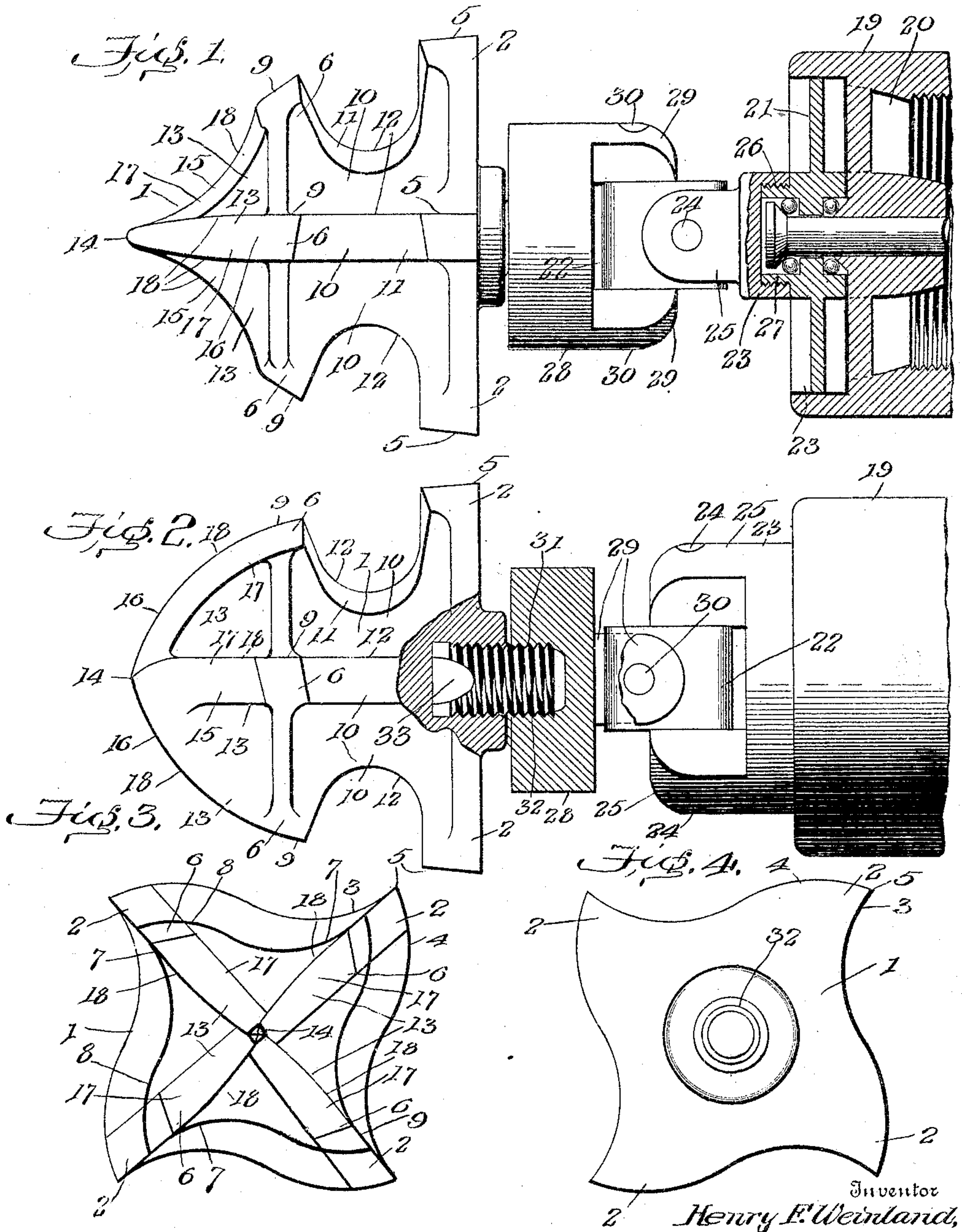


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H. F. WEINLAND.
BOILER TUBE CLEANER.
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Witnesses

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10/1/12

UNITED STATES PATENT OFFICE.

HENRY F. WEINLAND, OF SPRINGFIELD, OHIO, ASSIGNOR TO THE LAGONDA MANUFACTURING COMPANY, OF SPRINGFIELD, OHIO, A CORPORATION OF OHIO.

BOILER-TUBE CLEANER.

No. 850,701.

Specification of Letters Patent.

Patented April 16, 1907.

Application filed March 21, 1906. Serial No. 307,173.

To all whom it may concern:

Be it known that I, HENRY F. WEINLAND, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Boiler-Tube Cleaners, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to boiler-tube cleaners, and more particularly to that type of cleaner in which a cleaner-head rotated at a high velocity is passed through the tube to be cleaned and being connected with its driver
15 by a universal joint or coupling acts upon the scale through the medium of centrifugal force to break up or disintegrate and remove the same.

20 The object of the present invention is to provide a construction similar in some respects in its operation and functions to a known form of cleaner, but which will possess certain advantages of its own, hereinafter specified, with respect to its simplicity, durability, cost of construction, and efficiency.

25 To these ends my invention consists in certain novel features, which I will now proceed to describe and will then particularly point out in the claims.

30 In the accompanying drawings, Figure 1 is a side elevation of a structure embodying my invention in one form, illustrating my improved cleaner-head as connected to a turbine-motor of approved construction. Fig.
35 2 is a plan view of the same, partly broken away. Fig. 3 is a front elevation of the cleaner-head detached, and Fig. 4 is a rear elevation of the same.

40 In the said drawings, in which I have shown my improved cleaner-head as connected by a universal joint to an approved type of turbine-motor, said head is shown as formed in a single piece. This integral head may be readily and cheaply constructed of
45 cast-iron suitably hardened as a whole or in part by any approved process, its form being such that it may be readily produced by casting. It comprises a central or body portion 1, from which rigid picking or cutting teeth
50 extend outward in a plurality of circumferential groups of forwardly-diminishing length, the teeth of the groups being in longitudinal alinement and separated from each other by wide and deep clearance-spaces. The longi-

55 tudinally-alined teeth are connected by longitudinal concave or inwardly-curved ribs provided with correspondingly-curved cutting edges, and from the front circumferential group of teeth there extend forward
60 wardly-converging longitudinal ribs alternately convex or outwardly curved and concave or inwardly curved and provided with correspondingly-curved cutting edges, said ribs converging to a point at the extreme
65 front end of the head.

Referring to the drawings for a more detailed description, it will first be noted that in the particular construction illustrated I have shown the head as provided with two
70 circumferential groups, each group composed of four teeth. The teeth of the rear group are designated as a whole by the numeral 2 and being only four in number are spaced sufficiently apart to give ample clear-
75 ance between the several teeth of the group. The front face of each tooth is concave, as indicated at 3, while the back is convex, as indicated at 4, thus forming at their meeting a
80 cutting edge 5 with ample clearance in front thereof and sufficient metal at the back to give the tooth the proper strength. The
cutting edge 5 extends longitudinally of the head and is preferably slightly inclined with
85 respect to the central longitudinal axis of the head, the inclination being in an inward and forward direction.

The teeth of the front circumferential group are indicated as a whole by the reference-numeral 6, said teeth being shorter or of
90 less radial length than the teeth of the rear group. Each front tooth has a concave front face 7 and convex rear face or back 8, as in the case of the rear teeth, to give proper clearance and strength, and the cutting edge
95 9, formed by the meeting of the back and front, extends longitudinally of the head with a considerable forward and inward inclination, much greater or more abrupt than the inclination of the cutting edges of the
100 rear teeth.

The distance between the front and rear circumferential groups of teeth is sufficiently
105 great to constitute an ample clearance-space between the two groups for large pieces of scale. It will be noted that the teeth of the front and rear groups are in longitudinal alinement and the space between the groups is traversed by longitudinal ribs 10, connect-

ing the corresponding teeth of the two groups. These ribs are concave or inwardly curved, thus leaving ample clearance-space between the teeth which they connect, and their edges
5 are beveled off, as indicated at 11, to form cutting edges 12, which extend from tooth to tooth, joining at their extremities with the cutting edges 5 and 9 of the rear and front teeth.

10 From the teeth of the front group there extend forward ribs 13, corresponding in number with the teeth, and converging forwardly to a point 14 at the extreme front end of the head. These ribs are alternately concave or
15 inwardly curved, as indicated at 15, and convex or outwardly curved, as indicated at 16, and are beveled off on their rear sides, as indicated at 17, to form cutting edges 18.

It should be noted that the head is thus
20 provided with four continuous longitudinal cutting edges, each extending from the back of a rear tooth to the front point 14 of the head, and that each of these four cutting edges lies practically throughout its whole extent
25 in a plane in which the central longitudinal axis of the head also lies, each of said four cutting edges being deflected somewhat at its front end to meet the corresponding cutting edge, which lies diametrically opposite on
30 the other side of the head.

The cleaner-head is connected to the driver by a universal joint or coupling, as already stated. In the present instance I have shown the driver as a turbine-motor of an approved type, comprising a casing 19, adapted
35 to be connected to a hose or other means for supplying water under pressure thereto, said casing having guide-passages 20, which direct the water in jets against a turbine water-
40 wheel 21, mounted to rotate in the casing. The universal coupling may be of any approved form, that which I have shown being well known and comprising a block or link 22, to which is connected a coupling member 23
45 by means of a pivot 24, passing through lugs 25, forming part of the coupling member, and through the block 22. The coupling member 23 is adapted to be connected to the driver or water-wheel, having a threaded
50 socket 26 to screw onto the correspondingly-threaded hub 27 of the wheel. The other coupling member 28 has lugs 29 to receive a pivot 30, which also passes through the block 22, being arranged at right angles to the pivot
55 24. The coupling member 28 has a threaded socket 31, into which screws a threaded shank 32, projecting from the rear of the cleaner-head 1. Preferably this threaded shank is formed by means of a separate
60 threaded piece around which the head is cast, being firmly united thereto by the engagement of the threads of the embedded portion with the metal of the head. In order to prevent relative rotation of the head and
65 shank and a consequent loosening of their

connection, the embedded portion of the shank is flattened at the sides thereof, as indicated at 33.

In practice the cleaner-head being rotated at high velocity within the tube by its driver
70 assumes a position inclined to the axis of the tube, its free forward end moving outward toward the wall of the tube. This brings the ends of the teeth into contact with the incrustation, and the said teeth act upon the
75 incrustation with a picking action, being thrown against the same by centrifugal force, rebounding after each blow and again being thrown outward against the incrustation after each rebound, thus delivering a rapid
80 succession of hammer-like blows with the cutting edges of the teeth. By extended practical tests I have found that these teeth thus carried around by the rotatory motion of the head and at the same time moving radially
85 outward and striking the sediment with their cutting edges, will effectually loosen and remove the same, frequently breaking the hard sediment into long flakes or scales and detaching them from the tube. I attribute
90 this very efficient action of the teeth in a large degree to the fact that they strike the scale at points which are comparatively widely separated and that the large intervening clearance-spaces between the teeth
95 materially contribute to the successful detaching of the scale, as they permit the scale to move away from the wall of the tube when struck and loosened, the scale not being held to its position or prevented from separating
100 by other contacting parts in close proximity to the teeth which have just delivered their blow. The longitudinal alinement of the teeth and the longitudinal arrangement of the continuous cutting edges result in the
105 formation of clearance-spaces which are continuous from front to rear of the head to accommodate long flakes or scales, while the alined teeth result in the delivery of simultaneous blows by a plurality of teeth along the
110 same longitudinal line of the wall of the tube, although ample clearance-space is left between the teeth which thus strike the scale at the same time and those which deliver the following blow. From the graduation of the
115 radial length of the teeth it follows that when the head assumes an angular position in the tube to deliver its blow the ends of the teeth which contact with the incrustation strike the same about simultaneously, and the forward and inward inclination of the cutting
120 edges of the teeth serve to bring said cutting edges more squarely and uniformly against the incrustation. The forwardly-converging cutting-ribs at the front of the head act
125 somewhat in the nature of a drill to bore out the incrustation where its thickness is very great and prevent the formation of a square shoulder in front of the cleaner, the convex or outwardly-curved ribs acting to detach
130

the scale, while the concave or inwardly-curved ones serve to break it up after it is detached, and thereby facilitate its discharge from the tube. In the same way the con-

5 cave or inwardly-curved cutting-ribs between the groups of teeth serve to break up any large bodies or flakes of scale without so obstructing the clearance-space between the teeth as to reduce their efficiency. The continuous straight longitudinal edges are advantageous, for the reason that they permit and facilitate the sharpening of the device by the simple operation of grinding the same along the flat radial faces of said cutting edges.

15 It will be seen that the construction which I have devised possesses material points of advantage over prior constructions and especially over those constructions in which the picking projections are in the form of separate pins, which require special fastening devices to secure them to the head, and said pins require to be made of steel to give them sufficient durability and strength; but nevertheless they are apt to either wear rapidly if soft or break off in use if hard. My improved head is much less expensive, being made of cast-iron, (a cheap material,) requiring no fastening devices and being at the same time durable and efficient.

30 I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

35 Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A boiler-tube cleaner comprising a rotatory driver and a cleaner-head connected therewith by a universal coupling at its rear end, the front end of the head being free, said head comprising a body having integral rigid cutting-teeth projecting outwardly therefrom and separated from each other by wide and deep clearance-spaces, said teeth being arranged in a plurality of circumferential groups of forwardly-decreasing length, the teeth of the groups being in longitudinal alinement, and the body being provided with longitudinal cutting-ribs connecting the alined teeth and of less height than the teeth, substantially as described.

2. A boiler-tube cleaner comprising a rotatory driver and a cleaner-head connected therewith by a universal coupling at its rear end, the front end of the head being free, said head comprising a body having integral rigid cutting-teeth projecting outwardly therefrom and separated from each other by wide and deep clearance-spaces, said teeth being arranged in a plurality of circumferential groups of forwardly-decreasing length, the teeth of the groups being in longitudinal alinement, and the body being provided with inwardly-curved longitudinal cutting-ribs connecting the alined teeth and having cutting edges which are continuous with the cutting edges of the teeth, substantially as described.

3. A boiler-tube cleaner comprising a rotatory driver and a cleaner-head connected therewith by a universal coupling at its rear end, the front end of the head being free, said head comprising a body having integral rigid cutting-teeth projecting outwardly therefrom, separated from each other by wide and deep clearance-spaces, and arranged in circumferential groups of forwardly-decreasing length, the teeth of the groups being in longitudinal alinement, said body having cutting-ribs extending and converging forwardly from the front teeth, substantially as described.

4. A boiler-tube cleaner comprising a rotatory driver and a cleaner-head connected therewith by a universal coupling at its rear end, the front end of the head being free, said head comprising a body having integral rigid cutting-teeth projecting outwardly therefrom, separated from each other by wide and deep clearance-spaces, and arranged in circumferential groups of forwardly-decreasing length, the teeth of the groups being in longitudinal alinement, said body having cutting-ribs extending and converging forwardly from the front teeth, said ribs being alternately curved inward and outward, substantially as described.

5. A boiler-tube cleaner comprising a rotatory driver and a cleaner-head connected therewith by a universal coupling at its rear end, the front end of the head being free, said head comprising a body having integral rigid cutting-teeth projecting outwardly therefrom and separated from each other by wide and deep clearance-spaces, said teeth being arranged in a plurality of circumferential groups of forwardly-decreasing length, the teeth of the groups being in longitudinal alinement, said body also having longitudinal cutting-ribs connecting the alined teeth and of less height than said teeth, said body also having cutting-ribs extending and converging forwardly from the front teeth, substantially as described.

6. A boiler-tube cleaner comprising a rotatory driver and a cleaner-head connected therewith by a universal coupling at its rear end, the front end of the head being free, said head comprising a body having integral rigid cutting-teeth projecting outwardly therefrom and separated from each other by wide and deep clearance-spaces, said teeth being arranged in a plurality of circumferential groups of forwardly-decreasing length, the teeth of the groups being in longitudinal alinement, said body also having longitudinal cutting-ribs connecting the alined teeth and of less height than said teeth, said body also having cutting-ribs extending and converging forwardly from the front teeth, the

cutting edges of each longitudinal group of teeth and ribs lying in substantially the same longitudinal plane, substantially as described.

7. A boiler-tube cleaner comprising a rotary driver and a cleaner-head connected therewith by a universal coupling at its rear end, the front end of the head being free, said head comprising a body having integral rigid cutting-teeth projecting outwardly therefrom and separated from each other by wide and deep clearance-spaces, said teeth being arranged in a plurality of circumferential groups of forwardly-decreasing length, the

teeth of the groups being in longitudinal alinement, said body being provided with inwardly-curved cutting-ribs connecting the alined teeth, and also with cutting-ribs extending and converging forwardly from the front teeth and alternately curved inwardly and outwardly, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY F. WEINLAND.

Witnesses:

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