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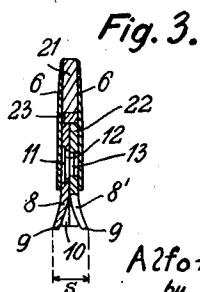
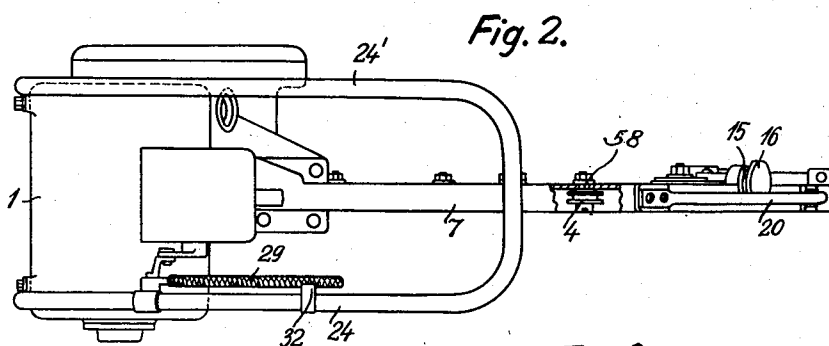
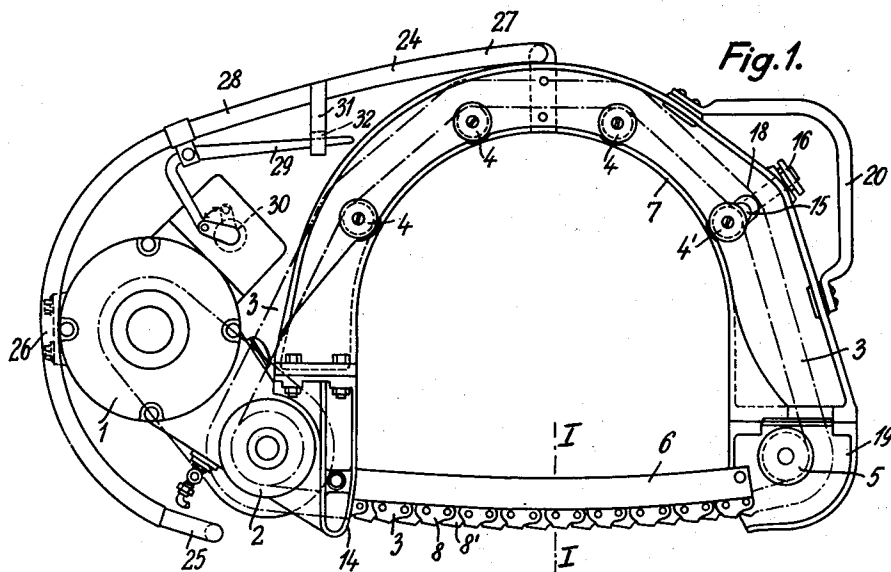
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2,109,702

CHAIN SAW

Filed March 9, 1936

3 Sheets-Sheet 1



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Fig. 4.

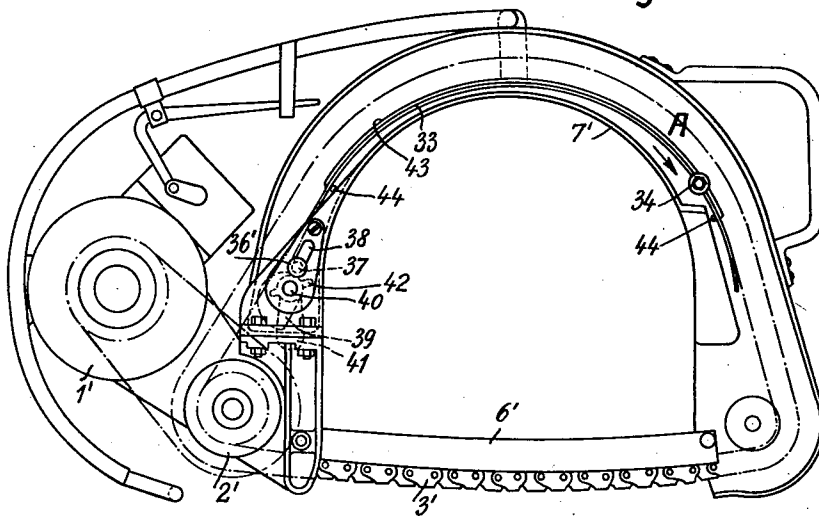


Fig. 5.

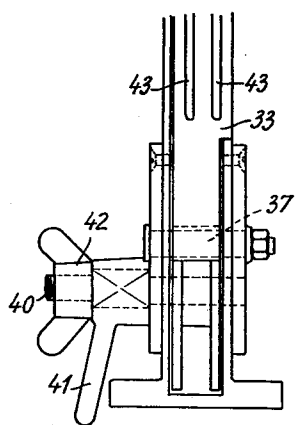
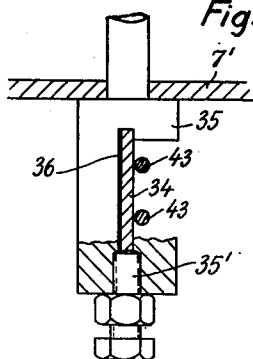


Fig. 6.



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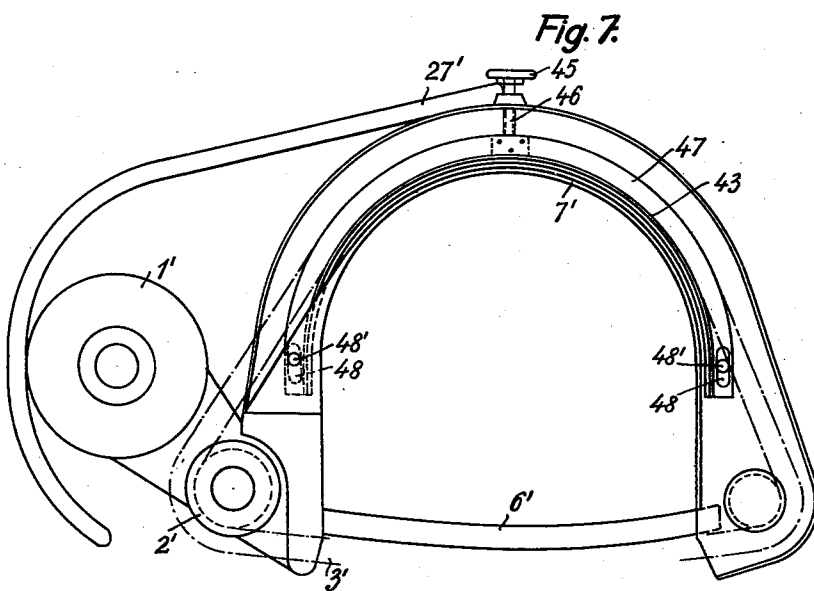
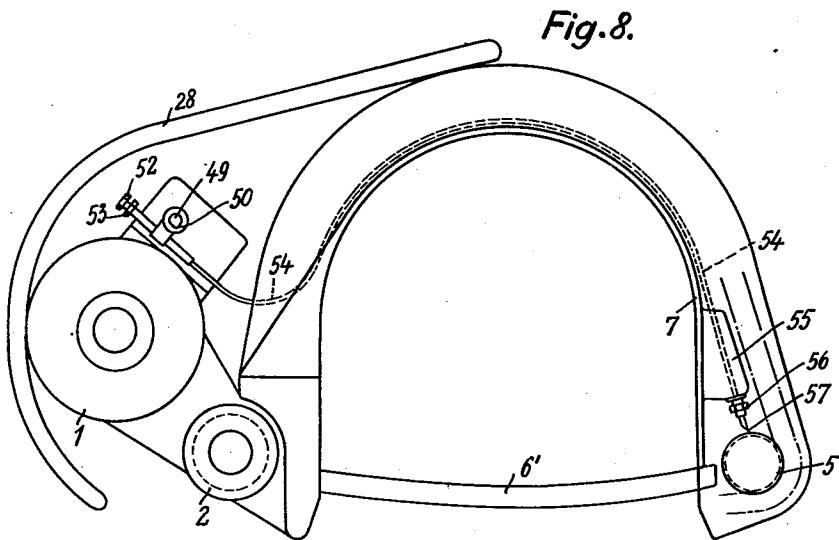
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UNITED STATES PATENT OFFICE

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CHAIN-SAW

Alfonso Lange, Altona-Hochkamp, Germany

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8 Claims. (Cl. 143—32)

The invention relates to a power-driven chain-saw provided with a bow-shaped guide.

In sawing through a tree-trunk with an endless chain-saw the rear run of the chain is, as is well known, easily wedged in by the tree-trunk. It has therefore already been proposed to guide the rear run of the saw-chain outside the profile of the tree to be sawn over guide rollers. These saws, however, had no guide rail for the saw so that satisfactory cut surfaces could not be obtained. They were also unwieldy and could not, for example, be operated by one man. Lighter constructions have, therefore, been suggested which can be operated by two operators and which can be carried. The rear run of the saw-chain was guided in a tubular bow and the front run supported by a rail. But even then it proved that the front run or the saw-rail was easily wedged-in, particularly if tree-trunks of fairly small diameter were to be sawn.

These disadvantages are avoided according to the present invention according to which the saw-rail which guides the front run of the saw-chain, is so dimensioned that the height from the front edge of the saw-teeth to the upper edge of the saw-rail amounts to from about twice to about eight times the "set" of the teeth. The saw-rail is preferably reduced in a direction towards its back.

In one form of construction according to the invention, the saw-chain is so guided in a groove in the rail that the groove receives at least a third of the height of the members of the saw-chain. The saw-chain preferably slides on an insert of hard material, preferably on a steel spring, a steel band or the like.

In another form the saw-chain is so arranged on the guide wheels or the like that it may be removed from one side after being untensioned and without dismantling parts of the machine. For this purpose the guide wheels are carried on one side on shaft pins.

In yet a further form the handle for manipulating the chain-saw is made in rocker-fashion and so that it extends from near the tree-side of the saw-chain round the motor up to the top of the bowed frame of the saw in the form of a curve which progressively flattens. Two such hand-bows are preferably provided, one on each side of the plane of the saw, and arranged to be approximately concentric around the motor so that a rocker is formed. A lever switch for controlling the motor is conveniently so arranged at one side of a bow-like handle that it can be operated in the sawing position by the workman

grasping the handle, irrespective of whether the saw is being held by one operative or by two.

The saw is provided, at the end of the saw-chain opposite to that of the tree-rail, with a tensioning device which is conveniently arranged above the rail-head on the bowed frame. Similarly the handle for the second operative is arranged above the rail-head on the bowed frame.

According to a further and preferred form of construction, a support of hard material, for example a steel band, is employed for guiding the rear run of the saw-chain. The support according to the present invention is conveniently releasably secured to the bowed frame of the saw at one end of the run by means of a guide member so that tensioning of the support is possible by means of the guide member.

In order to guide the saw-chain laterally the support or the track of the saw-chain in the bowed frame is limited laterally, conveniently by laterally-arranged rails, wires or the like. In one particular form of construction, the free end of the support is connected at one end with a tensioning device so that the support, which is secured at one side by the guide member, can be tensioned at the other free end by the tensioning device. The tensioning device may, for example, consist of an eccentric which can be operated by means of a hand-lever or the like. The support is for this purpose preferably connected at the free end with a pin or the like which rests against the eccentric of the tensioning device and is guided in a slot or the like.

The chain-saw may further be provided, according to the present invention, with lubricating means consisting of a lubricant container which is provided in or on the bowed frame of the saw, preferably above a guide roller or the like, and the outlet of which is provided with a valve which may be operated by suitable means, for example a Bowden wire, which can be moved from a point in the neighbourhood of the handle or of the switch for the driving motor. The Bowden wire may be adjustable as regards the length of its stroke by means of a screw with or without a lock nut. The Bowden wire is preferably so connected with the switch that the outlet valve of the lubricant container is opened when the motor is switched on.

Several forms of construction of saw made in accordance with the invention are illustrated diagrammatically in the accompanying drawings by way of example.

Fig. 1 shows one form of saw in side elevation.

Fig. 2 is a plan partly in section of the saw of Fig. 1.

Fig. 3 is a section on an enlarged scale through the saw and its guide rail and taken on the line I—I of Fig. 1.

Fig. 4 shows another form of saw in side elevation.

Fig. 5 is an edge elevation on an enlarged scale of the tensioning means of the flexible saw support of the saw of Fig. 4.

Fig. 6 is a section on an enlarged scale of the securing means for the support of the saw of Fig. 4 and taken in the direction indicated at A.

Fig. 7 is an elevation of a further form of saw, parts having been omitted in this view for the sake of clearness, while

Fig. 8 is a view similar to Fig. 7 illustrating the lubricating arrangement which may be provided according to the invention.

As will be seen from Figs. 1-3 the chain-saw according to the present invention comprises driving means 1, which may for example be an electric motor or an internal combustion engine. The motor 1 drives a wheel 2 which in turn drives the endless saw-chain 3. The saw-chain is led over guide rollers or wheels 4, 5 and over a guide or saw-rail 6, with its rear run in the interior of a protective bow-shaped frame 7 in such a way that the rear run of the saw-chain lies outside the profile of the tree-trunk or the like which is to be sawn through.

The saw-chain consists of separate members and, in the form of construction illustrated, is made as a two-plate chain, the plates being shown at 8 and 8'. The plates 8 may carry the clearing teeth 10 (Fig. 3) and the adjacent plates the cutting teeth 9. The plates are connected with one another by means of rivet pins in such a way that one plate is rotatably mounted on the pin 12 behind the head 11, while the adjacent plate is rigidly connected with the reduced offset part 13 of the pin by riveting. 14 represents an abutment against which the tree-trunk rests during the sawing operation and which resists the pull due to sawing.

The members 58 on which the guide wheels 2, 4, 4' and 5 are rotatably mounted are provided at one end with reduced portions by means of which they are mounted in the bowed frame 7. As a result of this arrangement the saw-chain may easily be removed for cleaning, repair, grinding, or other attention. The guide wheel 4' in the frame 7 is connected with a screwed spindle 15 which can be put under tension and secured by means of a nut 16 and possibly a lock nut against a band 18 of the bowed frame 7. In other words by tightening the nut 16 the spindle 15 pulls up on the wheel 4' to tighten the chain. A handle 20 is conveniently secured on the upper part of the frame 7 above the rail-head 19 and serves for holding the saw when it is being used by two operatives. As a result of the provision of the tensioning device 15-18 and of the handle 20 on the bowed frame, the rail-head 19 may be made smaller and thus the overall length of the saw shortened. This short overall length of the saw, which it was not possible to attain in the saws hitherto proposed, is of great practical importance because in this way it is in particular made possible to cut tree-trunks and the like while they are in a heap.

The guide wheels 2, 4, 5 and the guide or saw-rail 6 are provided with a guide groove 22 which is preferably made of such a depth that at least a third of the height of the saw-chain members

is received and guided therein. In this way tipping or displacement of the saw-chain during cutting is avoided and this is of considerable importance particularly when narrow and high saw-chains are employed. The saw-rail, as is more particularly to be seen from Fig. 3, is provided with an insert 21 which is preferably riveted together with two outer sheet metal covers 6. As may be seen from Fig. 3, the saw-rail is preferably made convex or reduced in the upward direction.

In order to prevent undue wear of the groove 22 of the saw-rail 6, an insert 23 of hard material, e. g. a spring of hardened steel ribbon or the like, is provided in the bottom, the saw-chain 3 sliding easily on it.

It is of importance that the height of the saw-rail 6, 21, including the height of the part of the saw-chain which projects from the saw-rail, should amount to about twice up to about eight times the "set" of the teeth 9, that is the distance marked s in Fig. 3. In this way wedging-in of the saw-rail, as in the sawing of tree-trunks of fairly small diameter, for example 15-20 centimetres, is avoided. This expedient is of importance for the reliability of chain-saws, because the guiding of the rear run of the saw-chain by the bowed frame 7 outside the profile of the tree-trunk is not sufficient to prevent wedging-in of the saw. Of importance also is the provision of the handle 24, 24', the lower part 25 of which is situated beneath the motor 1, that is approximately under the centre of gravity of the saw, the handle being secured at 26 to the motor and extending in a continuously flattening curve approximately concentrically about the motor up to the top 27 of the bowed frame 7 where it is secured.

As a result of the provision of the two bows 24 and 24', one on each side of the plane of the saw, carrying and operating during sawing is facilitated, so that the saw can easily be operated by one man. In this case the saw is held on the two sides by the handles 24 and 24' with both hands. The saw can be placed on the tree-trunk and put into operation from its position of rest on the bow by gradually tipping it about the point 25. The saw follows the cut as a result of its own weight, sinking accordingly about the point 25. It may therefore rest on the ground at the point 25 so that the operator is relieved and is able to give almost his whole attention to the actual sawing operation. It may here be mentioned that in the case of the previously proposed portable light chain-saws it was not possible in practice to do without the second operator. The overall lengths of the saws were relatively large so that the weight of the free lever-arm was too much for one man. Moreover, the preparation of the saw required considerable labour on account of the continual wedging, as will be explained further below. As a result of the high disposition of the rocker-like handles 24, 24' according to the present invention the operator is no longer compelled to work in a bent position so that he is not so easily tired even without the assistance of a second man.

If the saw is to be operated by two persons, one operator holds the saw by the bows 24 and 24' at about the point 28 while the other operator holds the saw at the handle 20.

It is further of importance that the switch lever 29 for controlling the motor 1 should be capable of being operated at any time, without changing the grip, in both conditions of operation, that is during operation of the saw by one man or by

two men. The switch lever 29 is therefore made of appropriate length and so mounted that it can be reached in all working positions without the operator needing to move his hands from the handle 28.

The switch lever 29 is illustrated in the "on" position in Fig. 1. A spring in the switch roller 30, which spring is not shown, ensures that the lever 29, which is held in the "on" position in a loop 31 by a stop or abutment 32, moves quickly upwards again into the "off" position as soon as it is released from the stop 32 by a slight lateral pressure.

It hardly needs explaining that the avoiding of wedging is of great importance. Hitherto it was necessary to support the tree-trunks before sawing under the plane of the saw by means of a block or the like, in order to avoid wedging and to ensure that the saw-cut spreads outwards during sawing. This was often difficult particularly when it was a case of a large tree of great weight or of sawing through individual trees, posts or the like directly from the pile. According to the invention all these disadvantages are removed.

By the combination of the non-wedging saw arrangement, the handles arranged rocker-fashion, the displacement of the tensioning device into the profile of the saw at the bowed frame, and the provision of the second handle at the upper part of the bowed frame, a very material simplification in operation, greater reliability, a high output capacity of the operator, and an extended sphere of application of the saw is obtained in an economic manner so that the saw may even be employed when it is a matter of sawing through tree-trunks or the like in inaccessible places. More particularly, it is possible according to the present invention to do without a second operative altogether in most cases, because as a result of the shortened overall length and the elevated arrangement of the rocker-like handles approximately over the centre of gravity of the saw it is made possible even for one man to carry out the sawing operation relatively easily.

Another form of construction according to the invention is illustrated in Figs. 4-6. In the saws hitherto proposed and as illustrated in Fig. 1, the rear run of the saw-chain is guided in the bowed frame 7 on guide rollers or guide wheels 2, 4, 4' and 5. It has proved, however, that this does not give quiet running. In particular the running up and down of the saw-chain is, with this arrangement, not free from vibration so that often the life and the reliability are adversely affected. These disadvantages are removed according to the present invention. As will be seen from Figs. 4-7 the chain-saw comprises driving means 1' which is connected with an endless saw-chain 3' by way of a driving wheel 2' and which is supported at its front run by means of a saw-rail 6' and is guided on its rear run by means of a bowed frame 7'. According to another feature of the present invention, the rear run of the saw-chain is guided on the bowed frame 7' not, as heretofore, by means of rollers but by means of a support of hard material, for example on a steel band 33, which is held at one end at 34 in a guide member. This guide member, which is secured to the frame of the bow 7' in some suitable manner, comprises, according to the form of construction illustrated in Fig. 6 of the drawings, a guide portion 35 having a slot 36 for the reception of the

steel band 33 which may be clamped firmly in the guide portion 35 by means of a screw 35'.

The other free end 36 of the steel band 33 is, for example, connected with a pin 37 which is movable in a slot 38, in the manner illustrated. Beneath the pin 37 is provided an eccentric 39 which may be rotated about the spindle 40 by means of a lever 41 and fixed in the desired position by means of a wing nut or the like 42.

In order to tension the saw-chain 3', the lever 40 is moved outwards or upwards so that the pin 37 is pressed upwards in the slot 38 by the eccentric 39. In this way the lower part 36 of the steel band 33 is raised and the band given a greater curvature, that is to say the chain-saw 3' is tensioned. If the tension should not be sufficient or if, after wear, the amount of tensioning which is necessary can no longer be brought about by means of the eccentric 39, the forward end 34 of the steel band 33 may be displaced in the guide member 35 after release of the screw 35' and thus the band shortened or lengthened, so that the pin 37 can again be effectively moved by means of the eccentric 39 to tension the steel band 33.

It has proved that it is preferable also to guide the saw-chain laterally. For this purpose two rods or wires 43, for example, may be provided on the steel rail 33. These rods 43 conveniently have two ends or extensions 44 which are bent at right-angles and which can be introduced into corresponding openings in the steel band 33 to give a sufficient hold. Such bent ends or extensions could also be provided at the other end or at the central portion of the lateral guide rods. Rails of other formation could be employed for giving lateral guidance instead of wires or rods; or the steel band could itself be provided with grooves, guiding ridges, crests or the like.

Fig. 7 illustrates another form of arrangement for tensioning the chain. Here also the rear run of the saw-chain 3' is guided in the bowed frame 7' on a steel band 43 which is mounted on a carrier 47 of approximately horseshoe-shape. The carrier 47 is connected with a rod 46 provided with a screw-thread at its outer end and the rod can be drawn up by means of a screw 45 at the upper part of the frame 7' and in the neighbourhood of the handle 27'. If the screw 45 is screwed on to the rod 46 the carrier 47 of the steel band 43 is raised and thus the saw-chain 3' is tensioned. In order to give improved guiding the carrier 47 is guided by the steel band 43 by means of two slots 48 which are provided in lateral flanges of the carrier 47 bent at right-angles and in which guide pins 48' can slide which are secured in the frame 7'.

As a result of the satisfactory operation of the chain-saw according to the present invention, a lubricating device is necessary which, according to Fig. 8, is applied near the switch shaft 49 of the motor 1. The switch shaft 49 has a take-up lever or a projection 50 which operates a Bowden wire 54 as soon as the motor 1 is in operation. The stroke of the Bowden wire can be accurately adjusted by means of an adjusting screw 52 and locking nut 53.

The Bowden wire 54 passes through an oil container 55 which may be fitted in the bowed frame 7 and opens the valve 56 which is situated in the interior of the exit nozzle 57.

On starting the motor 1 the Bowden wire 54 is moved by the take-up device 50 of the switch shaft 49, and the valve 56 opened so that at the

beginning of the operation oil drops from the opening 57 on to the guide roller 5 and thus on to the chain-saw in the desired amount, so that during operation continuous lubrication is ensured and interruptions in operation due to lack of lubrication are avoided. The positive coupling of the switch with the lubricating device is of particular importance.

The invention is not limited to the forms of construction illustrated.

It is to be understood that the claims are not limited to the constructions shown in the drawings since clearly modifications may be made and, therefore, the claims are intended to be construed to cover all such modifications as their language will allow in the light of the prior art.

I claim:

1. A chain-saw comprising an endless saw-chain, a bowed frame and a grooved saw-rail for guiding said saw-chain over its rear and cutting runs respectively, means for tensioning the chain, comprising a movable insert of hard material in said groove, said saw-chain sliding on said insert, and power means for driving said saw-chain.

2. A chain-saw comprising an endless saw-chain, a bowed frame and a grooved saw-rail for guiding said saw-chain over its rear and cutting runs respectively, a motor for driving said saw-chain, and at least one handle secured to the bowed frame and extending from a point near one end of said saw-rail, around the motor and up to the top of said bowed frame to form a rocker, said motor being mounted between the bowed frame and the handle.

3. A chain-saw comprising an endless saw-chain, a bowed frame and a grooved saw-rail for guiding said saw-chain over its rear and cutting runs respectively, power means for driving said saw-chain, a flexible support of hard material for the rear run of said saw-chain, and means on said support guiding said saw-chain laterally thereon.

4. A chain-saw comprising an endless saw-chain, a bowed frame and a grooved saw-rail for guiding said saw-chain over its rear and cutting runs respectively, power means for driving said saw-chain, a flexible support of hard material

for the rear run of said saw-chain, means on said support guiding said saw-chain laterally thereon, said means for guiding said saw-chain having at least one bent over portion at one end thereof to connect with the flexible support.

5. A chain-saw comprising an endless saw-chain, a bowed frame and a grooved saw-rail for guiding said saw-chain over its rear and cutting runs respectively, power means for driving said saw-chain, a flexible support of hard material for the rear run of said saw-chain, and tensioning means at least one end of said flexible support.

6. A chain-saw comprising an endless saw-chain, a bowed frame and a grooved saw-rail for guiding said saw-chain over its rear and cutting runs respectively, power means for driving said saw-chain, a flexible support of hard material for the rear run of said saw-chain, means guiding said flexible support at one end thereof, means for tensioning said flexible support at said end, and means for securing said flexible support in the tensioned condition.

7. A chain-saw comprising an endless saw-chain, a bowed frame and a grooved saw-rail for guiding said saw-chain over its rear and cutting runs respectively, power means for driving said saw-chain, a flexible support of hard material for the rear run of said saw-chain, and a carrier conforming to the shape of the inner surface of said bowed frame, said carrier positioning said flexible support, over which the rear run of said saw passes.

8. A chain-saw comprising an endless saw-chain, a bowed frame and a grooved saw-rail for guiding said saw-chain over its rear and cutting runs respectively, power means for driving said saw-chain, a flexible support of hard material for the rear run of said saw-chain, a carrier conforming to the shape of the inner surface of said bowed frame, said carrier positioning said flexible support over which the rear run of said saw-chain passes, a pin and slot connection between said carrier and said frames and screw-means for adjusting said carrier in position on said bowed frame.

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