June 20, 1944. A. N. BLUM 2,351,740

CHAIN SAW

Filed Feb. 20, 1942 2 Sheets-Sheet 1

FIG. 1.

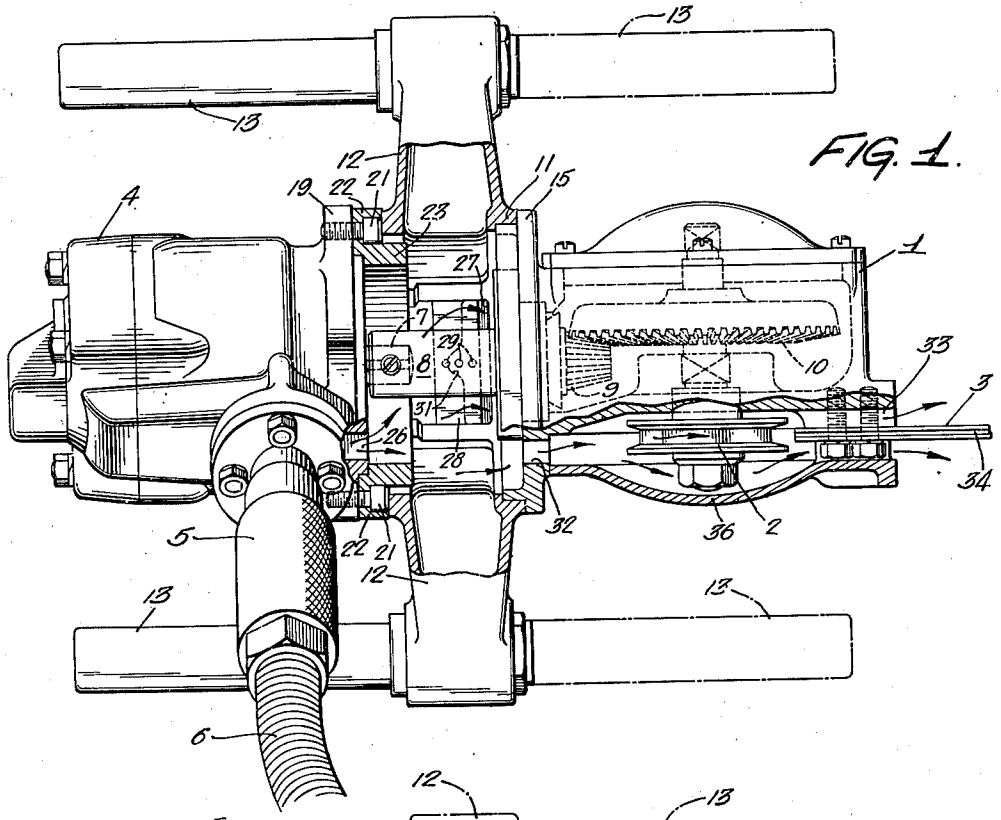

FIG. 2.

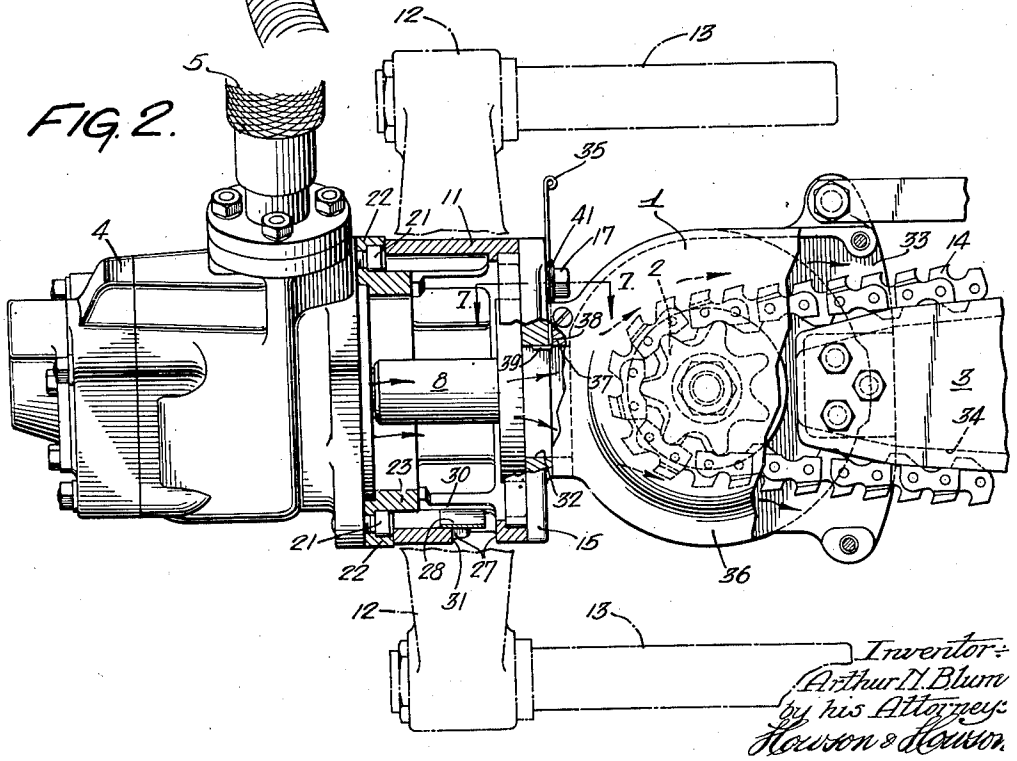

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FIG. 3.

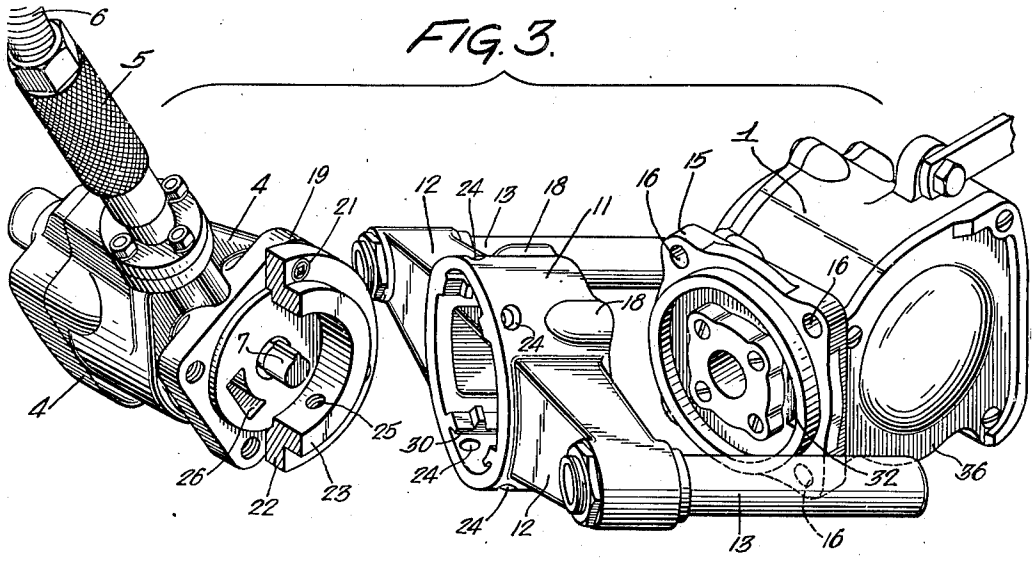


FIG. 4.

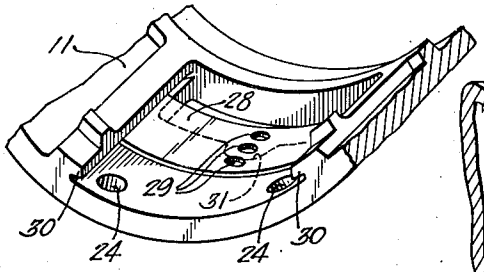


FIG. 5.

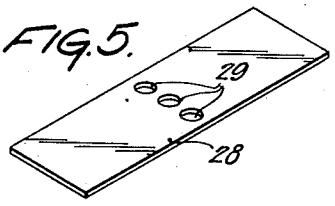


FIG. 6.

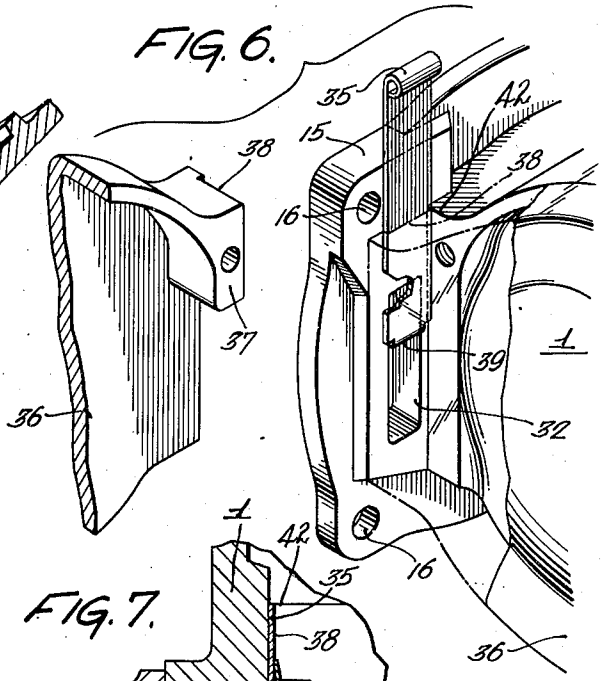


FIG. 7.

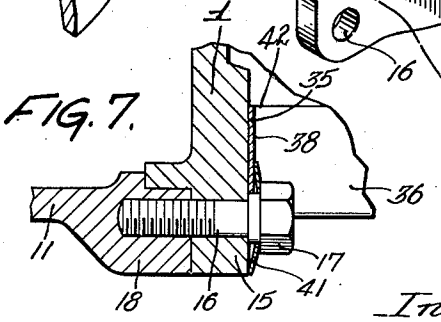
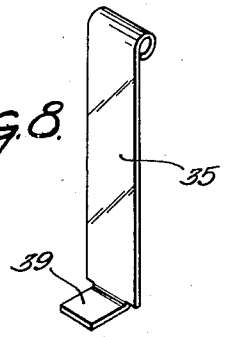


FIG. 8.



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UNITED STATES PATENT OFFICE

2,351,740

CHAIN SAW

Arthur N. Blum, Philadelphia, Pa.

Application February 20, 1942, Serial No. 431,772

13 Claims. (Cl. 143—32)

This invention relates to chain saws, and more particularly to portable chain saws wherein the tool is hand supported and air motors are utilized for actuating the cutting chain.

The invention contemplates a novel construction and assembly affording generally improved structural and functional characteristics in the saw, as hereinafter set forth.

More specific objects of the invention are to provide means for facilitating the holding and manipulation of the saw in conjunction with improved means for utilizing the exhaust from the aforesaid air motor for cooling and cleaning the running parts of the saw, as hereinafter fully described.

Another object of the invention is to direct a fluid blast from the exhaust of the air motor, or from a separate source, towards the sprocket, the chain and the guide rail in a direction approximately lengthwise of the cutting chain to effect thereby a saving of lubricating oil by impeding the centrifugal throw-off of lubricant from the rotating sprocket and chain, as well as a cleaning and cooling of the running parts.

The invention further resides in certain structural details hereinafter described and illustrated in the attached drawings, in which:

Figure 1 is a fragmentary longitudinal sectional view illustrating the head or driving end of a chain saw made in accordance with my invention;

Fig. 2 is a front elevational view of the same portion of the machine shown in Fig. 1;

Fig. 3 is an exploded view of the same portion of the machine showing certain of the details of construction;

Fig. 4 is a fragmentary view in perspective showing the details of the exhaust valve;

Fig. 5 is a view in perspective of one of the elements of the exhaust valve;

Fig. 6 is an exploded view in perspective illustrating a further detail of the air-cooling and cleaning system;

Fig. 7 is a section on the line 7—7, Fig. 2, and

Fig. 8 is an element of that portion of the machine shown in Figs. 6 and 7.

With reference to the drawings, 1 is the head-stock of the chain saw within which is journaled the driven chain sprocket 2 and to which is secured one end of the chain guide rail 3. 4 is the air motor housing to which is connected, by means in the present instance of a rigid fixture 5, which also constitutes the actuating or "live" handle for the motor control valve, the flexible duct 6 which extends to the source of air pressure. The air motor as illustrated is a commercial article, and requires no description as to its mechanical parts and mode of operation. The shaft 7 of the motor is connected by suitable transmission elements, including in the present instance a coupling 8, a bevel pinion 9 and a bevel gear 10, with the driving sprocket 2, the said gears being mounted in the head-stock 1, as shown.

In accordance with the present invention, I provide between the head-stock 1 and the motor housing 4, and uniting said housing to the head-stock, a hollow casing member 11, said member having at opposite sides thereof transversely projecting arms 12, 12 in which may be secured handle elements 13, 13. Preferably, and as shown in Fig. 1, these handle elements are detachably secured in the arms 12 and are adapted to be secured in the arms in either of the alternative positions illustrated respectively in solid and broken lines in Fig. 1. One function of the casing member 11, therefore, is to constitute a support for handle elements such as 13, 13. The rigid fixture 5 which attaches to the motor housing 4, as set forth above, is also adapted to form a handle for use in conjunction with one of the handles 13 in the support and manipulation of the saw.

It is to be noted that in the assembly shown in Fig. 1, the handles 13 are disposed at opposite sides of the vertical plane in which the toothed chain of the saw operates, this also being the plane of the sprocket 2, the cutting chain 14, and guide rail 3. For certain manipulations of the saw, it is desirable to have the handles disposed as shown in broken lines in Fig. 2, wherein the handles are disposed in a common plane which parallels the plane of operation of the toothed chain which in this figure is shown at 14. It may also be desirable to have the handles 13 disposed differently with respect to the fixture 5 of the air motor. To these ends, the member 11 is attached to the head-stock 1 and to the motor housing 4 by means which permits concentric angular adjustment of the casing 11 with respect both to the head-stock and the motor housing.

It is to be noted further that in the present instance the motor 4, member 11, head-stock 1, with sprocket 2, guide rail 3 and chain 14, are all arranged in line, and that all relative adjustments among these parts take place parallel with the shaft of the motor.

With reference particularly to Fig. 7, it is to be noted that the head-stock 1 comprises a flange 15 which forms a seat for the casing 11. The

flange 15 is provided with a plurality of apertures 16 for reception of screws 17, said screws being threaded into tapped bosses 18 in the wall of the casing 11. The flange 15 forms a seat for one end of the casing 11, and since the apertures 16 and bosses 18 are uniformly spaced and symmetrically arranged, the casing 11 may be attached to the head-stock 1 in four different positions in the present instance. By means of this adjustment the handles 13 may be brought selectively into the relative positions illustrated in Figs. 1 and 2.

With reference also to Fig. 3, it will be noted that the motor housing 4 is also provided with a flange 19, to which is secured, by means of screws 21, a ring 22. This ring forms a seat for the other end of the casing 11, it being noted that, like the head-stock 1, the ring has a transverse flange 23 which fits into the interior of the casing member 11. The casing 11 and flange 23 have registering apertures 24 and 25, the latter being tapped for reception of screws (not shown) which secure the housing 4 to the casing. The apertures 24 and 25 are uniformly spaced and symmetrically arranged so as to permit the two members to be secured together in a number of different positions of adjustment angularly about the axis of the shaft 7.

From the foregoing, it will be apparent that the arrangement affords a high degree of flexibility of adjustment of the handle elements 13 and the fixture 5 with respect to each other and with respect also to the plane of operation of the toothed chain 14.

In accordance further with the present embodiment of my invention, the exhaust from the air motor is directed through a port 26 in line with the plane of the sprocket 2 and chain 14 into the interior of the casing 11, the interior chamber being relatively of substantial volume, and the wall of the casing is provided with a port 27 for by-passing the air to the atmosphere. The effective size of the port 27 is regulated by means of a valve plate 28 which is slidably supported in the interior of the casing 11, as illustrated in Fig. 4. The plate 28 may be adjusted by means of a series of apertures 29 in the plate, at least one of which is continually exposed in the offset portion 31 of the port 27 and into which the tip end of a file or other suitable tool or instrument may be inserted for applying the necessary pressure to shift the plate. The plate is resilient and is normally flat, see Fig. 5, and is held in flexure in the casing between the flanges 30, 30 of the latter. This flexure creates frictional resistance which tends to retain the plate in adjusted position.

The wall of the head-stock 1 is provided with an elongated port 32 through which connection is established between the interior of the casing 11 and the sprocket space of the head-stock 1. As shown in Fig. 1, the port 32 is arranged in alignment with the plane of the driving sprocket 2 and the chain 14 which operates on this sprocket, and in line also with the opening 33 in the head-stock 1 through which the chain passes and in which also the proximate end of the guide rail 3 is secured. Air passing from the interior of the housing 11 through the port 32 is thus projected upon and approximately lengthwise of the toothed chain and its sprocket 2 and also on the adjoining end of the guide rail 3, into the slots 34 of this rail, in which slots the chain is guided, and also into the kerf. The volume of the air directed through the port 32 may be regulated by means of the valve plate 28 which controls the by-pass port 27 in the wall of the casing 11. Means is also provided for varying the slotted port 32 so as to regulate the velocity of air as it passes through this port to the sprocket space of the head-stock, as well as the point or points at which the discharge of the air into the sprocket space takes place. This regulating means comprises in the present instance an elongated valve plate 35 which is slidably secured in the wall of the head-stock 1, as shown in Fig. 6. The cover-plate 36 of the head-stock 1 is provided with a solid boss 37, which in assembly engages or lies in proximity to the wall of the head-stock body immediately above the slotted port 32, see Fig. 2. As shown in Fig. 6, the outer face of the boss 37 is slotted at 38 for reception of the valve element 35. When the plate is in position, the edge 42 of the head-stock, the screw 17 and the spring washer 41 function to retain and guide the said valve element. By adjusting the plate 35 upwardly or downwardly, the effective opening of the slot 32 may be varied as required, as well as the area of the impingement of the airstream against the sprocket and along the chain. It will be noted that in any position of the motor with relation to the guide rail and chain, the air blast will always be towards the sprocket and along the chain, the guide rail and the kerf. By reason of this structurally established direction of the air blast along the kerf, the cleaning and cooling action of the exhaust airstream will still be substantially available even if the cover plate 36 is removed, as might on occasion be necessary under certain operating conditions.

It will be noted, as shown in Fig. 8, that the valve plate 35 has at its lower end an outturned flange 39 which in assembly enters the port 32 and acts as a stop to prevent complete withdrawal of the valve plate 35 from the head-stock. Means is also provided for tensioning the plate 35 so that it will remain in any adjusted position. This device, shown in Fig. 7, consists of a spring washer 41 underlying the head of the retaining screw 17, which screw passes through the aperture 16 of the flange 15 which immediately adjoins the plate 35. The washer 41 bears resiliently against the face of the plate 35, see Fig. 7, and thereby retains the plate in any adjusted position without, however, interfering with the adjustment operation.

The member or casing 11 functions, therefore, as a medium for equalizing, controlling and regulating the application of the exhaust air from the motor 4 to the working elements of the chain saw for cooling and cleaning the latter. The relatively large interior space within the casing 11 acts as an accumulating and equalizing chamber, within which by means of the valve 28 the air pressure built up by the exhaust may be regulated, and the amount of velocity of the air exhaust drawn from this pressure chamber for use in cooling and cleaning the saw may be accurately regulated and directed by the valve 35 without substantially reducing the efficiency of the air motor.

The direction of the air blast against the groove of the sprocket 2 has the further effect of conserving the oil carried by the chain and thrown off by centrifugal force when the latter passes over the sprocket at high rotary speed. This oil, which is usually wasted at this point, is blown back by the air stream on and along the chain and the rail, keeps the chain and the rail cooler, and reduces friction and the power demand with

a minimum oil consumption. In this same respect chain saws operated by other than air motors may be provided with a separate fluid stream, or by a blower driven by the chain saw motor and connected with port 32, whereby the fluid blast is again directed and regulated so that it blows towards the groove of the sprocket and approximately lengthwise of the chain and rail, no matter in what position the latter might be with respect to the motor.

I claim:

1. In a chain saw having a head-stock and a chain-supporting element mounted in said stock, an air motor unit, a casing unit interposed between and connecting the motor unit with the head-stock, transmission mechanism extending through the casing and operatively connecting the motor with the chain-supporting element, means for directing the exhaust air from the motor into the casing, a port in the head-stock directed toward the chain-supporting element, a port in said casing opening to the atmosphere, and valve means for regulating the effective area of each of said ports.

2. In a chain saw, a head-stock having adjoining chambers, a chain-supporting element in one of said chambers, transmission mechanism operatively connected with said element and mounted in the other of said chambers, an opening in the first-named chamber and a toothed chain extending through said opening and around said supporting element, a second opening at the opposite side of said chamber and in alignment with the first-named opening, an air motor unit, a casing unit interposed between and connecting the motor unit with the head-stock, transmission means extending through said casing and operatively connecting the motor with the transmission elements in said second head-stock chamber, and means for directing the exhaust air from the motor into the casing for passage through the second-named opening into the head-stock.

3. In a chain saw, an air motor, a head stock, a chain-supporting element rotatably mounted in the head stock, a chain engaged with and operating in the plane of rotation of said element, and means in said head stock for directing the exhaust of said motor against said element and the portion of the chain in curviform engagement therewith, and substantially in the plane of said element.

4. In a chain saw, an air motor, a head stock, a chain-supporting element rotatably mounted in the head stock, a chain engaged with and operating in the plane of rotation of said element, and means in said head stock for directing the exhaust of said motor against said element and the portion of the chain in curviform engagement therewith, and substantially in the plane of said element, said directing means comprising an aperture in said head stock in fixed predetermined relation to said element.

5. In a chain saw, a motor, a head stock, a chain-supporting element rotatably mounted in the head stock, a chain engaged with and operating in the plane of rotation of said element, means providing an intermediate chamber of substantial volume interposed between said motor and said head stock, means for accumulating a fluid in said chamber, a pair of ports in the wall of said chamber, one of said ports being arranged to direct a blast of said fluid from the chamber against said element and chain and substantially lengthwise of the latter and the other port constituting a by-pass for a portion of said fluid to the atmosphere, and valve means to regulate at least one of said ports.

6. In a chain saw, an air motor, a head stock, a chain-supporting element rotatably mounted in the head stock, a chain engaged with and operating in the plane of rotation of said element, means providing an intermediate chamber of substantial volume interposed between said motor and said head stock, means for directing the exhaust from said motor into said chamber, a pair of ports in the wall of said chamber, one of said ports being arranged to direct said exhaust air from the chamber against said element and chain and substantially lengthwise of the latter, and the other port constituting a by-pass for a portion of said exhaust air to the atmosphere, and valve means to regulate at least one of said ports.

7. In a chain saw, an air motor, a head stock, a chain supporting element rotatably mounted in the head stock, a chain engaged with and operating in the plane of rotation of said element, an intermediate member interposed between said motor and said head stock and having therein a chamber arranged to receive the exhaust from said motor, means in said head stock to direct the said exhaust from said chamber against said element and chain and substantially lengthwise of the latter, said intermediate member being relatively adjustable with respect to said head stock, and carrying handle means adjustable with said member.

8. In a portable hand-held chain saw comprising a head stock structurally permanently related to the cutting plane of the saw, a motor unit and an intermediate member connecting the said unit with the head stock; said unit, head stock and intermediate member being arranged in line substantially parallel to said cutting plane, and said member being rotatably adjustable about said line with respect to the head stock and to the motor unit, handle means carried by the intermediate member and extending approximately parallel to said line, and means for adjusting said handle means on the said member longitudinally of said line, the plane in which said handles are held being angularly adjustable with said intermediate member relative to the said cutting plane of the saw.

9. In a portable hand-held chain saw comprising a head stock structurally permanently related to the cutting plane of the saw, a motor unit and an intermediate member connecting the said unit with the head stock, said unit, head stock and intermediate member being arranged in line substantially parallel to said cutting plane, a handle on said member extending approximately parallel to said line, and a handle element on said unit extending substantially at right angles to said line and affording with said first-named handle a means for supporting and manipulating the saw by hand, said member and unit being angularly adjustable about said line with respect to the head stock so as to correspondingly angularly adjust the handles jointly with respect to the said cutting plane of the saw.

10. In a portable hand-held chain saw comprising a head stock structurally permanently related to the cutting plane of the saw, a chain-supporting element rotatably mounted in the head stock, a chain engaged with and operating in the plane of rotation of said element, an air motor unit, and an intermediate hollow mem-

ber connecting the said unit with the head stock, said unit, head stock and intermediate member being arranged in line substantially parallel to said cutting plane, means for exhausting air from said motor into the interior of said member, means in said head stock for directing the exhaust air from the member into the head stock and against said element and chain and substantially lengthwise of the latter, and handle means carried by said intermediate member, said member being angularly adjustable about said line with respect to the head stock so as to correspondingly adjust the plane of said handle means with respect to the said cutting plane of the saw.

11. In a portable hand-held chain saw comprising a head stock structurally permanently related to the cutting plane of the saw, a chain-supporting element rotatably mounted in the head stock, a chain engaged with and operating in the plane of rotation of said element, an air motor unit, and an intermediate hollow member connecting the said unit with the head stock, said unit, head stock and intermediate member being arranged in line substantially parallel to said cutting plane, and said member forming an air chamber of substantial volume between the motor unit and the head stock for connection both with the air exhaust from said motor and with the interior of the head stock, means for directing the exhaust air from said chamber against said element and chain and substantially lengthwise of the latter, handle means on said member and on said motor unit, and means providing for angular adjustment of the intermediate member about said line with respect both to the motor unit and to the head stock.

12. In a power chain saw, a head stock, a chain supporting element mounted in the head stock, a chain engaged with and operating in the plane of rotation of said element and extending in a substantially straight run from the latter, a guide rail for guiding the said substantially straight portion of the chain extending from said element, said guide rail being attached to said head stock and being arranged to transmit working pressure to the chain in the direction of said plane in order to produce a kerf in the work piece, means providing a fluid stream and means for directing said stream toward said element and the portion of the chain in curviform engagement with said element and approximately toward said kerf lengthwise of the said straight portion of the chain and of the guide rail.

13. A power chain saw in accordance with claim 12 wherein the means for directing the fluid stream includes an aperture in the head stock in fixed predetermined relation to said element.

ARTHUR N. BLUM.