that each set will enter between the cutting-cylinders on opposite sides of their lapping circles and extend to and enter between the feed-rollers, whereby to form a confining-passage for the thin board to the cutting-cylinders and for the sheet of splints emerging from the cutting-cylinders between the delivering-rollers.

2. In combination, in a machine for making matches, the splint-producing cylinders, the two sets of table guide-supports, *b b b' b'*, the yielding delivering feed-rollers D D, and the receiving feed-rollers B C, composed of a smooth yielding and a grooved or fluted non-yielding roller, all constructed and arranged substantially as described, for the purpose specified.

3. The combination, in a machine for making match-splints, of the splint-producing cylinders and the feed-rollers with a confining-passage for the thin board and for the sheet of splints produced the efrom, formed by the two sets of table-guides, *b b b' b'*, the upper plate of one set extending over the lower cutting-cylinder, and the lower plate of the other set extending beneath the upper cutting-cylinder, the inner ends of both said plates beveled and crossing the vertical axial lines of their respective cylinders, and both sets of said guide-plates extending to and between the feeding and the delivering rollers, substantially as described, for the purpose specified.

4. In a machine for making match-splints, the combination of the splint-producing cylinders with the two sets of table-guides *b b b' b'*, each set having fixed relations to said cutter-cylinders, and the feeding and delivering rollers, each set having fixed relations to said table-guides, and means, substantially as described, for connecting and operating the said rollers from one of said cutting-cylinders, for the purpose specified.

5. In combination, in a machine for making match-splints, the splint-producing cylinders A A, provided each with a driving-pulley, R, the two sets of table-guides, *b b b' b'*, the feeding and delivering rollers, and the train of gear consisting of the spur-gears K L Q P, connecting each set of rollers, the bevel-gear I J, the worm-gears F and E, the intermediate stud-gears, M N O, connecting the gears L P of the lower rollers, all arranged at one end of the frame, and the driving-pulleys R R, arranged at opposite ends of the frame, all constructed and adapted for operation substantially as herein set forth.

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

CHS. E. RAMUS.

Witnesses:

A. E. H. JOHNSON,

J. W. HAMILTON JOHNSON.