Dec. 21, 1954 C. L. DURKEE 2,697,557

WOOD CHIPPER

Filed March 17, 1952 3 Sheets-Sheet 1

FIG. 2.

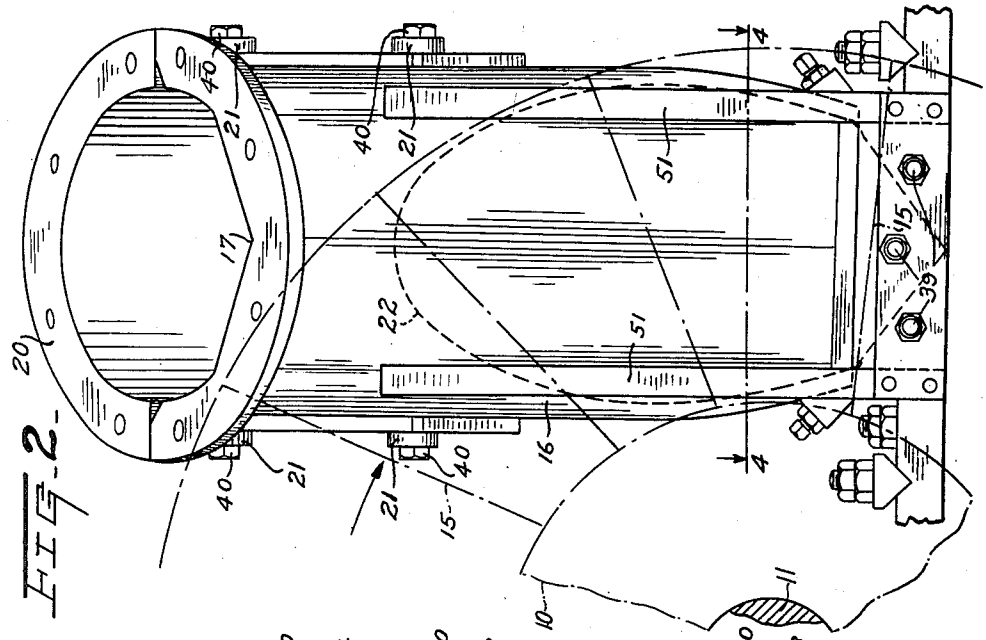
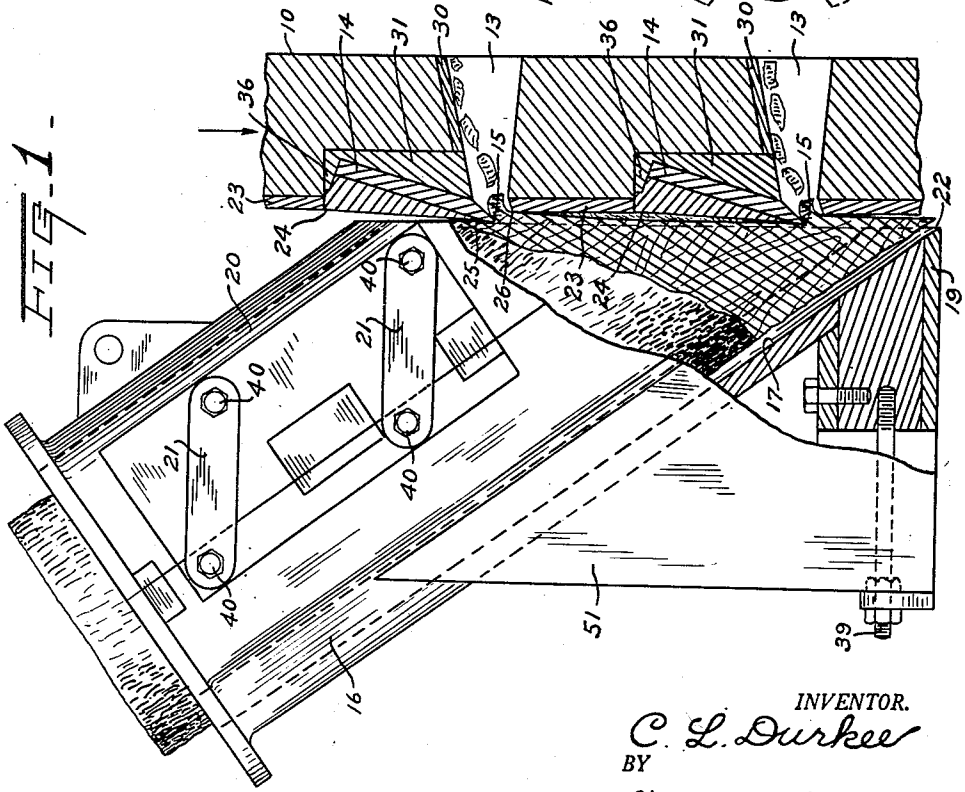


FIG. 1.



INVENTOR.
C. L. Durkee
BY
Lieber & Lieber
ATTORNEYS.

Dec. 21, 1954

C. L. DURKEE

2,697,557

WOOD CHIPPER

Filed March 17, 1952

3 Sheets-Sheet 2

FIG. 4.

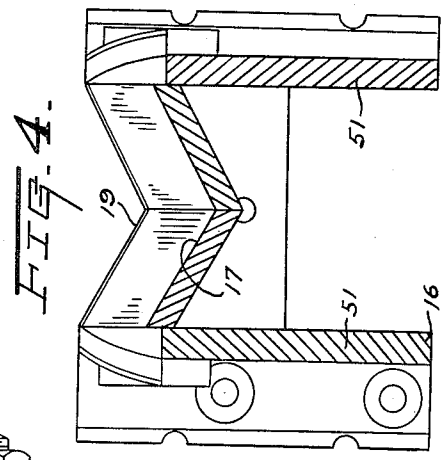
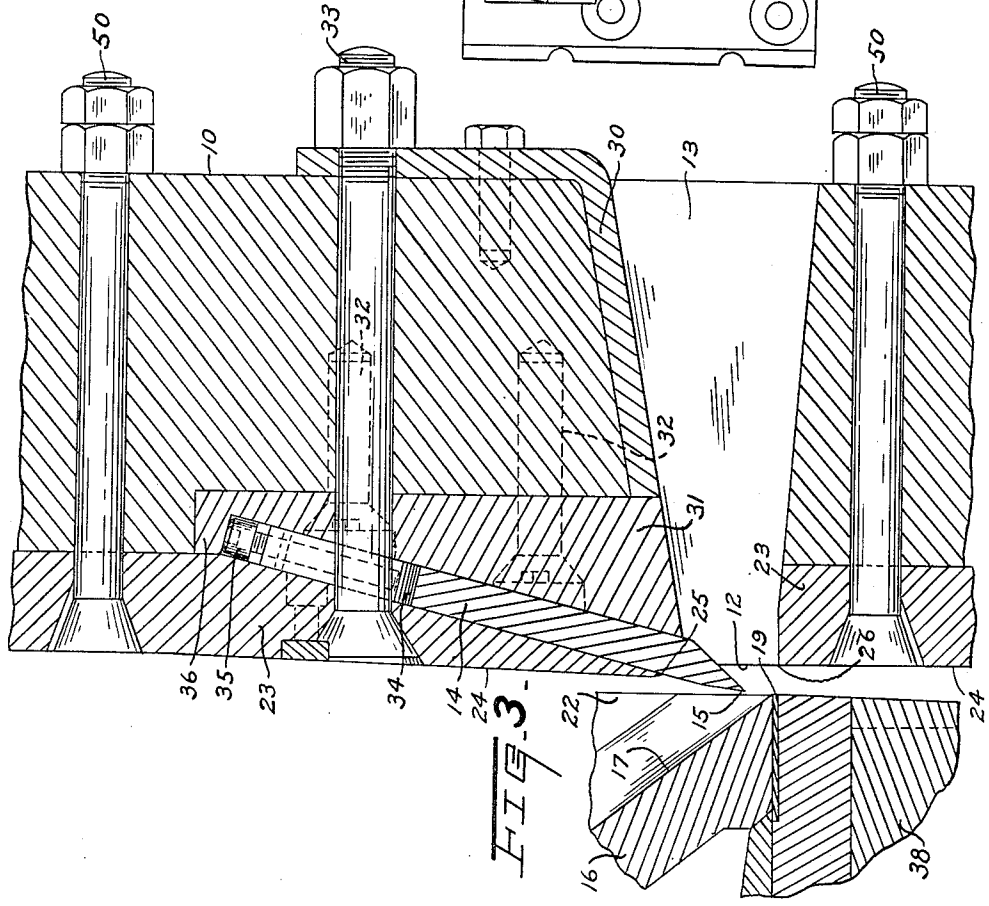


FIG. 3.



INVENTOR.

C. L. Durkee

BY

Lieber & Lieber

ATTORNEYS.

Dec. 21, 1954 C. L. DURKEE 2,697,557

WOOD CHIPPER

Filed March 17, 1952 3 Sheets-Sheet 3

FIG. 9.

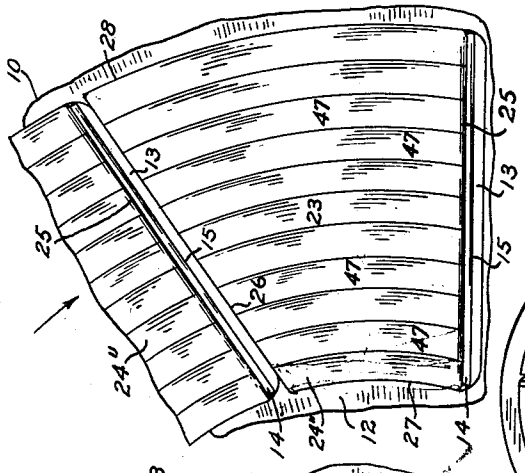


FIG. 8.

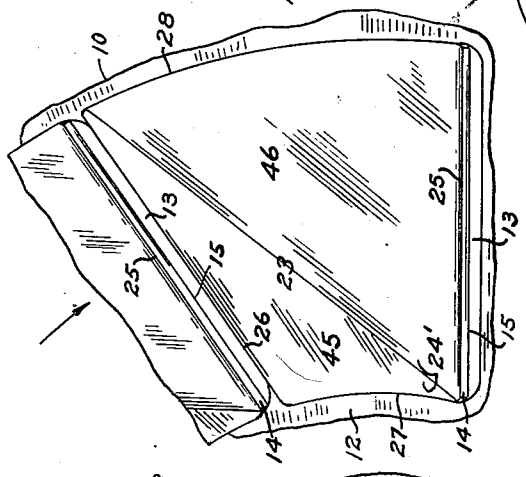


FIG. 7.

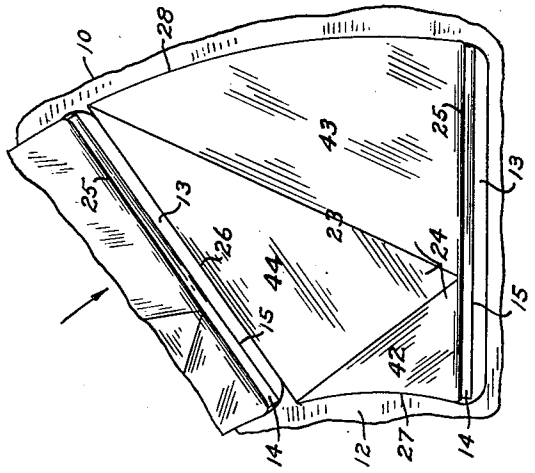


FIG. 6.

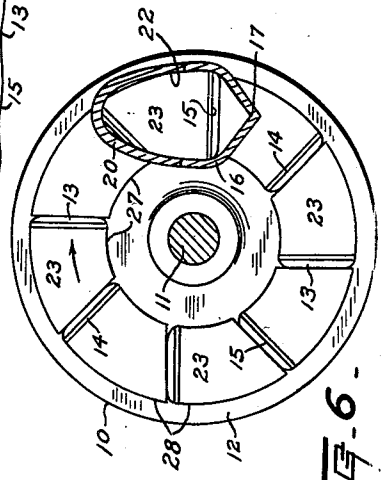
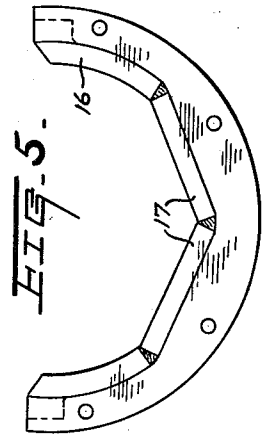


FIG. 5.



INVENTOR.
C. L. Durkee
BY
Lieber & Lieber
ATTORNEYS.

United States Patent Office 2,697,557 Patented Dec. 21, 1954

2,697,557

WOOD CHIPPER

Clarence L. Durkee, Wausau, Wis., assignor to D. J. Murray Manufacturing Co., Wausau, Wis., a corporation of Wisconsin

Application March 17, 1952, Serial No. 276,960

7 Claims. (Cl. 241—92)

The present invention relates generally to improvements in machines for cutting wood into small pieces suitable for further treatment in the production of paper pulp or the like, and relates more specifically to improvements in the construction and operation of rotary chippers of the type having revolving knives cooperable with wood logs delivered through an inclined spout into the path of advancement of the cutting edges of the knives.

The primary object of my invention is to provide an improved wood chipper which is simple and durable in construction and which is also operable with utmost safety to handle logs of various diameters and shapes, and to produce relatively uniform and clean final chips.

Wood chippers of the rotary type wherein an annular series of knives radiating from the central area of a rapidly revolving carrier disc are cooperable with logs or slabs delivered into the path of revolution of the cutting edges by an inclined feed chute or spout, and in which the chips are discharged through openings in the disc adjacent to the individual knives, have long been utilized to produce chips for the paper industry. In most of these prior rotary chippers the knife blades were disposed at an oblique angle relative to the plane of the adjacent flat side surface of the rotating disc with the cutting edges disposed parallel to and located outwardly beyond this plane so as to produce an abrupt drop-off between the disc and each knife edge rearwardly beyond the latter and facing the spout outlet. This structure resulted in the production of non-uniform chip and numerous slivers and excess sawdust, and in order to eliminate the difficulty it has heretofore been proposed to provide each knife with a helicoidally curved heel surface facing the feed spout, and extending from its cutting edge up to the next succeeding chip delivery opening in the rotary disc. While this proposal apparently obviates some of the trouble, the structure is difficult to produce commercially and to maintain in operating condition especially because the helicoidal surfaces are formed directly upon the knife blades themselves which must be resharpened from time to time and thereafter adjusted to compensate for wear, so that these helicoidal surfaced blades have not yet proven entirely satisfactory.

Then too, the stock which is fed to these rotary chippers usually comprises logs of various diameters and shapes, some of which have protruding limb stubs or lumps while others are crooked and tend to become lodged in the feed spout. In order to insure uniform feeding and production of suitable chips, the logs or slabs should preferably be fed relatively near to the medial portion of the path of revolution of the knife edges, and the stock should also be free to advance along the feed chute or spout at all times. The prior wood chippers did not make adequate provision for the accommodation of such variable stock and for automatically preventing jamming of abnormal logs in the feed spout while insuring proper guiding of smaller logs relative to the knife path. Proper advancement of the material being reduced and proper formation of the knives so that they may freely withdraw the stock from the spout under the influence of gravity are of utmost importance in order to insure most efficient and uninterrupted production of uniform chips.

It is therefore an important object of the present invention to provide various improvements in the construction of rotary chipper knife and feed spout assemblages whereby maximum efficiency and the production of uniform chips are assured at all times.

Another important object of this invention is to provide an improved trailing surface on the disc of a rotary chipper beyond the cutting edge of each knife and facing the feed spout outlet, which can be readily machined to provide for the production of uniform chips throughout the entire length of each cutting edge.

A further important object of the invention is to provide a chipper knife assemblage wherein ordinary flat surfaced knife blades are caused to cooperate with retainer plates having outer surfaces facing the feed spout discharge and so formed that they will provide uniform lead for the cutting edges of the knives throughout their entire lengths, whereby the knives may be reground, adjusted or replaced without producing inferior product.

Still another important object of my invention is to provide an improved feed spout especially adapted for cooperation with a multiple knife chipping rotor having trailing surfaces formed for uniform cutting lead associated with the knives, and which will most effectively guide the logs toward the path of revolution of the knives regardless of the diameter or shape of the logs.

An additional important object of my present invention is to provide an improved rotary chipper feed spout which will prevent abnormal logs from lodging or jamming therein, and which will insure free flow of the stock toward the cutting path at all times.

Still another object of the invention is to provide an improved rotary wood chipper which comprises relatively few simple but sturdy parts cooperable to produce uniform chips in rapid succession from diverse types of fibrous stock.

These and other objects and advantages of my invention will be apparent from the following detailed description, but the gist of the improvement is the provision of a multiple-knife rotary chipper utilizing flat surfaced knives each of which is held in place by a plate having a trailing surface for the cutting knife edge formed to produce equal lead throughout the length of the cut and cooperating with a feed spout formed to most effectively guide the stock toward the cutting path and to release abnormal logs which tend to lodge in the spout.

A clear conception of the improved features constituting the present invention, and of the construction and operation of typical commercial chippers embodying the same, may be had by referring to the drawings accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the various views.

Fig. 1 is a part sectional and diagrammatic side view of one of the improved feed spouts applied to a similarly diagrammatic fragmentary developed section of one of the improved chipper rotors, and showing a log being reduced to chips;

Fig. 2 is a rear view of the feed spout shown in Fig. 1, and illustrating the path of travel of the knife edges in dot-and-dash lines;

Fig. 3 is an enlarged fragmentary section through the lower outlet end of a feed spout and through one of the knife mountings and the adjacent portion of the rotor disc, of a slightly modified type of the improved chipper;

Fig. 4 is a horizontal section through the lower half of the feed spout of Figs. 1 and 2, taken along the line 4—4 of Fig. 2;

Fig. 5 is an inlet end elevation of the lower half of the feed spout;

Fig. 6 is a diagram of an eight blade chipper rotor looking toward the knives and showing the location of the feed spout outlet end with respect to the path of travel of the cutters;

Fig. 7 is an enlarged plan view of a fragment of the rotor disc and one of the knives, showing one type of the improved retainer plates providing a uniform lead trailing surface for the knife;

Fig. 8 is a similar fragmentary view of the rotor disc and knife, showing another type of the improved retainer plate also providing a uniform lead trailing surface for the knife; and

Fig. 9 is another similar fragmentary view of the rotor disc and knife, showing still another type of the improved retainer plate likewise providing a uniform lead trailing surface for the knife.

While the invention has been shown herein as having been applied to an eight knife chipper of the horizontal type having several knives in the cut simultaneously, it is not the intent to limit the improvements to such a unit since they are also applicable to chippers having more or less knives and which are otherwise disposed; and it is also contemplated that specific descriptive terms used herein be given the broadest possible interpretation consistent with the disclosure.

Referring to Figs. 1, 2, 3 and 6 of the drawings, the rotary wood chipper illustrated therein comprises in general, a rotary disc **10** mounted upon a central driving shaft **11** and having a plane side surface **12** and an annular series of elongated through openings **13** terminating at the surface **12**; an annular series of planar elongated knives **14** disposed at an acute angle relative to the disc **10** and each having a sharp cutting edge **15** located at the trailing or following edge of one of the disc openings **13** and partially covering the adjacent opening, and all of which edges are disposed in a plane parallel to the surface **12** and extend outwardly away from the axis of the shaft **11**; a feed spout having a lower fixed section **16** provided with a V-shaped bottom **17** and a bed knife **19** at the lower end thereof, and an upper semi-cylindrical section **20** movably connected to the base section **16** by four parallel links **21**, the spout being inclined at an obtuse angle relative to the disc surface **12** and also being provided with an elliptical outlet opening **22** located closely adjacent to the plane of revolution of the knife edges **15**; and a knife heel or retainer plate **23** coacting along a plane surface with each knife **14** and each having a composite outer surface **24** composed of several flat or plane areas facing the spout outlet opening **22** and extending from its leading edge **25** nearest to the corresponding knife edge **15** to its trailing end edge **26** adjacent to the following opening **13**, each of the knife trailing surfaces **24** of the plates **23** being bounded by inner and outer arcuate edges **27**, **28** respectively of unequal length and which are disposed at different angles relative to the disc surface **12**.

The disc **10** should be of sturdy construction and firmly secured to the shaft **11** which may be rotated at relatively high speed from any suitable source of power, so as to cause the annular series of knives **14** to normally travel along a circular path in a common plane perpendicular to the axis of the shaft **11** and in a clockwise direction as indicated by the dot-and-dash lines and by the arrow in Fig. 2. The through openings **13** in the disc **10** are preferably tapered away from the adjacent knives **14**, and may be provided with liners **30** along their trailing sides against which the removed chips impinge and along which these chips normally travel toward the outlet ends of the openings, as illustrated in Fig. 1. In order to position the knives **14** so that they will assume the proper angles relative to the disc surface **12** and will travel in close proximity to the spout outlet, the carrying disc **10** is also provided with a seating pad **31** for each knife blade, secured to the disc **10** adjacent to each liner **30** by screws **32**, as shown in Fig. 3.

The flat or planar knives **14** may be firmly but detachably clamped against the seating pads **31** by bolts **33** which pass freely through slots **34** formed in the inner ends of the blades, as in Fig. 3; and since these knives **14** are subjected to considerable wear and must be resharpened from time to time, provision must be made for adjusting the position of the cutting edges **15** slightly outwardly beyond the leading edges **25** of the retainer plates **23** after each regrinding. The rear portion of each knife **14** is therefore provided with several threaded sockets with which jack screws **35** coact between the slots **34**, and these jack screws **35** react against the integral inner end walls **36** of the adjacent seating pads **31**, as shown in Fig. 3. Adjustment of the jack screws **35** may be effected before the retainer plates **23** and the clamping bolts **33** are applied, and the knives **14** have flat parallel opposite sides coacting with the pads **31** and with the adjacent clamping plates **23**, and are rectangular in shape, while their cutting edges **15** may be disposed either truly radial with respect to the axis of the shaft **11** or tangentially relative to a circle disposed coaxially of the shaft axis.

The feed spout which cooperates with the revolving knives **14** and with the retainer plates **23** so as to produce uniform chips, is of special construction and may be inclined at an acute angle, preferably slightly less than 45°, relative to the disc surface **12**, in order to properly guide the wood into the path of the cutting edges **15** and against the heel plates **23** while preventing jamming of abnormal pieces within the spout. The V-shaped bottom **17** of the lower fixed section **16** of this feed spout rests upon a sturdy foundation **38** shown in Fig. 3, and the bed knife **19** which may be of various types as in Figs. 1 and 3, is adjustable by means of stud bolts **39** toward and away from the path of revolution of the knives **14**; while the spout section **16** is formed to guide both large and smaller round logs toward the medial portion of the cutter path. The parallel links **21** which connect the upper semi-cylindrical spout section **20** with the lower section **16** are attached to these sections **16**, **20** by pivot pins **40** so that the upper section **20** may lift away from its complementary lower section **16** in case an abnormal log tends to become jammed in the spout. This movement takes place without interfering with the knives **14**, and the weight of the heavy spout section **20** will return it to normal position when the obstruction has passed through the spout.

As previously indicated, the formation of the outer surfaces **24** of the retainer plates **23** and which face the outlet end opening **22** of the feed spout is important in order to produce uniform chips throughout the length of each outwardly protruding cutting edge **15** of the knives **14**, because the advancing forward edge **25** of each plate **23** and the trailing rear end edge **26** are disposed parallel to but at different locations relative to the plane disc surface **12** while the inner and outer arcuate bounding edges **27**, **28** are inclined at different angles relative to the surface **12**. Because of the relative angularity of the front and rear edges **25**, **26** of each plate **23**, the inner shorter arcuate edge **27** is far more steeply inclined than the outer longer arcuate edge **28**, and the surface **24** must be formed to maintain substantial contact with the adjacent ends of the logs being cut from a line slightly in back of each cutting edge **15** to a line slightly in advance of the next succeeding edge, if uniform chips of the desired thickness are to be produced.

In order to enable these plate surfaces **24** to be readily machined, it is preferable to provide each surface **24** with several flat areas having straight line generatrices producing several adjoining plane local surfaces intersecting adjacent plane surface areas, and this may be accomplished in various ways as shown in Figs. 7, 8 and 9. In Fig. 7 the surface **24** of each plate **23** is formed with three approximately triangular plane areas **42**, **43**, **44** of which the inner area **42** is bounded by the inner arcuate edge **27** of the plate **23**, while the area **43** is bounded by the outer arcuate edge **28**, and the area **44** is bounded by the rear edge **26** and intersects the other two areas **42**, **43** both of which are also bounded by the forward edge **25** of the plate. In Fig. 8 the surface **24'** of each plate **23** is formed with two approximately triangular plane areas **45**, **46** of which the inner area **45** is bounded by the inner arcuate edge **27** and the trailing edge **26** of the plate **23**, while the area **46** intersects the inner area **45** and is bounded by the outer arcuate edge **28** and the leading edge **25**. In Fig. 9 the surface **24''** of each plate **23** is formed of a series of concentric arcuate plane areas **47** which are progressively more steeply inclined as they approach the inner arcuate bounding edge **27** of the plate **23**, and the leading ends of all of which terminate in the front edge **25** of the plate, while the trailing ends thereof terminate in the rear plate edge **26**. But in all of these modifications the composite surfaces **23**, **23'**, **23''** are formed of adjoining plane areas which substantially contact the logs throughout the spaces between successive knives **14** and thus insure the production of approximately uniform chips.

When the various parts of the improved wood chipper have been properly constructed and assembled the unit may be placed in operation by merely rotating the shaft **11** and disc **10** at the desired speed, thereby causing the annular series of knives **14** to revolve in the direction indicated by the arrows in Figs. 2 and 6. Successive logs or slabs of the stock which is to be reduced, may then be admitted in succession into the upper end of the

feed spout, and as the admitted material gravitates through the abruptly inclined spout bottom **17** it eventually enters the path of the cutting edges **15** of the knife blades and is reduced to chips which pass through the rotor openings **13** and are thrown clear of the disc **10** at the side of the latter remote from the plane surface **12** thereof. When the cutting edges **15** of the inclined knives **14** have passed through the ends of the logs, they promptly but subsequently cooperate with the trailing surfaces **24** of the blade retaining plates **23** to draw or pull the logs toward the disc surface **12** with equal lead as determined by the extent to which the cutting edges **15** of the knives **14** project beyond the plate edges **25** throughout the lengths of the blades, and thus insure the production of chips having uniform fibre length. The V-shaped bottom **17** of the lower hopper section **16** will also guide logs of various diameters toward the medial portion of the cutting path; and if an abnormally formed log which tends to jam within the feed spout is admitted thereto, the upper spout section **20** will swing upwardly with the aid of links **21** and will automatically relieve the obstruction.

The heel plates **23** which cooperate with the cutting edges **15** of the knives **14** to provide the composite trailing surfaces **24**, may be formed either in several pieces or sections as in Fig. 1, or in one piece as in Fig. 3, and may be held in blade clamping position by several bolts **50** as depicted in Fig. 3. The flat areas of these plates **23** which form the heel surfaces may be readily machined on a planer, lathe, or the like with the aid of suitable supports for producing proper angularity or inclination of the plane areas; and by forming the surfaces **24** upon separate plates and not upon the knives **14** standard flat or planar knife stock having rectangular transverse cross-section may be utilized in constructing the knife blades, and the knives **14** may be re-ground and adjusted outwardly to provide the proper relief beyond the knife edges **15** and without disturbing the surfaces **24**. The liners **30** for the chip delivery openings **13** may also be formed either as shown in Fig. 1 or as in Fig. 3, and the feed spout may be constructed of heavy steel plates welded together and may also be provided with triangular supports **51** as shown in Figs. 1, 2 and 4.

From the foregoing detailed description it will be apparent that the present invention provides a rotary wood chipping unit which besides being simple and durable in construction, is adapted to effectively feed the stock to the chipping rotor and to rapidly convert the stock into uniform chips. The improved construction of the rotor with separate plates **23** for holding the knives **14** in place and for providing proper relief and heel surfaces beyond the cutting edges **15** of these knives, not only facilitates manufacture of these rotors but also permits the use of standard blade stock and enables adjustment of the knives **14** without destroying proper coaction of the trailing knife surfaces with the logs. The improved construction of the feed spout with a V-shaped bottom **17** and an upwardly movable top section **20**, insures most effective guiding of the wood stock toward the path of the cutting blades **15** and also prevents possible interruption of the feed when abnormal logs are supplied. The units may be built with any number of knives **14** from four to twelve with rotors of any desired diameter, and perform their function automatically with minimum attention.

It should be understood that it is not desired to limit this invention to the exact details of construction or to the precise mode of operation of the eight knife chipper herein shown and described, since various modifications within the scope of the appended claims may occur to persons skilled in the art.

I claim:

1. In a wood chipper, a rotary disc having a plane side surface disposed substantially perpendicular to its axis of rotation and also having an annular series of elongated openings therethrough terminating at said surface, an annular series of knives each having a cutting edge projecting partly over one of said openings and all located parallel to said disc surface and extending outwardly away from said axis, a spout for feeding wood at an acute angle toward the plane of revolution of said knife edges, and means forming a trailing surface extending rearwardly away from each knife a short distance rearwardly of its cutting edge and facing said spout, each of said trailing surfaces comprising several plane areas disposed at different angles relative to said plane disc surface and terminating substantially in the plane of said disc side surface.

2. In a wood chipper, a rotary disc having a plane side surface disposed substantially perpendicular to its axis of rotation and also having an annular series of elongated openings therethrough terminating at said surface, an annular series of knives each having a cutting edge projecting partly over one of said openings and all located parallel to said disc surface and extending outwardly away from said axis, a spout for feeding wood at an acute angle toward the plane of revolution of said knife edges, and means forming a trailing surface extending rearwardly away from the cutting edge of each knife and facing said spout, each of said trailing surfaces being bounded by inner and outer arcuate edges disposed at different oblique angles relative to said disc side surface and having approximately radial leading and trailing edges the former of which lie slightly inwardly of the plane of travel of said cutting edges while the latter lie substantially in the plane of said disc side surface.

3. In a wood chipper, a rotary disc having a plane side surface disposed substantially perpendicular to its axis of rotation and also having an annular series of chip delivery openings therethrough terminating at said surface, an annular series of knives each having a cutting edge projecting partly over and extending outwardly along one of said openings and all located parallel to said disc surface, a spout for feeding wood at an acute angle toward the plane of revolution of said knife edges, and a retainer plate for each knife forming a trailing surface extending rearwardly away from the cutting edge thereof and facing said spout, each of said trailing surfaces comprising several intersecting plane areas disposed at different angles relative to said plane disc surface.

4. In a wood chipper, a rotary disc having a plane side surface disposed substantially perpendicular to its axis of rotation and also having an annular series of chip delivery openings therethrough terminating at said surface, an annular series of planar rectangular knives each having a cutting edge projecting partly over and extending outwardly along one of said openings and all located parallel to said disc surface, a spout for feeding wood at an acute angle toward the plane of revolution of said knife edges, and a retainer plate for each knife having a flat knife engaging inner surface and an outer surface extending rearwardly away from the cutting edge of the adjacent knife and facing said spout, each of said outer plate surfaces comprising several intersecting plane areas disposed at different angles relative to said plane disc surface.

5. In a wood chipper, a rotary disc having a plane side surface disposed substantially perpendicular to its axis of rotation and also having an annular series of elongated openings therethrough extending away from the disc axis and terminating at said surface, an annular series of knives each having opposite parallel faces and a cutting edge projecting partly over and extending away from said axis at one of said openings and all located parallel to said disc surface, a spout for feeding wood at an acute angle and medially toward the plane of revolution of said knife edges, and a retainer plate for each knife having an inner knife clamping surface and an outer surface extending rearwardly away from the cutting edge of each knife and facing said spout, each of said outer plate surfaces comprising several plane areas inclined at different angles relative to said plane disc surface and terminating near the forward edge of the next succeeding through opening.

6. In a wood chipper, a rotary disc having an annular series of elongated through openings extending away from the axis of rotation of the disc, a knife carried by said disc adjacent to each of said openings and projecting forwardly from the trailing side of the adjacent opening, a spout for feeding material to be chipped toward said knives, and means forming trailing surfaces extending rearwardly away from the cutting edge of each knife and facing said spout, the cutting edges of all of said knives being revolvable in a common plane perpendicular to said axis and each of said trailing surfaces having its foremost edge disposed slightly inwardly of said plane and being bounded by several plane surfaces extending at different acute angles away from the plane.

7. In a wood chipper, a rotary disc having an annular series of elongated through openings extending away from the axis of rotation of the disc, a knife carried by said disc adjacent to each of said openings and projecting forwardly from the trailing side of the adjacent open-

ing, a spout for feeding material to be chipped toward said knives, and means forming trailing surfaces extending rearwardly away from the cutting edge of each knife and facing said spout, the cutting edges of all of said knives being revolvable in a common plane perpendicular to said axis and the knives being independently adjustable relative to said plane, and each of said trailing surfaces terminating short of the adjacent cutting edge and being bounded by several plane surfaces extending at different acute angles away from said common plane.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
807,571	Morterud	Dec. 19, 1905
1,684,411	Rae	Sept. 18, 1928
1,942,675	Wegger	Jan. 9, 1934
2,183,224	Norman	Dec. 12, 1939
2,247,665	Ottersland	July 1, 1941
2,570,845	Ottersland	Oct. 9, 1951