

A. O. CROZIER,
 APPARATUS FOR CUTTING CONCRETE AND THE LIKE.
 APPLICATION FILED FEB. 8, 1919.

1,405,671.

Patented Feb. 7, 1922.

3 SHEETS—SHEET 1.

Fig. 1.

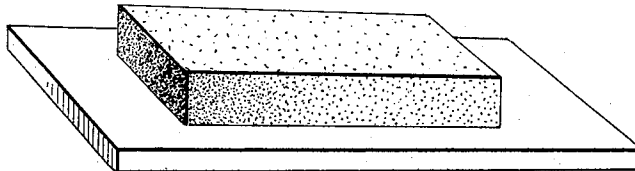


Fig. 2.

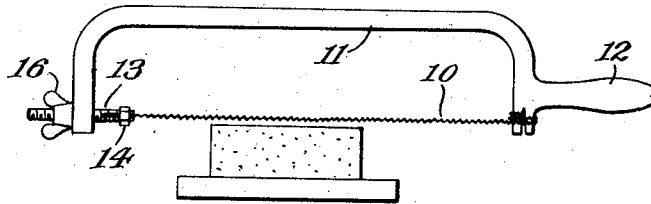


Fig. 7.

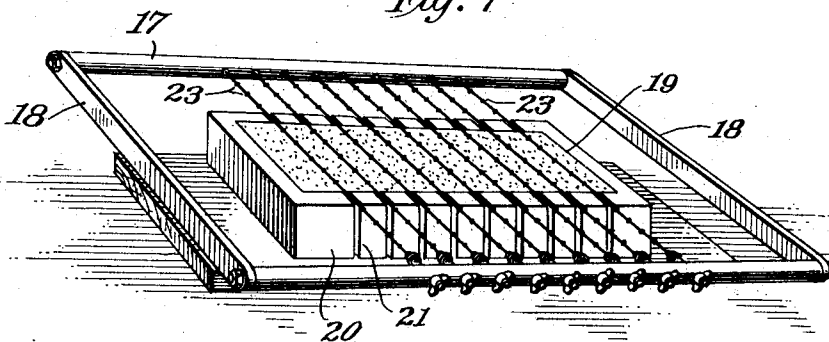


Fig. 8.

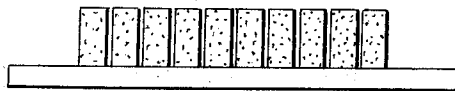
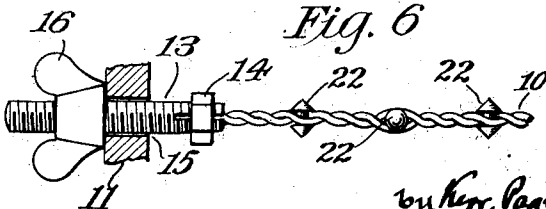


Fig. 6.



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3 SHEETS—SHEET 2.

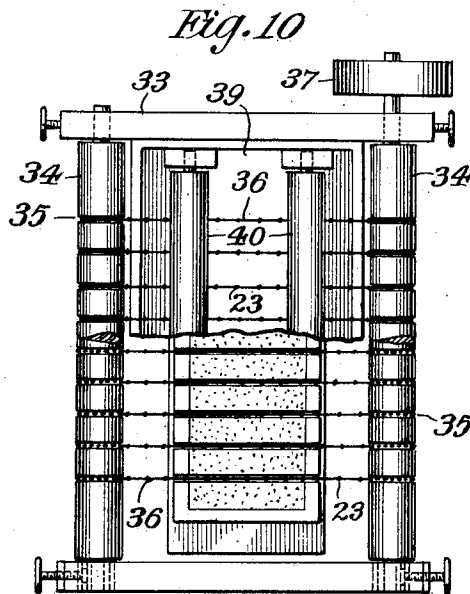
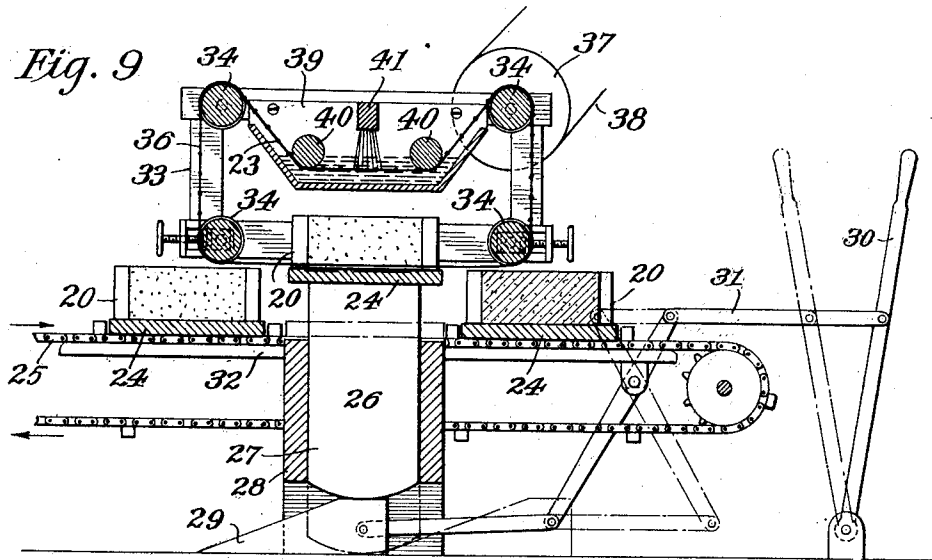


Fig. 3



Fig. 4

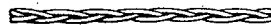


Fig. 5



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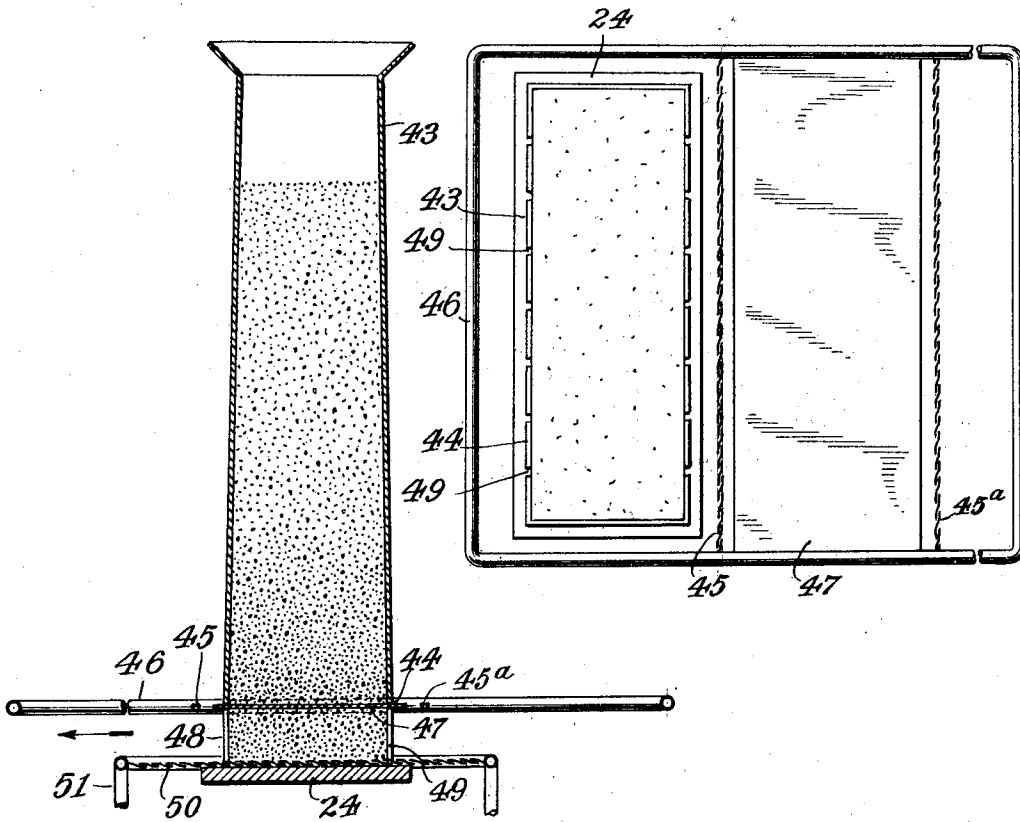
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3 SHEETS—SHEET 3.

Fig. 11

Fig. 12



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CUTTING CONCRETE AND THE LIKE.

1,405,671.

Specification of Letters Patent.

Patented Feb. 7, 1922.

Application filed February 8, 1919. Serial No. 275,696.

To all whom it may concern:

Be it known that I, ALFRED OWEN CROZIER, a citizen of the United States, temporarily residing at New York city, county and State of New York, have invented certain new and useful Improvements in Apparatus for Cutting Concrete and the like, of which the following is a full, clear, and exact description.

10 This invention relates to the manufacture of cementitious or concrete articles, such as brick, tile, pipe, building blocks, etc. More particularly it relates to the manufacture of such articles by methods in which a
15 shaped mass or body of concrete of rectangular, circular or other suitable cross section is formed and then cut up or subdivided into smaller articles. The body or mass of concrete from which such portions are severed can be conveniently produced by the so-called column method. In this
20 method an upright hollow shaft or container is provided, of which at least the lower portion has the desired cross sectional size and contour. The shaft is filled with (preferably) "wet" concrete, up to such
25 height that the weight of the superincumbent mass upon the lower portion will exert a marked compacting, or "densifying", and
30 unwatering effect on the lower portion, from which latter successive sections are removed, the column in the shaft descending after each removal and being maintained at the proper height by the continuous or inter-
35 mittent addition of fresh concrete of suitable consistency. A convenient and effective apparatus for practicing the method thus briefly outlined is described in my Patent No. 1,330,172, issued February 10, 1920,
40 to which reference may be had for a more complete explanation and which is hereby made a part of the present disclosure.

Heretofore my practice has been to use one or more knives to sever and cut up or
45 divide the more or less compacted portion of the column. A clean cut is thus produced, with the additional advantage that the movement of the knives has a "trowelling" effect on the surfaces of the concrete
50 articles, making said surfaces denser and less porous. The knives, however, suffer considerable wear, and for certain purposes

the smooth, "slick" finish imparted by the knives is not desirable, as for example, on brick, tile, or other concrete articles upon
55 which plaster or stucco or the like is to be applied.

I have therefore been led to devise my present invention, which has for its chief object to provide improved means for cutting concrete, by which surfaces of practically any desired degree of roughness can be produced, and which, when worn out, can be replaced at small expense. To this and other ends the invention consists in the novel features and combinations hereinafter described.

In its preferred form my improved cutting device operates in the manner of a saw, and consists preferably of two or more wires twisted, woven or braided together and supported in any convenient and suitable manner. Each set of twisted, braided, or woven wires may be conveniently termed a "cutter", and one or a plurality of cutters may be provided, according to the number of
75 cuts that are to be made. It will be understood that cutters of this type are intended to operate only on concrete or other cementitious bodies which have not completely
80 "set" and hardened. Partial setting and hardening by no means makes their use impossible or even impracticable.

Referring to the accompanying drawings, in which several embodiments of the invention are illustrated,

Fig. 1 shows in perspective a rectangular body of concrete, for example a section severed from the lower portion of a cementitious column formed in the manner illustrated in
90 Figs. 11 and 12. The said body is shown resting on a suitable pallet or other support, and it is assumed that it is to be cut up or divided into smaller articles, in the present
95 instance bricks.

Fig. 2 illustrates a simple embodiment of the invention and indicates the manner in which it is used.

Fig. 3 is a detail view showing a cutter composed of two wires twisted together. 100

Fig. 4 is a detail view showing a cutter composed of three wires braided together.

Fig. 5 is a detail view showing a cutter composed of a chain.

Fig. 6 is a detail view showing a cutter (in the present instance two wires twisted together) provided with "knots" in the form of double headed studs or rivets, for use when it is desired to have the concrete articles scored or grooved more or less deeply to afford a more secure hold or anchorage for plaster, stucco, or other facing. This figure also illustrates a simple and effective method of securing and tautening the cutter in its frame.

Fig. 7 is a perspective view showing a simple embodiment of the invention in which a plurality of cutters are provided, for making a plurality of cuts simultaneously.

Fig. 8 is an end elevational view showing the bricks produced by cutting up a concrete body such as is illustrated in Fig. 1.

Fig. 9 is a vertical section of a power-driven manually controlled embodiment of the invention.

Fig. 10 is a plan view of the apparatus shown in Fig. 9.

Fig. 11 is a diagrammatic view in vertical section, illustrating the column method of making concrete articles, with cutting devices of the kind provided by my present invention, for the severing of successive sections from the lower portion of the column.

Fig. 12 is a sectional plan view in the plane of the slot 44, Fig. 11.

The cutter employed in my present invention may be made in various ways. For example, it may consist simply of two or more wires,—say piano wires of suitable gauge,—twisted together as indicated in Fig. 3. If more than two wires are used they may be twisted together, or they may be woven together, or braided, as illustrated in Fig. 4. In general the thicker the wires, and the tighter they are twisted, braided, or woven, the more material the cutter will remove in the sawing operation and the wider will be the cut or kerf, and accordingly these factors should be kept in mind in designing cutters for use with a given apparatus or method for producing the body of concrete which is to be severed or cut up. The invention is not limited, however, to the use of cutters composed of wires. Other forms may be used, as for example, a chain, as in Fig. 5.

In the device illustrated in Fig. 2, the cutter 10 is secured in a frame 11 of the hacksaw type, having a handle 12 by which it can be manipulated. One end of the cutter can be fastened to the frame in any convenient manner, as for example, by wedging it in a narrow V-shaped slot in the handle end of the frame and wrapping it around the part in which the slot is formed. The other end can be inserted into a split socket member 13 (see also Fig. 6) provided with a tapered thread to receive a binding nut 14. The member 13 extends through an opening 15 in the frame and is provided with a wing nut

16 by which the device can be drawn outwardly and the cutter thereby tensioned and made suitably taut. That is, it may be actually tensioned, or it may even be slack. In the latter case the pressure exerted in making the cut puts the cutter under slight but sufficient tension.

In the device shown in Fig. 7 a simple frame 17, of rectangular form, is provided, and is equipped with a plurality of cutters. The frame may consist of two pieces of pipe secured at their ends to flat strips 18. If necessary or desirable, vertical guides for the cutters may be provided, to insure accurate spacing and parallelism of the cutters and also to keep the edges of the bricks sharp and clean-cut by preventing bits of material from being torn off by the reciprocating cutters. For such purpose a closely fitting form 20 may be used, having vertical slots 21 in which the cutters can work.

Scoring or grooving of the surfaces of the articles can be effected, simultaneously with making the cut, by providing the cutter with knots or other suitable projections, as for example, the rivets or studs 22 with pointed heads shown in Fig. 6. If the progress of the cutter through the concrete is rapid in comparison with the speed and range of its reciprocation, the projections will form wavy grooves or scorings in the sides of the bricks, as will be readily understood. On the other hand, by increasing the speed or range of reciprocation, or both, or by decreasing the pressure on the cutter so as to diminish the speed of the cut,—in short, by suitable variation of any one or more of these factors,—practically any degree of surface roughness can be produced, as will be readily understood. This is a highly advantageous feature, as it affords secure anchorage for mortar, and also for plaster, stucco, or other facing and therefore permits the same to be applied directly to the bricks or other products instead of requiring the use of metal lathing or other intermediate support as has been customary heretofore. In Fig. 7 the cutters are shown equipped with scoring, grooving or roughening devices 23, but it is to be understood that devices for such purposes can be employed in other embodiments of the invention whenever their use is necessary or desirable.

In Figs. 9 and 10 I have illustrated a power-driven machine to receive and cut up into bricks or other smaller articles, larger concrete bodies delivered from a suitable forming or shaping apparatus, as for example, an apparatus of the general type described in my Patent No. 1,330,172, hereinbefore referred to. In the machine illustrated, the relatively large articles or bodies, resting on pallets 24, are delivered by an intermittently moving conveyor 25 com-

posed of two chains between which is an elevator 26. The latter comprises a vertically movable support 27 which can descend by gravity in a guide 28 and can be raised at will by means of a horizontally movable wedge-block 29 actuated by a hand lever 30 through the medium of a suitable connecting linkage 31. Above the conveyer (the upper reach of which travels on supporting rails or guides 32 to prevent sagging) is a suitable frame 33. At the upper and lower corners of the frame are journaled four elongated pulleys or rollers 34, grooved circumferentially as at 35, to receive the cutters 36 which are in the form of endless belts, resembling band saws in operation and effect. One of the rollers is equipped with a driving pulley 37 to receive a driving belt 38.

The conveyer 25 being at rest, with a loaded pallet 24 directly above the elevator 26, the operator advances the wedge-block 29, thereby lifting the pallet off the conveyer and bringing the concrete article into contact with the lower reach of the moving cutters 36. When the cutting operation is completed the block 29 is retracted, thereby allowing the pallet to descend until it again rests on the conveyer. The latter now advances, carrying the pallet to the position shown at the right (whence it is removed over the side of the conveyer) and carrying the next pallet, with another large article upon it, into position over the lifting device 26. If necessary or desirable, the concrete bodies on the pallets can be supported laterally by slotted frames 20 as in Fig. 7, to prevent or diminish tearing or roughening of the edges as before explained. In the operation of the machine the interstices of the cutters tend to collect concrete which, hardening more or less rapidly, may accumulate to such an extent as to impair the work of the cutters. To prevent such results I provide in the upper part of the frame 33 a receptacle 39 containing water, into which the travelling cutters are carried in their upper reach by idler guide-rollers 40. Across the receptacle or trough is a brush 41. The cutters are thus continuously washed and scrubbed, and thereby freed of all adhering material, so that they are always clean when they enter the concrete article. The conveyer, as 25, which delivers the articles to the dividing machine, can be operated by any convenient and suitable means, not shown, preferably under the control of the attendant so that he can regulate the rate of delivery according to the rate at which the articles are being cut up.

In the so-called column method of making concrete articles, illustrated diagrammatically in Figs. 11 and 12, a hollow upright shaft or container 43 is provided, which is filled with wet concrete to a height such that

the weight of the upper portion of the column will exert on the lower portion a marked compacting and unwatering effect. By "wet concrete" as the term is herein used, I mean a mixture of cement, inert material (for example sand), and water in excess of the amount needed for complete hydration of the cement. The compacting or densifying effect mentioned eliminates the excess water from the lower portion of the column (the water largely escaping upwardly in the shaft) but leaves in such portion enough water for satisfactory hydration. The bottom of the shaft is closed by a removable pallet or closure 24, on which the column rests, and above the pallet, at a height depending on the size of the concrete articles which are to be produced, the shaft has a horizontal slot 44 to admit the device by which the more or less compacted lower portion is severed from the rest of the column. According to the present invention this severing device may be a cutter of the type hereinbefore described, for instance, one composed of twisted or braided wires, as 45, carried by a frame 46 of any suitable form and construction which can be moved transversely of the column and at the same time reciprocated laterally to give the desired sawing effect. If it is found necessary or desirable to support the upper part of the column until the severed section is removed, the frame 46 may be provided with a transverse plate 47 in rear of the cutter 45, so that as the latter progresses it is followed by the supporting plate. After the severed section is removed (in the present instance downwardly by lowering the pallet) an empty pallet is placed under the shaft, and the frame 46 is suddenly retracted to the position shown in Fig. 12, whereupon the column, no longer supported, descends upon the pallet with a powerful impact, which further compacts the section which is next to be severed. If desired, another cutter, as 45^a may be provided. In such case, assuming that in Fig. 12 the frame 46 was moved in the direction of the arrow to make the cut, the subsequent removal of the supporting plate is effected by further movement in the same direction. In the next operation the frame moves in the opposite direction and the other cutter, 45^a makes the cut. Then the supporting plate is removed by further movement in the same direction, to the position shown in Fig. 12. This construction makes it unnecessary to move the severing device in two directions in the same cycle.

I may use one or more cutters of the type herein described, to divide the severed part or section of the column into smaller articles before removal from the shaft. For this purpose the portion 48 of the shaft below the slot 44 is provided with one or more ver-

tical slots, as 49, according to the number of bricks or other articles into which the severed body is to be divided. A corresponding number of cutters 50 are arranged to work in these slots, being carried by a frame 51 (not shown in Fig. 12) by which they can be raised, and simultaneously reciprocated lengthwise. When the column descends, the vertically operating cutters occupy the position indicated in Fig. 1, on the pallet 24. They may be operated before or after, but preferably after, the horizontal cutter has done its work. Suitable mechanism may be provided for actuating the horizontal and vertical cutters by power, as for example, the mechanism illustrated in my copending application Ser. No. 383,501.

If ordinary hand or circular saws are used the smooth sides thereof tend to smooth or "slick" the sides of the articles by a "troweling effect" instead of giving them the roughness or texture desired and produced when cutters of the type herein described are employed. Moreover, the use of a single wire cutter, such as is common for cutting clay products, is impracticable when the concrete is so thoroughly compacted by the column method or otherwise as to eliminate most of the excess water and adjust or "dovetail" together the sharp angles of the cement-coated sand; but the cutter herein described will go through the concrete easily and with little strain on the wires, since the twists or bends of the wires dislocate and rearrange the individual sand particles where the cut or slot is being made, and either push the particles back into the concrete and out of the way, or carry them forward and out of the cut.

It is to be understood that the invention is not limited to the forms herein specifically illustrated and described, but can be embodied in other constructions without departure from its spirit. The appended claims describe the cutter as composed of wires twisted together, but such claims are intended to cover equivalents, particularly braided wires, woven wires and chains.

I claim:

1. A device for cutting compacted and densified concrete, comprising a cutter composed of wires twisted together, and means for supporting the cutter and permitting actuation thereof in the manner of a saw.
2. A device for cutting compacted and densified concrete, comprising a cutter composed of wires twisted together, means for supporting the cutter and permitting actuation thereof in the manner of a saw, and means for tensioning the cutter.

3. A device for cutting compacted and densified concrete, comprising a cutter composed of wires twisted together and provided with lateral projections adapted to score or roughen the surface of the concrete,

and means for supporting the cutter and permitting actuation thereof in the manner of a saw.

4. A cutter for cutting or dividing bodies of compacted and densified concrete, consisting of a plurality of wires twisted together and held suitably taut.

5. In an apparatus for cutting compacted and densified concrete, in combination, a support for a concrete article, one or more cutters composed of twisted wires, means for driving the cutters longitudinally, means for preventing fraying of the edges of the cut or cuts where the cutter or cutters emerge from the concrete, and means for producing relative movement of approach of the cutters and said support to cut the concrete article on the latter.

6. In an apparatus for the purpose described, in combination, a vertically movable support for a concrete article, one or more cutters composed of twisted wires arranged above the support, means for driving the cutters longitudinally, and means for raising the support to bring the concrete article thereon into engagement with the cutters.

7. In an apparatus for the purpose described, in combination, a support for a concrete article, one or more endless band cutters composed of twisted wires arranged above the support, means for driving the cutters longitudinally, and means for producing relative movement of approach of the cutters and the support to cut the concrete article on the latter.

8. In an apparatus for the purpose described, in combination, a support for a concrete article, one or more cutters composed of twisted wires, means for driving the cutters longitudinally, means for producing relative movement of approach of the cutters and the support to cut the concrete article on the latter, and means for preventing fraying of the edges of the cut or cuts where the cutter or cutters emerge from the concrete, said means comprising a housing enclosing the concrete and provided with one or more slots to permit the passage of the cutter or cutters.

9. In an apparatus for the purpose described, in combination, a support for a concrete article, one or more endless band cutters, means for driving the cutters, and means for producing a relative movement of approach between the cutters and the support to cut the concrete article on the latter.

10. In an apparatus for the purpose described, in combination, a plurality of parallel cutters, means for actuating the same lengthwise, means for bringing a concrete article into engagement with the cutters to divide the article into parts, and means for preventing fraying of the edges of the cut or

cuts where the cutter or cutters emerge from the concrete, said means comprising a housing enclosing the concrete and provided with one or more slots to permit the passage of the cutter or cutters.

11. In an apparatus for the purpose described, in combination, a cutter composed of twisted wires, means for actuating the same lengthwise, and means for cleaning the cutter of adhering concrete as the cutter is actuated.

12. In an apparatus for the purpose described, in combination, an endless band cutter composed of twisted wires, means for driving the cutter continuously in one direction, and a cleaning receptacle through which the cutter passes.

13. In an apparatus for the purpose described, in combination, an endless band

cutter composed of twisted wires, means for driving the cutter continuously in one direction, a cleaning receptacle adapted to contain a liquid through which the cutter passes as it travels, and a brush arranged to engage the cutter.

14. In an apparatus for the purpose described, in combination, an endless band cutter composed of twisted wires, supporting devices for the cutter providing upper and lower reaches, means for driving the cutter, a liquid receptacle below one of the reaches, means for carrying the cutter in the latter reach through the receptacle, and a brush arranged to engage the cutter in its travel through the receptacle.

In testimony whereof I hereunto affix my signature.

ALFRED OWEN CROZIER.