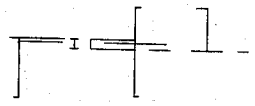
No. 881,852. PATENTED MAR. 10, 1908.

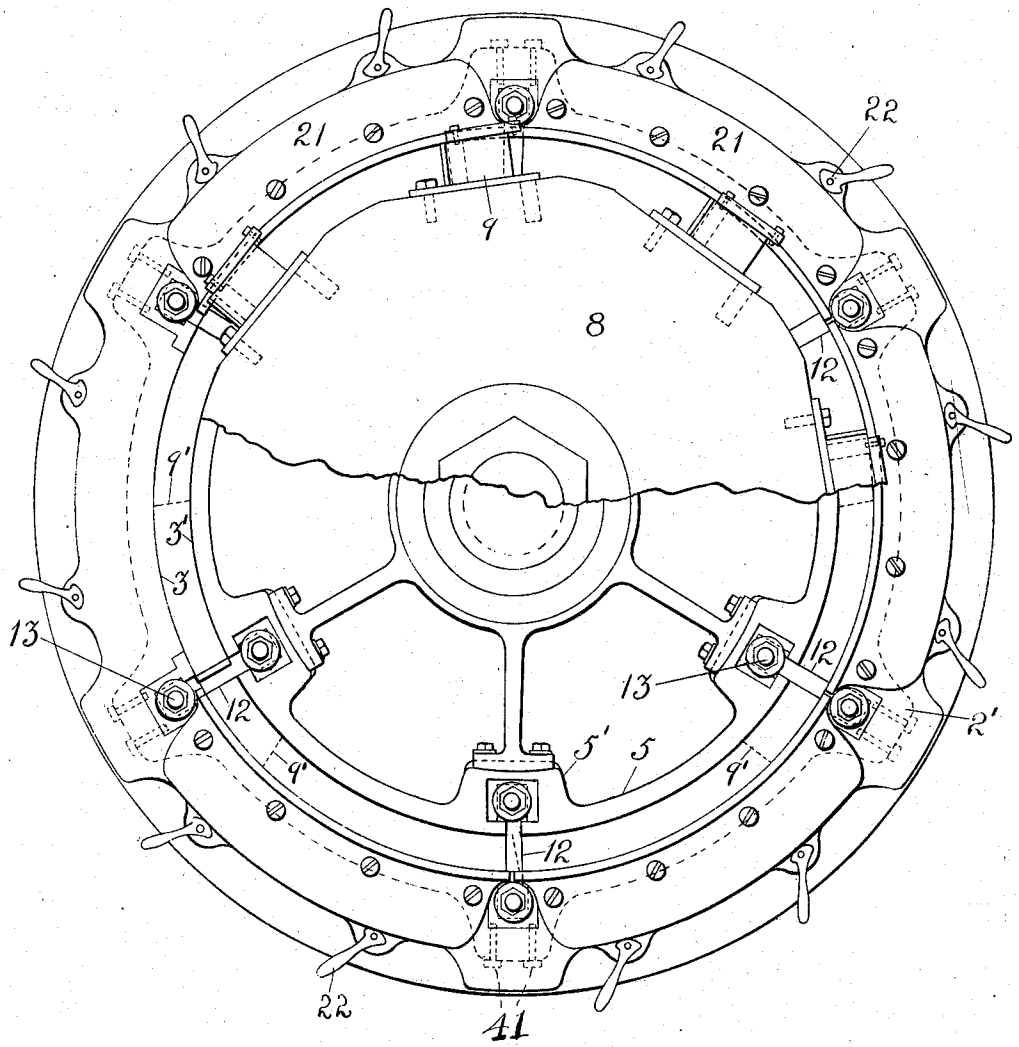
H. C. GAMAGE.

APPARATUS FOR MANUFACTURING STEEL OR OTHER METAL WOOL.

APPLICATION FILED MAR. 20, 1903.

6 SHEETS—SHEET 1.





WITNESSES:

C. A. Fischmuth

E. L. Lawler

INVENTOR

Harry C. Gamage

BY

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ATTORNEYS

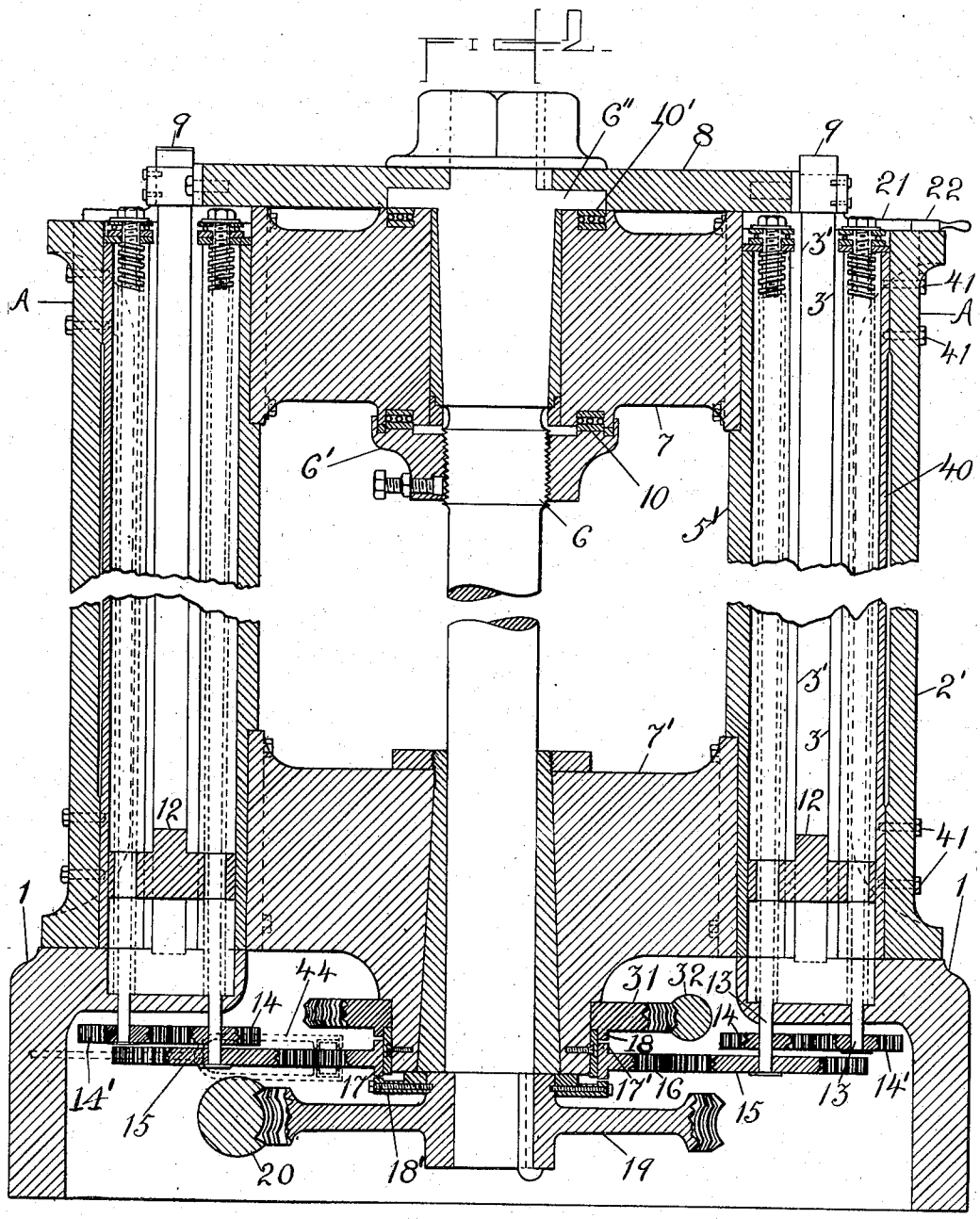
No. 881,852. PATENTED MAR. 10, 1908.

H. C. GAMAGE.

APPARATUS FOR MANUFACTURING STEEL OR OTHER METAL WOOL.

APPLICATION FILED MAR. 20, 1903.

6 SHEETS—SHEET 2.



WITNESSES:

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INVENTOR

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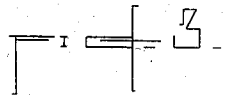
No. 881,852. PATENTED MAR. 10, 1908.

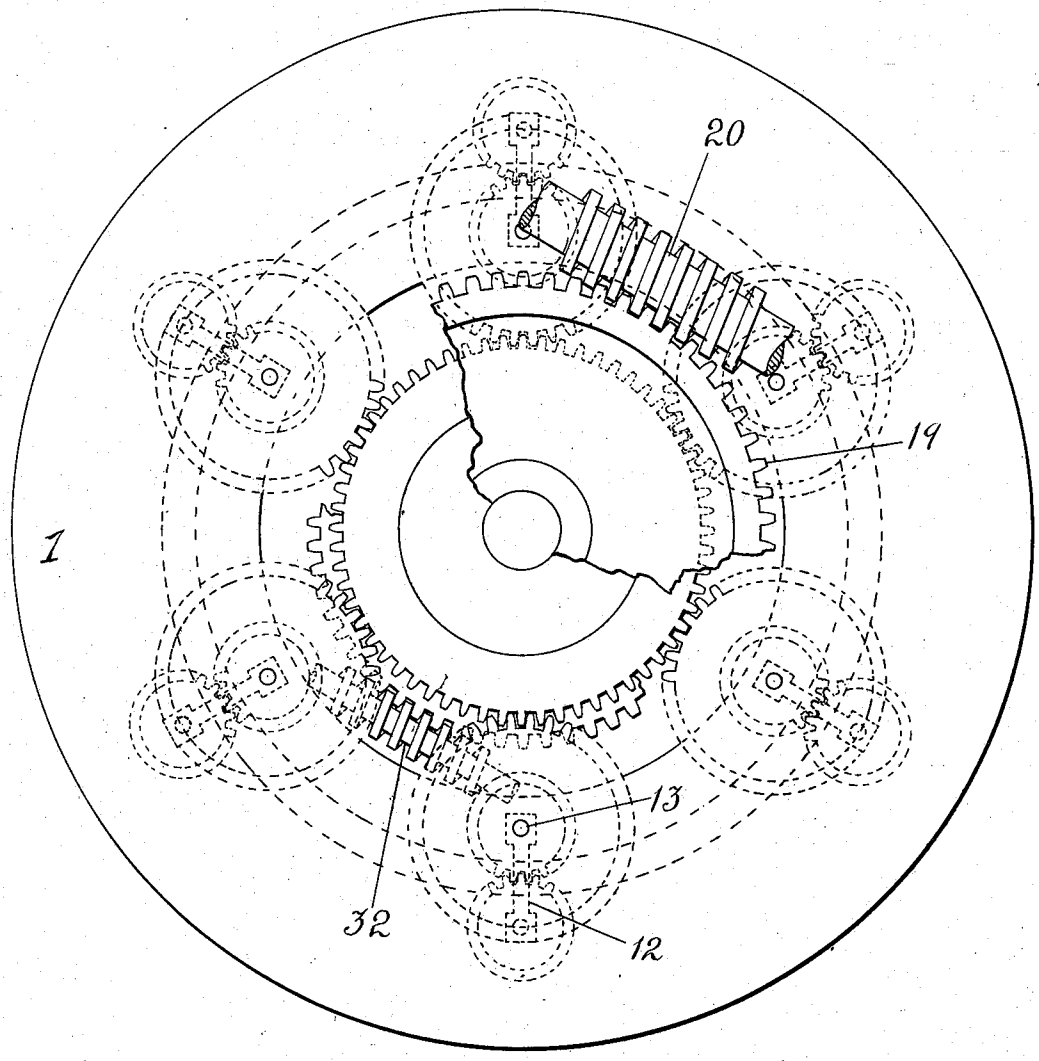
H. C. GAMAGE.

APPARATUS FOR MANUFACTURING STEEL OR OTHER METAL WOOL.

APPLICATION FILED MAR. 20, 1903.

6 SHEETS—SHEET 3.





WITNESSES:

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E. L. Lawler

INVENTOR

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ATTORNEYS

No. 881,852. PATENTED MAR. 10, 1908.

H. C. GAMAGE.

APPARATUS FOR MANUFACTURING STEEL OR OTHER METAL WOOL.

APPLICATION FILED MAR. 20, 1903.

6 SHEETS—SHEET 4.

FIG 4

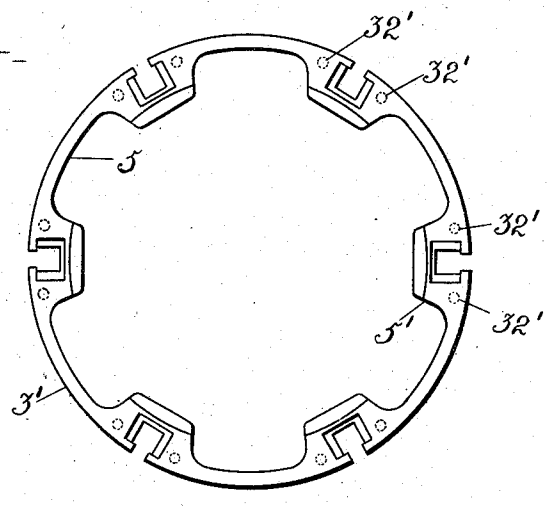
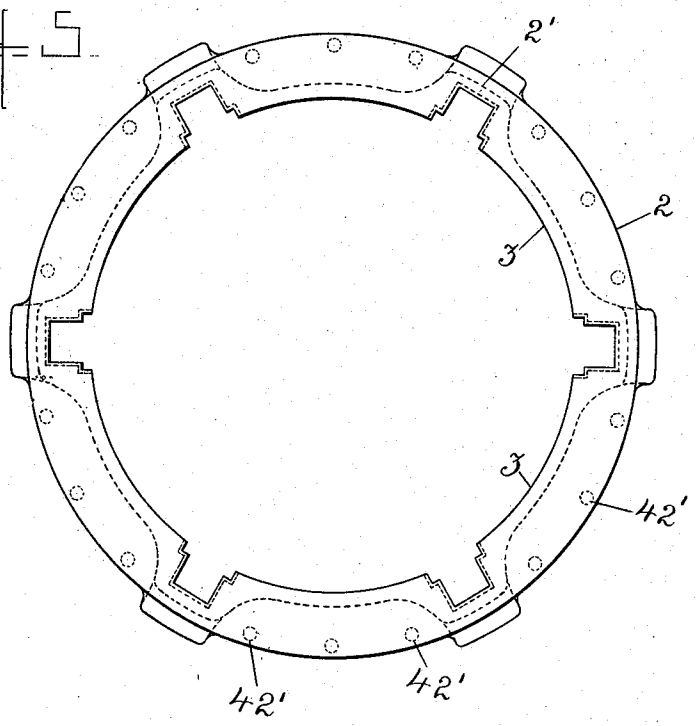


FIG 5



WITNESSES:

C. A. Fischer Jr.

E. L. Lawler

INVENTOR

Harry C. Gamage.

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ATTORNEY

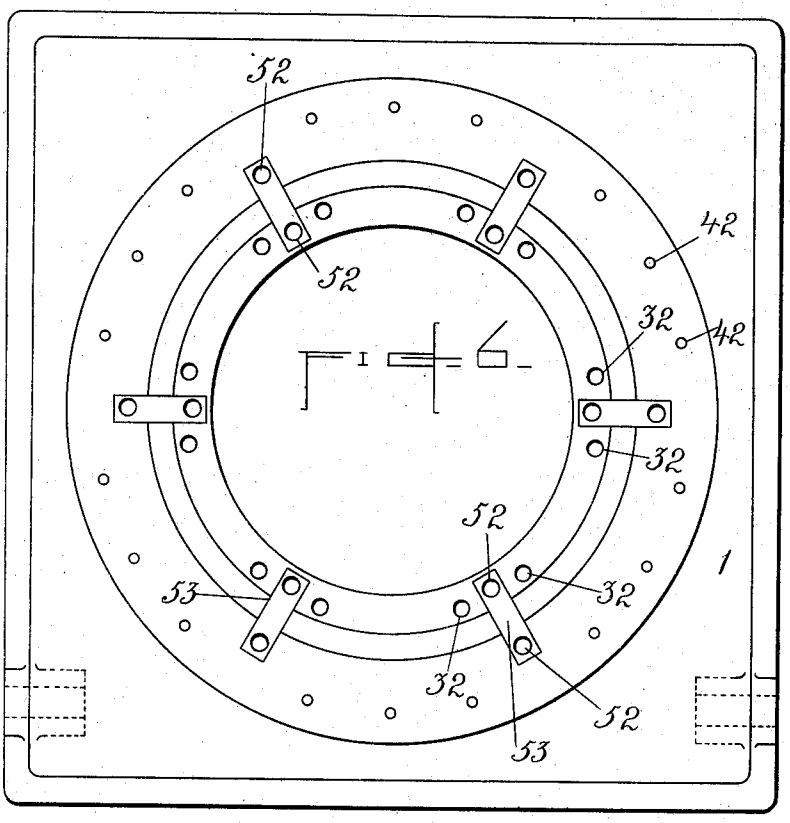
No. 881,852. PATENTED MAR. 10, 1908.

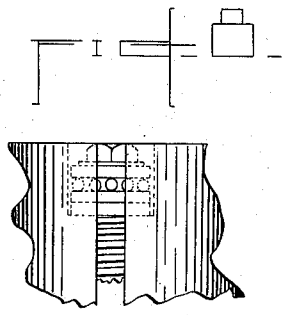
H. C. GAMAGE.

APPARATUS FOR MANUFACTURING STEEL OR OTHER METAL WOOL.

APPLICATION FILED MAR. 20, 1903.

6 SHEETS—SHEET 6.





WITNESSES:

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No. 881,852. PATENTED MAR. 10, 1908.

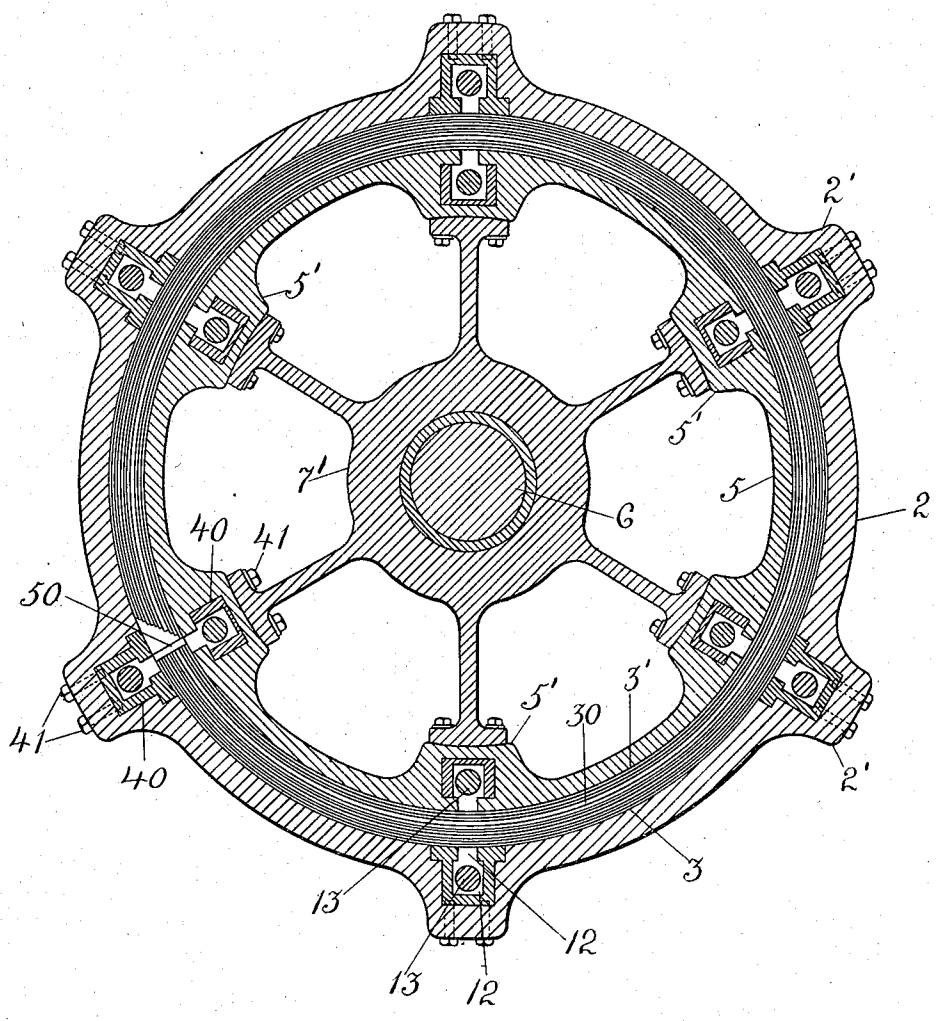
H. C. GAMAGE.

APPARATUS FOR MANUFACTURING STEEL OR OTHER METAL WOOL.

APPLICATION FILED MAR. 20, 1903.

6 SHEETS—SHEET 6.

FIG 7.



WITNESSES:

C. F. Gischner Jr.

E. L. Lawler

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ATTORNEYS

UNITED STATES PATENT OFFICE.

HARRY C. GAMAGE, OF LYNN, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE GAMO COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR MANUFACTURING STEEL OR OTHER METAL WOOL.

No. 881,852. Specification of Letters Patent. Patented March 10, 1908.

Application filed March 20, 1903. Serial No. 148,683.

To all whom it may concern:

Be it known that I, HARRY C. GAMAGE, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Manufacturing Steel or other Metal Wool, of which the following is a specification.

My invention relates to an improved machine or apparatus for cutting fine shavings from the edge of a bundle or pile of sheets of metal or other laminated structure, and is designed more particularly to afford a suitable machine or apparatus for producing metal wool by the general process described in my application for patent filed February 26th, 1903, Serial No. 145,171.

The apparatus heretofore employed for the purpose of producing metal wool by shaving the edge of a thin sheet of metal has been, prior to my invention, of various forms, in one of which a number of sheet metal disks being mounted upon a suitable mandrel are revolved on lathe centers while in engagement with a suitable cutting or shaving tool. In another machine or apparatus suitable reels are provided for reeling a ribbon of metal from one to the other past one or more cutting tools arranged to take a thin shaving from the edge thereof. In still another form of machine, the sheet metal is wound in a spiral upon a suitable mandrel which is rotated by power, while the edge of the spiral roll is exposed to the action of a knife that is fed up against the edge. In this form of machine, the spiral is kept from unrolling by rotating the mandrel in a direction to wind up the roll and by the use of suitable rollers bearing on the outside thereof. When such rollers are not employed, it has been proposed to solder the outer end of the spiral roll of sheet metal. Neither of said machines or apparatus is adapted to produce thin shavings from a laminated structure by paring a straight edge of a bundle or pile of metal sheets, or other material, and the apparatus first mentioned is subject to the great objection that it is not practicable to cause the clamping devices to recede as the edge of the pile of disks is pared away so as to permit a knife covering the whole pile on its lateral dimension, to be fed up as the cylindrical pile or bundle is cut away.

My present invention comprises a novel construction of machine and combination of parts for permitting the edge of a bundle or pile of sheets of metal to be readily pared away, and with a uniformity in the resulting product not attainable by the apparatus previously employed, and to these ends my invention consists in the novel combination of a suitable receptacle or holder adapted to hold a pile of sheets exposed at one edge, and a rotating carrier provided with one or more cutting tools, said carrier being mounted upon an axis adapted to rotate the tool holders in a circular path or line whose plane is perpendicular to the plane of the laminations in contradistinction to the machine or apparatus before mentioned, wherein the line of cut is a circular path whose plane is substantially parallel to the plane of the laminations.

The holder or receptacle for the pile or bundle of sheets is preferably curved in a line which is concentric, or approximately concentric, with the axis of revolution of the cutter, heads or holders.

In the preferred construction of machine embodying my invention the cutter, heads or holders rotate and the work is at rest, although it is obvious that the converse arrangement might be employed. I also prefer to provide means whereby the curved pile of sheets may be fed edgewise through the opening at the edge of the receptacle as the laminations are pared away by the rotating knives. Suitable clamping devices are employed for holding the edge of the pile firmly where the cut is taking place, and the receptacle itself is so constructed as to afford a firm support laterally for the bundle or pile so as to prevent the outside plates from bulging or becoming distorted under the effect of the heavy pressure applied to force the bundle edgwise through the clamps. The feed of the bundle is preferably continuous.

My invention consists also in the improved details of construction and combinations of parts for effecting the rotation of the knives and the simultaneous feed of the bundle or pile, all as will be more particularly hereinafter described and then specified in the claims.

In the accompanying drawings, Figure 1 is a plan view of a form of machine embodying my invention, a part of the tool-carrying

plate or wheel being broken away and one of the clamps employed being removed. Fig. 2 is a vertical central section through the machine in its preferred form. Fig. 3 is an inverted plan of the machine, some of the parts being broken away. Fig. 4 is a plan of the inner shell or cylinder which constitutes the inner wall or support for the inside of the curved bundle or pile of metal sheets. Fig. 5 is a plan of the part of the machine which constitutes the outer shell or wall of the receptacle adapted to hold and support the laminated pile of material to be operated upon. Fig. 6 is a plan of the base of the machine in the preferred rectangular form. Fig. 7 is a horizontal section taken midway of the height, showing the bundle of plates in edge view. Fig. 8 is a side view of a part of the inner shell near the top.

1, indicates a suitable base of cast metal upon which the parts of the machine are mounted and within which base some of the operating wheel-work or transmission-gear may be mounted in suitable cavities.

2, indicates an annular shell or casting mounted upon and properly secured to the base 1, and adapted to afford at its inner wall or portion 3, a lateral support for the bundle or pile of sheet metal or other laminated material 30 (see Fig. 7) supported on edge in the space between said outer casting or shell and an inner shell or casting 5, whose wall or surface 3′ affords a support for the inside of the laminated pile or bundle during the operation of reducing and feeding said bundle. The width of the space between the vertical walls or surfaces 3, 3′, as shown in Figs. 2 and 7 indicates approximately the thickness of the bundle or pile which the receptacle formed by the annular space between the shells 2 and 5 is adapted to accommodate. At any number of points around its periphery the outer shell or frame 2 may have the vertical ribs or enlargements 2′, and the inner shell 5 may be provided with similar vertical grooves or guide-ways to be presently described, in which the carriage, or carriages, supporting the laminated bundle move vertically.

6, indicates the rotating shaft on which is mounted the wheel or frame 8 carrying at its edge and immediately over the annular space between the shells 2 and 5, suitable tool-holders in which are secured the cutting or planing tools 9 whose width is preferably sufficient, as shown, to take in the whole width of any laminated bundle or pile secured between the shells 2 and 5 with its edge exposed for reduction by the said cutters 9. The shaft 6 is suitably mounted so that its axis of rotation is substantially parallel to the direction of feed of the bundle held in the aforesaid receptacle and so that the cut made by the cutters 9, shall be in a circle whose plane is substantially transverse to the plane of the laminations of the pile or bundle. Said shaft 6 may be mounted in suitable bearings provided in frames or spiders 7, 7′, which are secured to the inside of the inner shell or frame-work 5, the latter being properly secured to the foundation or base 1 by screws passing upward through holes 52 in the base, (Fig. 6) into holes tapped in the bottom of the shell 5 at points 32′ (Fig. 4.) Similar holes for fastening the outer shell are shown at 42 and 42′ (Figs. 6 and 5.)

Other means might be provided for mounting said shaft. Preferably, the shaft is provided with suitable ball bearings as indicated at 10, 10′, the upper one of which sustains the weight of the shaft while the lower one takes the upward thrust thereof when the machine is at work.

6′ indicates a collar (preferably adjustable for wear of the bearings,) secured to the shaft and adapted to sustain the parts of the ball bearing 10 to transfer the upward thrust of the shaft to said bearing. A similar collar or flange 6″ may be secured to, or form a part of the shaft above the upper frame or spider 7 to sustain said shaft upon the upper ball bearing 10′.

At the lower end of the shaft a wheel 19 is secured thereto to enable power from a shaft 20, to be applied to rotate the shaft and cutters 9. The power-transmitting-gear may consist as shown of a worm 20 rotated by power and gearing with the worm 19.

To form a rest and carriage by which the bundle may be projected edgewise towards the cutters, one or more bars 12 are provided which extend radially across the space between the inner and outer shells 2, 5, and are provided with guide-heads or projections 12′ preferably of rectangular shape, as shown in the horizontal section Fig. 7, which work in guide-slots formed in the inner and outer shells or frames at their enlarged portions 2′, 5′. These guide-slots or openings may have a suitable lining 40, secured therein by screws 41 as more clearly shown in Figs. 2 and 7. The heads of the cross-pieces 12 are tapped or formed as nuts through which pass the shafts 13, screw-threaded, as indicated at their upper ends, Fig. 2, to engage said nuts and force the cross-bars or carriages 12 upward after the manner of lead-screws.

The shafts 13 are mounted in the guide-slots and are sustained at their upper ends on suitable ball or antifriction bearings, as clearly shown in Fig. 2, mounted in countersunk openings at the upper ends of the slots, as more fully illustrated in Fig. 8. These antifriction bearings sustain the feed screws and take up the end-thrust or pull during the operation of feeding the bundle forcibly upward by the action of the rests or carriages 12. I do not limit myself to any particular number of feed-screws or of carriages or supports 12, or to any particular way of

mounting or assembling said parts. The shafts 13 extend down through openings 52 (Fig. 6,) in the base, where said base is preferably provided with the countersinks or recesses 53 adapted to receive the carriages 12 when in their lowermost position.

Rotation may be imparted to the screw-shafts 13 from any suitable power, and for this purpose the shafts may be provided respectively with gear-wheels 14, 14′, gearing together, while one of said shafts is provided with a wheel 15 which is driven from a wheel 16. The latter wheel may turn on suitable bearings formed as shown on a hub or projection from the lower spider 7′.

The hub of wheel 16 may be provided with a crown-gear 17′ adapted to be engaged by a crown-wheel 18 secured to and rotating with a worm-wheel 31, driven by a screw-shaft 32, operated by any suitable power. By these means the screw-shafts 13, by which the carriages 12 are actuated for the purpose of feeding the bundle, are turned. The wheel 16 may also be provided at its lower side with another similar crown gear 17, which may be brought into gear with the gear-wheel 18′ on the hub of the wheel 19, for the purpose of reversing the movement of the feed-shafts 13 and lowering the carriages 12 by a quick movement.

Any suitable means may be provided as indicated in dotted lines at 44, for supporting the wheel 16 and lifting it into engagement with wheel 31 when power is to be applied to feed the pile or bundle, or for lowering it out of gear with wheel 31 and into gear with wheel 18′ after the bundle or pile has been fed to the top of the circular recesses in which it is held and its edge has been completely reduced by the operation of the cutters 9.

At or near the upper end of the curved holder or receptacle, suitable clamping devices are provided for firmly securing the bundle or pile at or near its upper edge where it is acted upon by the knives 9. Said clamping devices may comprise a series of clamp-plates 21, whose clamping edge conforms to the curve of the holder or receptacle and which are mounted upon the upper edge of the outer shell 2 and in suitable manner to permit them to be guided and moved towards and away from the bundle or pile contained in the curved receptacle. These clamping plates may be operated by cam levers 22, or other devices. They are by preference of such extent circumferentially as to afford a firm support for the edge of the bundle around practically its whole periphery thus permitting the use of sheets whose thickness is of the gage desired in the finished product of the machine.

I do not limit myself to the particular details or construction herein shown and described, as it is obvious that other means may be employed for supporting and feeding the bundle or pile of sheets upward through the receptacle into engagement with the knives and also that the construction of the operating gears or mechanisms as well as of the clamping devices and the manner of supporting the knife carrying the shaft and rotating it in proper relation to the curved receptacle or holder may be varied in very many ways without departing from the general construction herein broadly claimed.

A suitable stop may be provided to prevent the shifting of the pile or bundle circumferentially in the curved holder under the stress of the cutters when in operation. Said stop may be formed upon one of the supports 12 as indicated at 50, Fig. 7. Preferably the cutters are set so that their cutting edges shall be more or less oblique to the circular path which they describe during rotation as indicated by the dotted lines 9, Fig. 1, in order that the cutter may have a combined planing and shearing action thereby securing a uniform product and producing shavings having a greater relative curl and elasticity than would be otherwise produced if the cuts were in the exact direction of the grain or lamination.

What I claim as my invention is:

1. In an apparatus for paring the edges of bundled sheets of metal, the combination of a curved holder, adapted to retain the sheets on edge, a central rotatable shaft, a knife mounted on the shaft so as to move in a path concentric with the opening in the holder, and means for feeding the curved sheets edgewise from the holder into the path of the knife for the purpose specified.

2. The combination substantially as described of a curved holder open at one end and adapted to sustain a laminated bundle of sheets of metal on edge and to prevent the bundle from buckling sidewise, clamping plates movable inwardly on the outer wall near the open end of the holder for clamping the outer edge of the bundle, means for feeding said bundle edgewise out of the open end of said holder, and one or more cutters mounted to revolve over said opening in a circular path, the axis of the cutters being substantially coincident with the axis of the curved holder, substantially as specified.

3. The combination substantially as described of a curved receptacle or holder adapted to sustain a bundle or pile of metal or other sheets on edge, a series of carriages or supports on which the bundle or pile may rest, a tool-carrying shaft carrying one or more cutters adapted to take a cut from the edge of the sustained plates or sheets on the circumference of a circle whose plane is transverse to the laminations, and means for actuating said supports to feed the bundle edgewise during rotation of the cutter or cutters.

4. The combination substantially as described of two concentric frames or shells having an annular or curved space between them adapted to receive a bundle or pile of laminated material, a series of supports upon which said bundle rests, guides for said supports in said frames or shells at opposite sides of the curved space or receptacle, and feed-screws for operating said supports and projecting the laminated bundle edgewise from the space between said frames or shells.

5. In an apparatus for reducing the edge of a pile or bundle of laminated material, the combination of concentric shells or frames adapted to provide a lateral support for the pile sustained on edge between them, a series of rests or carriages 12 extended across the space between said frames and provided with heads working in suitable guides and operating screw-shafts passing through said heads.

6. In a machine for reducing the edge of a laminated pile or bundle by taking thin shavings from said edge, the combination of a pair of frames or shells adapted to afford a curved space or receptacle between them for the laminated bundle or pile, a series of carriages or rests extending transversely across the space between said frames or shells and guided at their opposite ends in slots in said frame or shells and operating screw-shafts sustained on the frames at the upper ends of said slots on suitable antifriction bearings.

7. The combination with the concentric frames or shells affording an annular or curved bundle supporting receptacle between them, of rests or supports 12 guided in said frames and operated by screw-shafts mounted within said frames, a cutter or cutters adapted to be rotated in a circular path over the upper end of said receptacle, and a suitable operating-gear for rotating said cutters and the screw-shafts simultaneously.

8. In an apparatus for reducing the edge of a curved bundle or pile of material by taking thin shavings from an edge thereof, the combination of a suitable holder or receptacle of curved form, means for feeding said bundle or pile edgewise through said holder and suitable clamping devices adapted to engage the said bundle or pile at or near the edge from which the shavings are to be removed.

9. The combination substantially as described, of the inner and outer shells 2, 5, a rotary cutter shaft sustained within the same and carrying a cutter or cutters adapted to describe a circular path over the upper edge of the opening between said shells or frames, means for rotating said shaft, screw-shafts sustained on said frames or shells at opposite ends of supports or rests 12 having nuts located in the space between said shells and means for rotating said shafts simultaneously with the rotation of the cutter or cutters.

10. In a machine for making metal wool the combination of a curved holder adapted to sustain a bundle of thin metal sheets on edge, clamping plates on the outer wall of the holder, a cutter, means for rotating the cutter over the edge of said bundle, and means for feeding the bundle edgewise out of the curved holder up to the knife, as and for the purpose described.

11. In a machine for making metal wool, the combination of a curved holder adapted to retain thin sheets of metal on edge, a central rotatable shaft, a knife mounted so as to be rotated with the shaft and to move in a path concentric with the holder, means for applying lateral pressure to the sides of the sheets at or near the edge operated upon to compress them firmly together, and means for feeding the curved sheets edgewise from the holder into the path of the knife, substantially as specified.

12. In an apparatus for making metal wool the combination of a curved holder adapted to retain a bundle of thin metal sheets on edge, a movable knife, means for revolving the knife over the holder, and screws and gearing for automatically pushing the bundle edgewise through an opening at one end of the holder into the path of the knife, substantially as specified.

Signed at New York city, in the county of New York, and State of New York, this 19th day of March A. D. 1903.

HARRY C. GAMAGE.

Witnesses:

J. GALLURT,

E. L. LAWLER.