This invention relates generally to power-driven hand-supported chain saws used primarily for felling and bucking trees, and more particularly to certain improvements in that type of chain saw which is the subject of an application for United States Letters Patent filed by Leonard M. Strunk on September 2, 1934, Serial No. 453,811.

A principal object of the present invention is to provide for a chain saw of the type aforesaid, a saw bar having along its upper and lower edges and along its front end a continuous chain guiding channel, and having internal passage means for delivery of a lubricant to the channel aforesaid at the front end of the saw bar where the need for lubrication is greatest.

Another object of the present invention is to provide for a chain saw of the type aforesaid, powered by an internal combustion engine having a crankcase which, in the normal operation of the engine, is internally pressurized, means for equalizing the pressures to which the interiors of the engine crankcase and the reservoir for lubricants are subjected, whereby the lubricant is delivered under pressure to the internal passage means aforesaid.

Other objects and advantages of the invention, such as those relating to details of design and construction to provide for most efficient operation of the saw as well as to provide for most economical manufacture thereof, will appear more fully hereinafter, it being understood that the present invention consists substantially in the combination, construction, location and relative arrangement of parts, all as described in detail in the following specification, as shown in the drawings and as finally pointed out in the appended claims.

In the accompanying drawings, which are illustrative of a preferred construction of chain saw embodying the principles of the present invention:

Figure 1 is a side elevation of a saw embodying the present invention;

Figure 2 is a front elevation of the saw with part in section showing details of the arrangement for lubricating the chain;

Figure 3 is an enlarged side elevation, partly broken away and partly in section, of the saw chain side of the saw, showing certain of its constructive features;

Figure 4 is an exploded view showing the relative disposition of certain of the saw parts, and wherein the parts are sectioned substantially as in Figure 2;

Figure 5 is an enlarged side elevation, partly broken away, of the side of the saw remote from the saw chain, showing certain constructive features;

Figure 6 is an enlarged section taken on line 6-6 of Figure 5;

Figure 7 is a side elevation of the saw bar detached from the saw;

Figures 8 and 9 are enlarged sections taken respectively on lines 8-8 and 9-9 of Figure 7;

Figure 10 is a section taken on line 10-10 of Figure 9; and

Figure 11 is an enlarged fragmentary view, partly broken away and in section, showing details of the arrangement for lubricating the chain.

Referring to the drawings, and particularly to Figures 1 through 5, the saw embodying the present invention comprises an internal combustion engine 8, a rearwardly positioned conventional carburetor 9 connected to the engine, a top-mounted compartmentalized fuel and oil tank 10, a conventional magneto and engine starter within an air shroud 11 at one side of the engine, a side frame casting 12 at the opposite side of the engine through which an engine power shaft 13 extends, a sprocket 14 and a clutch 15 mounted upon the power shaft, a forwardly projecting saw bar 16 supported by the side frame casting for carrying, and directing the travel of, a saw chain 17 which is also trained over the sprocket, an encircling handle 18 and a rear supporting leg 19 disposed beneath the carburetor.

The engine 8, preferably of two cycle, single cylinder type having a crankcase body 20, is relatively so positioned in the saw that while its power shaft 13 extends horizontally in a direction normal to the saw bar 16, its cylinder is inclined forwardly of the saw. The power shaft 13, which is an extension of the engine crankshaft, extends through a centrally apertured well 21 formed on the inner or engine side of the side frame casting 12, the well base being connected to the crankcase body 20 to firmly secure the side frame casting 12 directly to the engine.

The side frame casting 12 is of the shape and configuration best shown in Figures 3 and 4, wherein it will be noted that this casting is integrally provided adjacent its upper edge with a part which forms a passage 22 that communicates with, and forms a continuation of, the exhaust passage leading from the engine.

The forward edge 23 of the casting 12 is preferably curved, as shown in Figure 3, and is fitted along its lower portion with a complementarily curved bumper guard 24 having integrally formed thereon a plurality of forwardly presenting spurs which bear against the saw 8 and other work being cut and hold the saw operatively in a desired position. This tooth bumper guard or bracket 24 is removably secured to the casting 12 by a plurality of screws 25.

Formed along the upper and rear edges of the casting 12 is a continuously extending, outwardly directed flange 26 of a depth sufficient to project across the operating plane of the saw chain and so serve as a guard for the chain in the region of its rear driven end.

The saw bar 16 is secured to the drive shaft side of the engine 8 by means of a pair of spaced parallel studs 27-27, the latter being provided with enlarged non-circular heads 28 which are respectively accommodated within correspondingly shaped recesses 29 formed in the casting 12 on the inner face thereof, the studs 27 having threaded end portions which project freely through the casting 12 and through an elongated slot 30 formed in the rear end of the saw bar 16 disposed flatwise against an underlying rib 31 formed on the casting 12 on the outer face thereof. Fitted against the outer face of the saw bar 16 to overlie the slot 30 thereof is a retainer plate 32, which is suitably apertured, as at 33, for projection of the studs 27 therethrough, the outer ends of which latter receive nuts 34 and washers 35 adapted to bear against the outer face of the retainer plate 32. Thus, the studs 27 and their respective nuts 34 serve to secure the saw bar 16 and the retainer plate 32 to the casting 12 whereby all of said parts are disposed in flatwise assembled relation against the drive shaft side of the engine 8.

The saw bar 16 is provided along its upper and lower longitudinally extending edges and along its rounded front edge with a continuously extending chain guiding channel, groove or slot 36, which slot is of a depth sufficient to accommodate therein the chain guide wings conventional-
ly provided on the inner edges of the chain links 37 and which guide wings are adapted to be engaged by the teeth of the sprocket 14 for driving the saw chain 17 about the saw bar 16 in work sawing direction, as indicated by the arrows in Figure 1. The adjoining ends of successive drive links 37 of the saw chain are secured together by pivotal link elements respectively disposed on opposite sides of the drive links and by pivot pins, as best shown in Figure 11. Certain of these paired links consist of a pair of identical elements 38—38, while others consist of one such element 38 and a cutter link 39, which cutter link may be of any conventional form having a cutting edge 40 and a depth gauge 41 spaced in advance of the cutting edge. The links 39 are alternately arranged on opposite sides of the saw chain so that successive cutter links respectively cut opposite sides of the kerf cut by the saw. It will be understood, of course, that in order to properly tension the saw chain and maintain it in operative engagement with its supporting saw bar 16, the latter may be extended or retracted relative to the casting 12, within the limits permitted by the slot 30 through which the securing studs 27 project, by the simple expedient of loosening as required and then retightening the nuts 34 on the studs 27.

It will be appreciated that efficient operation of the saw requires that adequate provision be made for abundantly supplying the saw chain and the guiding groove 36, in which the saw chain runs, with a suitable lubricant. With this in mind, the present invention effectively meets this requirement in the manner now to be described.

The compartmented fuel and oil tank 10 includes, in addition to the oil reservoir 42 for supplying lubricating oil to the chain-traversed saw bar 16, a compartment 43 in which is stored fuel for the engine 8. As is most clearly shown in Figures 1 and 3, the tank 10 is mounted so that the oil compartment 42 thereof is elevated above the upper run of the saw chain during all normal positions of use of the saw so that oil for lubricating the saw chain and its guideway may be delivered by gravity flow as required through a valve fitting 44. To this end, the tank 10 is provided along its bottom with a longitudinally extending supporting rib 45 which is embraced by a pair of angle members 46—46 suitably secured together by bolts 47. The oppositely extending base flanges of the angle members 46—46 are respectively secured, as by bolts 48 to a flat plate 49, which in turn is suitably secured to the engine body also by the bolts 48, the plate 49 being supported in suitably spaced relation to the engine body by spacers 50, the shanks of the bolts 48 below the plate 49. Preferably, the tank mounting is such that the tank 10 is spaced from and generally parallels the top side of the engine 8.

Referring particularly to Figures 2 and 5, a fitting 51 is threaded into the front of the crankcase body 20, and a pressure line 52 extends from the fitting 51 rearwardly and then upwardly around the back of the crankcase body 20, within the air shroud 11. Then the line 52 extends through the air shroud 11, makes a loop 53 and connects to a check valve 54, which latter is threaded into the roof of the oil reservoir 42, near the partition which separates the oil and fuel compartments. The line 52 serves to place the interior of the engine casing in communication with the oil reservoir 42. Since, in the normal operation of the engine 8, the interior of the engine casing is under pressure, in the order of 5 p. s. i., the oil reservoir is likewise under pressure, in consequence of which oil is discharged from the oil reservoir 42 under pressure through the valve fitting 44.

Referring particularly to Figures 3 and 4, extending forwardly from the valve fitting 44 is an oil line 55 that makes a loop 56 and then extends through the casting 12 and communicates with the base of an open recess 59 that is formed on the outer face of the casting 12, in the rib 31, being elongated in a direction fore and aft of the saw.

Referring particularly to Figures 7 through 10, the saw bar 16 conveniently comprises a pair of plates 60—60 that are disposed respectively on opposite sides of a plate 61 in side abutting relation thereto, these plates being secured together as by spot welding, or in any other suitable manner. The center plate 61 is provided with upper and lower longitudinally extending edges that gradually diverge in a direction from rear to front of the plate and with a rounded front edge. The rear end portion of the center plate is provided with a pair of apertures 62—62 disposed respectively just below the upper, and just above the lower, edges of the center plate. Extending forwardly from the apertures 62—62 respectively parallel to the upper and lower edges of the center plate are a pair of open grooves 63—63. These grooves respectively have laterally extending forward end portions 64—64 that terminate at the peripheral edge of the center plate, respectively at the opposite ends of the rounded front edge thereof. The grooves 63—63 are formed respectively on opposite sides of the center plate, the uppermost groove being on the engine side thereof.

The side plates 60—60 are substantially the same in peripheral outline as the center plate 61, just described. However, these side plates are somewhat larger in size, in consequence of which, when the center and side plates are assembled, there is formed the chain guiding opening 36 Groove or slot 36 which extends transversely about the engine part of the chain 63—63. These grooves conjointly form a pair of oil passages 66—66 that are defined respectively by the grooves 63—63 of the center plate and the surface portions of the side plates overlying these grooves 63—66. The side plate on the engine side of the center plate is provided with an aperture 65 that registers with the upper aperture 62 in the center plate, and the other side plate is provided with a second aperture 65 that registers with the lower aperture 62 in the center plate.

The inlet openings 65—65 are located so that no matter which face of the saw bar 16 is disposed flatwise against the casting 12 an inlet opening 65 will be in communication with the elongated recess 59 formed in the outer face of the casting 12. The recess 59 is elongated as already stated so that for any adjusted position of the saw bar 16, within the limits permitted by the studs 27—27 projected through the slot 30, the inlet opening 65 will be in registry with the recess 59.

It will be understood, of course, that the saw bar 16 may be variously constructed. For example, a simple, the side plates 60—60 can be made somewhat smaller in size, instead of larger, than the center plate 61, in which event the marginal portion of the center plate 61 protruding beyond the side plates 60—60 will constitute the chain guiding means extending along the upper and lower edges and along the front end of the saw bar. In addition, the passages 66—66 can be formed by grooving the center plate 61 and/or the side plates 60—60.

Suitably secured to and extending rearwardly from the tank 10 in rigid assembly therewith is a hand grip 67 by means of which the saw may be held and guided by the operator, which grip is preferably provided with a hand actuated trigger 68 pivoted within the grasp, as at 69, for controlling the delivery of fuel to the carburetor 9.

The handle 18, by means of which the saw is principally supported by the operator during use of the saw, is a tubular member practically in the form of a closed loop extending transversely about the engine part of the chain
saw, the terminal ends of the handle tubing being vertically spaced apart on the drive shaft side of the saw. For intermediate sections the casting 12 is used.

Extending rearwardly and downwardly from beneath the body of the engine 8 is the rear supporting leg 19 the lower end of which underlies and supports a cradle 70 upon which the carburetor 9 is mounted.

In the operation of the chain saw, the oil reservoir 42 is pressurized in the manner already described. The flow of pressurized oil from the oil reservoir is controlled by manipulation of the valve 44. Oil that is passed by the valve 44 flows through the oil line 55 and the fitting 57, then into the passage 58 and the recess 59 formed in the casting 12. The saw bar 16 being disposed flatwise against the casting 12 with one of its oil inlet openings 65 in communication with the recess 59, the oil then flows from the latter into the opening 65, through the associated oil passage 66 and then into the chain guiding groove or slot 36 of the saw bar. The oil thus delivered to the chain guiding groove 36 is carried by the saw bar 17 along the chain guiding groove 36, in consequence of which, in addition to the saw bar itself being lubricated, the chain guiding groove 36 is lubricated, particularly the portion of the latter which extends about the front end, and along the bottom of the saw bar 16, where the need for lubrication is greatest.

While it is advantageous to deliver oil from the oil reservoir 42 to and through the oil passage in the saw bar 16 under pressure derived from the engine crank case, as hereinbefore described, it will be understood, of course, that other suitable arrangements may be provided for pressurizing the interior of the oil reservoir to insure the requisite delivery of lubricating oil to and through the saw bar and to the saw bar which traverses the same during operation of the saw. Thus, in certain instances the oil reservoir 42 may be provided with a hand-actuated pump which may be operated as required to effect delivery of oil from the reservoir under suitable pressure.

It will also be understood that in certain instances the oil may be satisfactorily delivered from the oil reservoir to and through the oil passage in the saw bar simply by gravity flow, it being observed in this connection that the oil reservoir is positioned at an elevation sufficiently above the normal operating position of the saw bar to provide for gravity flow of oil from the reservoir to the saw bar and through the oil passage therein leading to the front end of the saw bar.

As has been hereinabove indicated, the oil passage in the saw bar extending from the inlet port 65 in one side wall thereof to the outlet port 64 in communication with the chain guide channel 36 extending peripherally about the chain bar may be formed otherwise than as shown in the drawings. For example, instead of providing the opposite faces of the center plate 61 with longitudinally extending grooves 63—63 as shown, the center plate 61 may be longitudinally slotted adjacent each of its opposite longitudinally extending edges, each such slot extending from a point in registry with one of the inlet openings 65—65 respectively formed in the side plates 60—60 to a point adjacent the freely extending front end of the saw bar, at which end each such slot is laterally turned to communicate freely with the saw chain guide channel 36. When the center plate 61 is thus slotted and assembled in proper relationship with respect to its embracing side plates 60—60 with the plates all welded together, the embraced side plates close off the side of the slots formed in the center plate and so provide the saw bar with a pair of internal oil passages 63—63 extending from the oil inlet openings 65—65 at the rear end of the bar to the outlet ports leading into the saw chain channel 36 at the freely extending front end of the bar.

Still another way of providing the saw bar with the desired internal longitudinally extending oil passages is to undercut the base walls of the chain guide channels
said last two mentioned ports being in the form of an elongated slot extending in a direction lengthwise of said bar, thereby to maintain registry between said side wall and frame member ports upon lengthwise adjustment of said bar relative to said frame member.

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