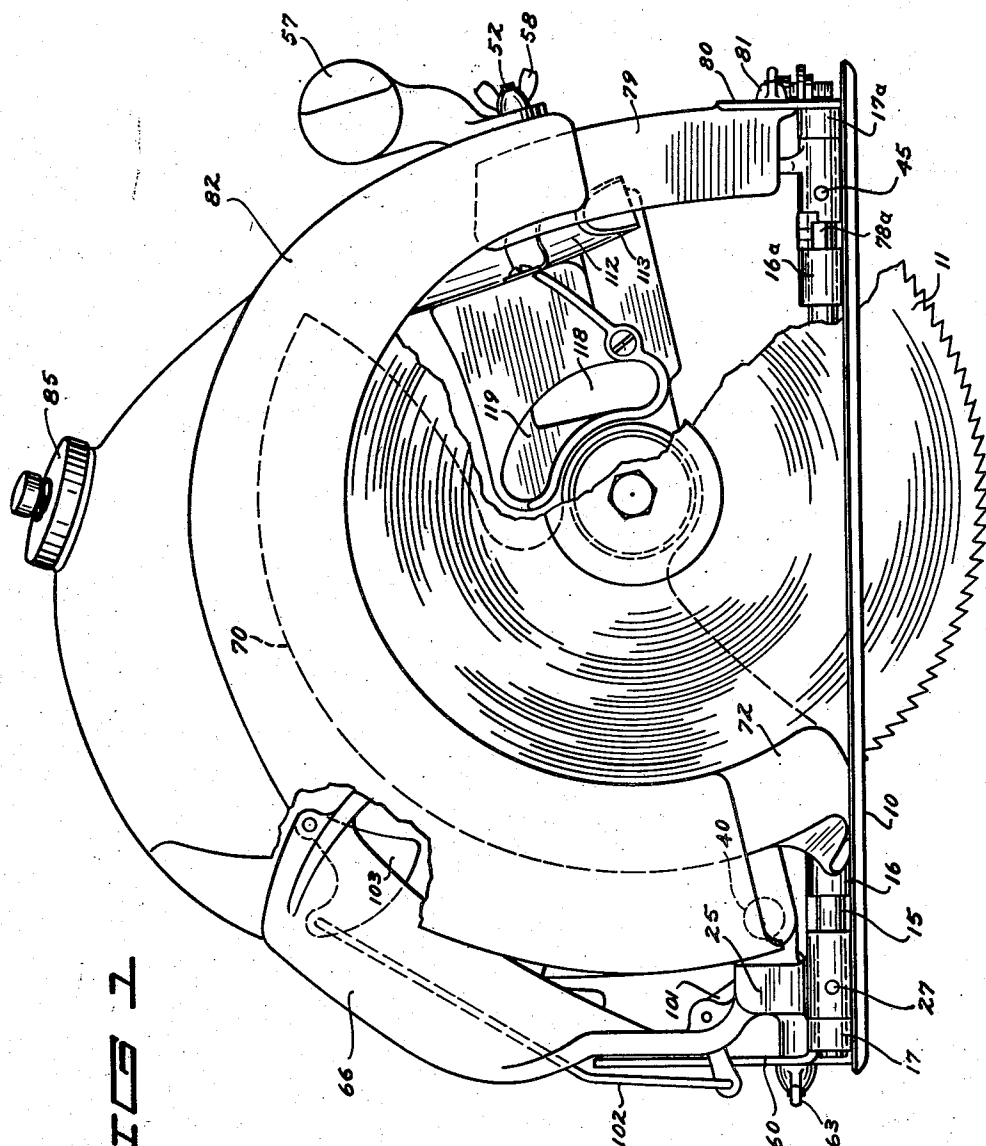


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GASOLINE POWERED HANDSAW

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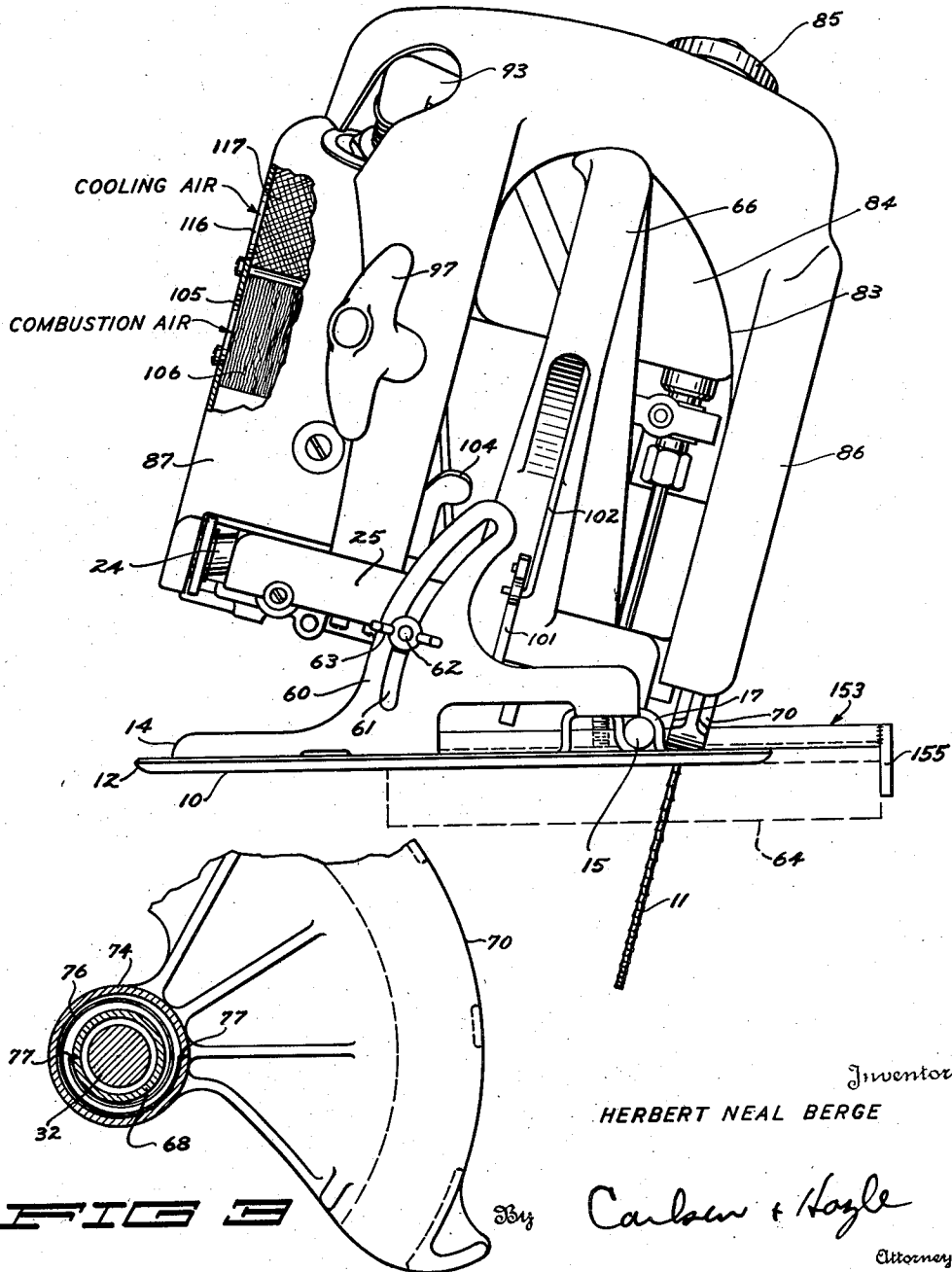
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GASOLINE POWERED HANDSAW

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FIG 2



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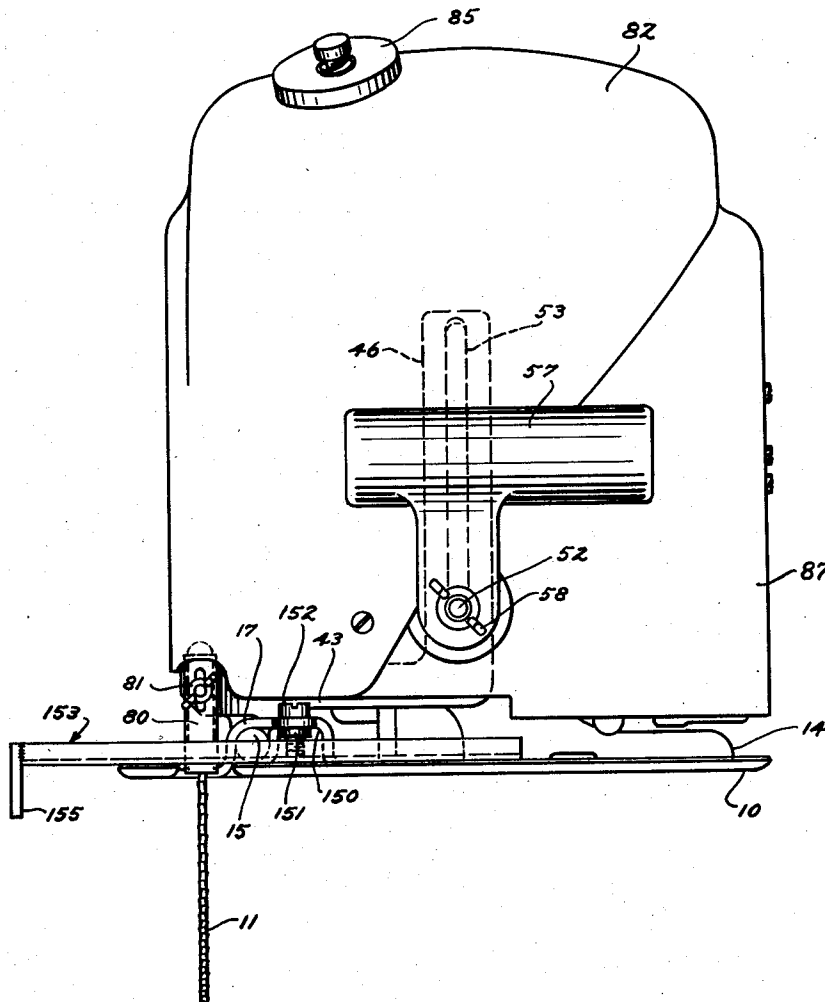
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FIG 4



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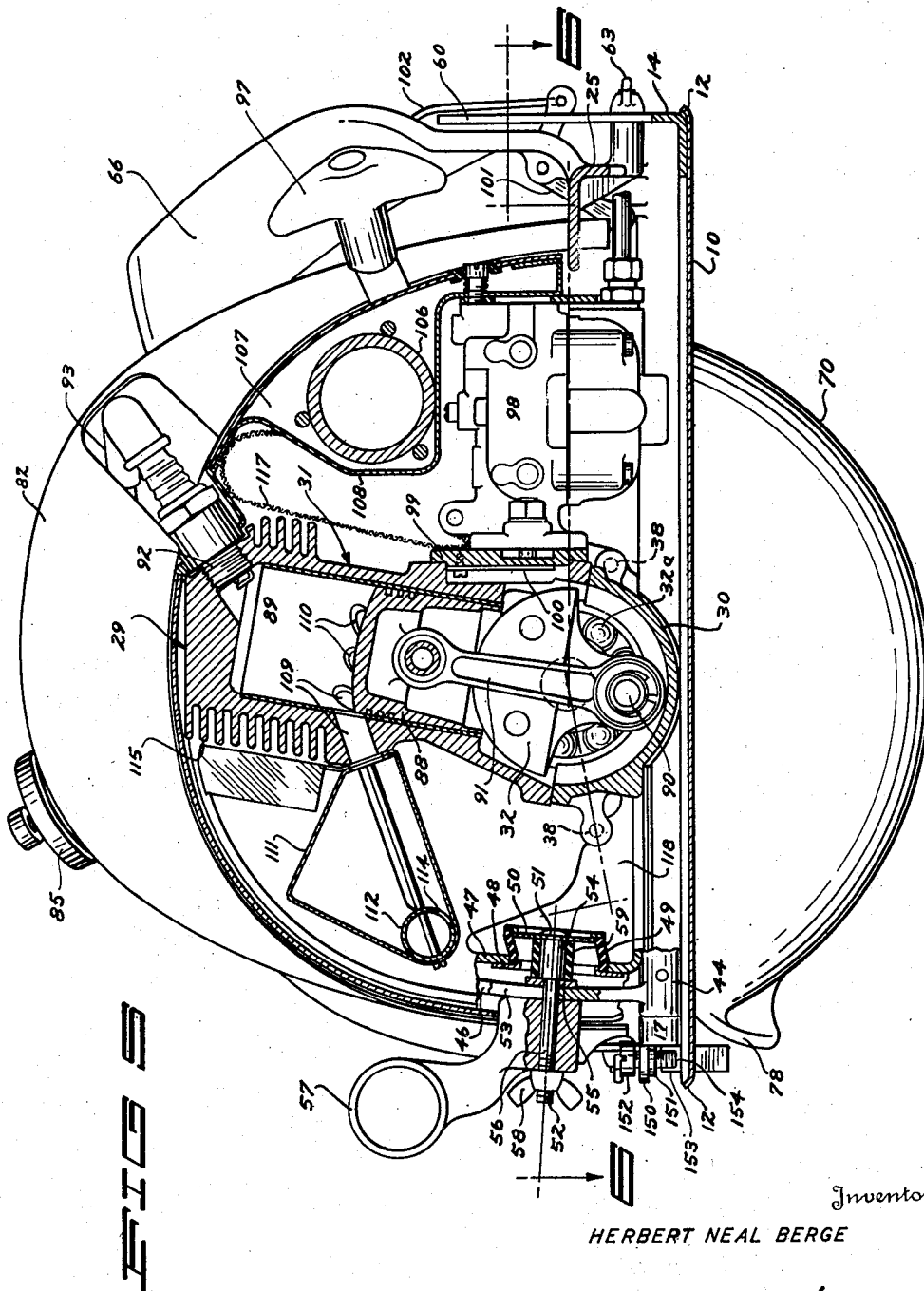
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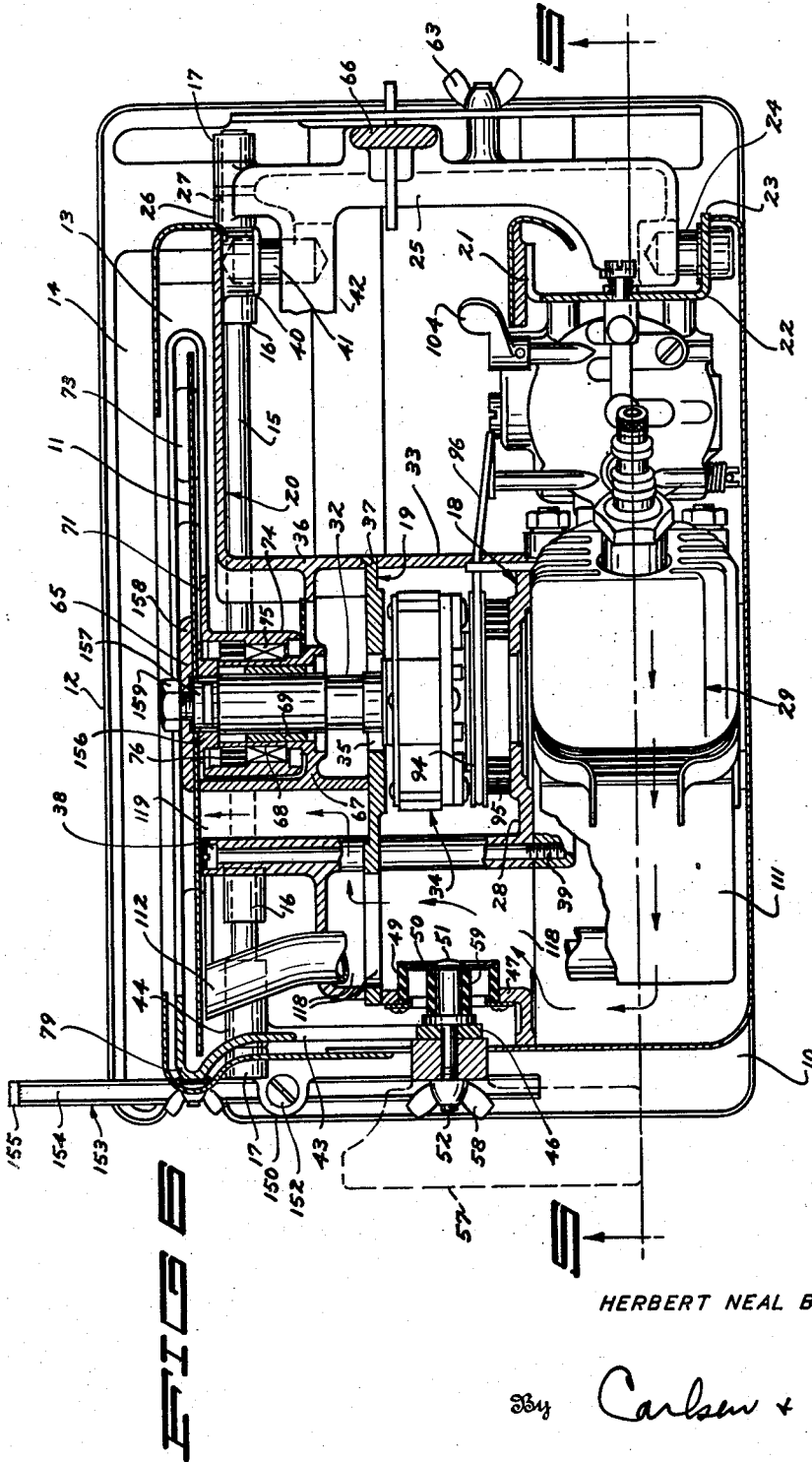
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Filed Jan. 14, 1948

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GASOLINE POWERED HANDSAW

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FIG 2

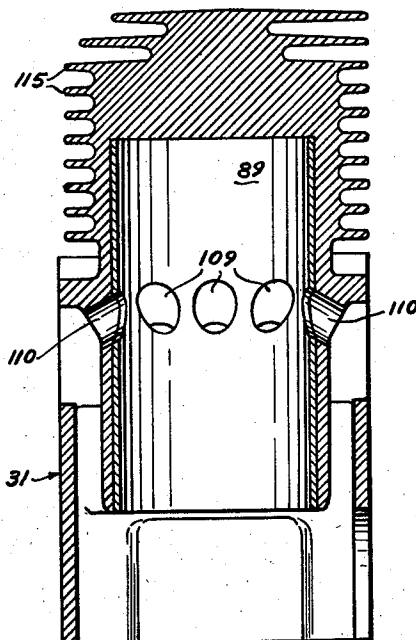
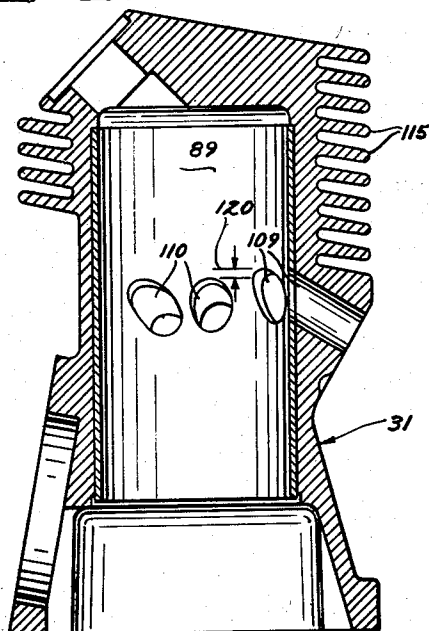
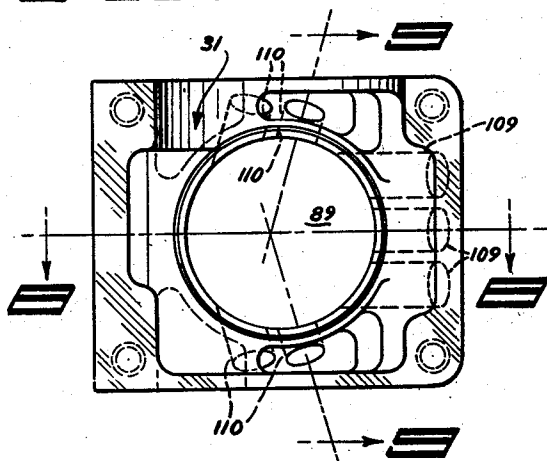


FIG 3

FIG 7



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2,693,207

GASOLINE POWERED HANDSAW

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Application January 14, 1948, Serial No. 2,239

8 Claims. (Cl. 143—35)

This invention relates to the improvements in portable hand manipulated circular saws such as used by carpenters and similar workmen for ripping and cutting off lumber, and the primary object of my invention is to provide a saw of this kind which is powered by a small gasoline engine with the obvious advantages of making the tool useful where electricity is not available and without confining the useful range of the saw by the usual electric cord, as is the case with the present day electric motor driven saws.

Another object of my invention is to provide a saw wherein a small two-cycle internal combustion engine is used, with the circular saw mounted directly on the end of the crank shaft thereof, and with provision made for cooling the engine by air which is circulated about the engine by the rapidly spinning saw.

Another object is to provide a saw of this kind wherein the exhaust from the engine is utilized for blowing away the saw dust and chips during the operation of the saw. For this purpose, an exhaust pipe is extended from the engine to a point adjacent the working edge of the saw where it contacts the lumber being worked upon, as will be readily understood.

Another object is to provide a gasoline powered saw which is compact and light in weight so that it may be readily operated and manipulated and with provision made for all adjustments which may be found necessary in various sawing operations.

A further object of my invention is to provide a porting construction, for the two-cycle engine used in the saw, which will give improved scavenging and consequently better power output.

These and other more detailed and specific objects and advantages of my invention will be made in the course of the following specification, wherein reference is had to the accompanying drawings, in which—

Fig. 1 is a side elevation of a gasoline powered saw constructed in accordance with my invention illustrating the manner in which the depth to which the saw itself depends beneath the base plate may be adjusted and with certain parts broken away to disclose interior details.

Fig. 2 is an end view of the saw illustrating how it may be angularly adjusted and also with certain parts broken away to show interior details.

Fig. 3 is a fragmentary cross-section through the end of the crank shaft and associated bearing and also through the hub of the movable or swingable guard, of which a part appears in elevation.

Fig. 4 is an end view of the saw taken from the end opposite the showing of Fig. 2.

Fig. 5 is a vertical, longitudinal section taken through the engine and housing of the saw and showing the swinging guard in a position completely enclosing the circular saw. This view is taken substantially along the line 5—5 in Fig. 6.

Fig. 6 is a horizontal sectional view taken approximately along the line 6—6 in Fig. 5 but showing the engine itself and certain other parts in plan view.

Fig. 7 is an inverted plan view of the cylinder block for the engine illustrating the angles at which the ports are drilled into the cylinder.

Figs. 8 and 9 are, respectively, diametrical sectional views taken along the line 8—8 and 9—9 in Fig. 7.

Referring now more particularly and by reference characters to the drawing, 10 designates generally a rectangular base or guide plate whereon are mounted and supported the various elements making up my improved

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saw and through which the circular saw blade 11 projects in a downward direction, so that by resting the plate upon the board or lumber to be sawed, the saw may be guided through the work as may be readily understood. The base plate 10 is turned upwardly all around as indicated at 12 and adjacent one edge has a longitudinally extending and elongated narrow slot 13 (Fig. 6) to clear and pass the saw. Welded or otherwise suitably rigidly fastened upon the base plate 10 is an irregularly shaped mounting or bracket plate, designated generally at 14. This mounting plate 14 extends in part generally lengthwise of the base plate and surrounds the saw slot 13 for stiffening purposes, and also alongside the slot, adjacent each end thereof, the mounting plate is formed with eyes or loops for the accommodation of a mounting or pivot rod, indicated at 15. A pair of such eyes is formed adjacent each end of the saw slot, as designated at 16 and 17, with the individual eyes of each pair spaced apart axially as best shown in Figs. 1 and 6.

The main assembly for the saw structure comprises three complementary castings indicated generally at 18, 19 and 20, respectively, all of which are assembled together and rigidly connected as a unit and are supported upon the mounting rod 15 as will now be described. The casting 18 has anchored at one lower corner portion, at 21, a bracket plate 22 which extends in a direction away from the saw slot 13 and has an apertured ear 23 which is connected by means of a cylindrical rubber shock absorber connection 24 to one end of a handle casting 25. From this end the handle casting 25 extends generally transversely of the assembly and terminates in an eye 26 connected to rod 15, near the eyes 16 and 17, and pinned thereto as indicated at 27 in Fig. 1. The casting 18 further has a central portion 28 which is positioned against the side of the engine which drives the saw. This engine is designated generally at 29 and its crank case 30 (Fig. 5) is mounted over and closes the lower end of a cylinder block designated at 31. These parts of the engine are secured together in a conventional manner and contain a bearing 32 for the crank shaft 32, which extends out through the central part of the casting 18 and over the saw slot 13. The crank case and cylinder block are, of course, faced off to mount the casting 18 and it will be noted that this casting has a housing-like extension on the side remote from the engine, the walls 33 of which form and enclose a space for more or less conventional magneto and rope recoil starter mechanism, which are mounted upon the crank shaft and which are designated generally at 34. The center casting 19 acts as a stator plate for the magneto mechanism and this casting is positioned over the otherwise open end of the housing 33 and is, of course, provided with an opening 35 through which the crank shaft 32 loosely passes. The casting 20 has a centrally located housing portion 36 for the magneto points (not shown) which abuts against the casting 19 and is counter-bored as indicated at 37 to restrain these castings against edgewise dislocation. A plurality of long cap screws 38 are passed through the castings 20, 19 and 18, in that order, and are screwed as indicated at 39, into the engine assembly in such manner that by pulling up these screws tightly, the castings and engine may all be held in rigid assembly, as will be understood. The casting 20 has a mounting end or socket 40 which is connected by a cylindrical shock absorber connection 41, like that previously described at 24, to an ear 42 formed upon the handle casting 25 thus providing two wide spaced mountings for this end of the main assembly upon the handle casting. It will be noted, too, that this mounting further supports the entire assembly for swinging movement about the axis of the mounting rod 15 to which one end of the handle casting is pinned as previously described. At the opposite end of the assembly, a fixed guard casting designated at 43 is provided and this casting has an eye 44 at one end which is mounted upon the mounting rod 15 between the ears 16 and 17 and which is also pinned to the upwardly extending arcuate guide member 46 and adjacent thereto the casting 18 has an end portion 47 provided with a large opening 48 wherein is rigidly anchored one end of a short cylindrical rubber sleeve 49. This sleeve 49 ex-

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tends away from the guide member 46, and in its end remote therefrom, there is mounted a disk 50 in which is fastened at 51 one end of a stud 52 projecting outwardly through an elongated vertical slot 53 in said guide member. The stud 52 is enlarged as indicated at 54 and this enlarged portion is braced against a washer 55 inside the guide member 46 and outwardly of the guide member the stud passes through a bore 56 in a generally T-shaped handle 57 and is provided with a wing nut 58. A smaller cylindrical rubber sleeve 59 surrounds the enlarged portion 54 of the stud and the arrangement is such that by turning the wing nut 58 tight the handle 57 will be clamped in place upon the guide member 46 thus anchoring the enlarged portion of the stud 54 and the inner end of the sleeve 49. Thus, the weight of this end of the casting and engine assembly is supported wholly upon the sleeve 49 so that its outer end is stressed downwardly as shown in Fig. 5, and since the sleeve is of flexible resilient material, a shock mounting is provided, as will be readily understood. It will be noted further that this completes a three-point suspension for the main assembly of the saw and that the guard casting 43 being mounted to turn with the mounting rod 15 will enable the entire assembly to tilt about the axis of this rod without any tendency to twist or bind.

To secure the main assembly in any such tilted adjustment the mounting plate 14 at the end opposite the handle 57 has an upstanding segment shaped member 60 wherein is a slot 61 (Fig. 2) formed in an arc centered about the axis of the mounting rod 15. Appropriately mounted in the handle casting 25 is a stud 62 which moves in the slot 61 and exteriorly thereof is provided with a wing nut 63. Since the plate from which the segment portion 60 projects is rigidly fastened to the base plate 10, it will be evident that, by loosening the wing nut 63, the entire assembly may be rocked about the axis of the rod 15 and locked in such adjustment by retightening the wing nut. This is clearly shown in Fig. 2 and the purpose of this adjustment is obviously to permit the angle of the saw blade 11 with respect to the base plate 10 to be adjusted so that angular cuts may be formed through the board or lumber, designated at 64, in this view. It will be understood in this connection, and it constitutes an important feature of my invention, that the saw blade 11 is secured as indicated at 65 (Fig. 6) to the end of the crankshaft 32 immediately outside of the third casting 20 and that the aforesaid angular adjustment of the assembly results in the corresponding angling motion of the saw. It will further be evident that the saw slot 13 will be of such width as to permit this motion of the saw.

The handle casting 25 has an upstanding nicely shaped handle 66 which may be grasped with one hand by the operator while his other hand reaches over the saw housing later to be described, and grasps the T-shaped handle 57, giving him convenient and complete control over the manipulation of the saw along the work.

The housing portion 36 of the casting 20 has a web 67 from which there extends a tubular bearing sleeve 68 about the crankshaft 32. An anti-friction bearing 69 is positioned between the sleeve 68 and crankshaft thus rotatably supporting the extended end of the crankshaft whereon the saw 11 is mounted. It will be understood, of course, that throughout this bearing assembly, suitable oil seals will be provided wherever needed although they are not shown in the drawing.

A swinging guard, designated generally at 70, is provided to guard the saw 11 and this guard is substantially less than semi-circular in shape and is closed on its inner side at 71 (Fig. 6) while its outer side is provided with a comparatively narrow flange 72 which covers the cutting edge of the saw. Between the inner side 71 and the said flange 72, the guard is slotted out at intervals as indicated at 73 for the radial escape of air from the saw, and projecting from the inner side of the guard is a tubular mounting collar 74 which fits loosely over the aforesaid bearing sleeve 68. An anti-friction bearing 75 is positioned between the bearing sleeve and the collar 74 and it will thus be understood that the swinging guard may turn freely about the axis of the crankshaft 32. It will further be understood that the saw slot 13 is wide enough to clear the swinging guard 70 and normally or when the saw is not in use, the guard projects beneath the base plate 10 to completely enclose this part of the cutting edge of the saw. A spirally wound biasing spring 76 is positioned between the bearing sleeve 68 and collar 74

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outwardly of the bearing 75 and the opposite ends of the spring are hooked, as indicated at 77 in Fig. 3, to the bearing sleeve and collar. This spring 76 is so positioned and tensioned that it normally rotates the swinging guard toward the position of Fig. 5 and at one end the guard has a cam shaped extension 78 which will contact a rubber bumper 78^a (Fig. 1) on guard casting 43 in this position and limit the movement of the guard in this direction. The extension 78 is so shaped, however, that, when it is pushed against the end of the board, the board will cam against this extension and rotate the guard 70 in a counterclockwise direction as viewed in Fig. 5 to progressively expose the saw to the work. As the sawing proceeds, the swinging guard will finally reach the position of Fig. 1 entirely clear of the portion of the saw below the base plate 10 and then as the work is completed, the tension of the spring 76 will return the guard to its normal position as will be readily apparent.

The hereinbefore described connections 24 and 41 are so arranged that pivotal action is provided about their axes and about an axis at right angles to that of the mounting rod 15 previously described. This is for the purpose of permitting the saw 11 to be raised and lowered with respect to the mounting plate 10 and therefore to vary the exposure of the saw to the work. This adjustment will be readily understood from a study of Figs. 1 and 5 and it is made by loosening the wing nut 58 so that by grasping the handle 57 that end of the saw assembly may be raised and lowered while being guided by the slotted guide portion 46 of the fixed guard casting 43. This guide portion 46 is curved about a center located on the axes of the connections 24 and 41 and within the range permitted by the slot 53 the saw may be adjusted and locked very conveniently by manipulation of the wing nut 58. It will be noted that lifting this end of the saw assembly to reduce the exposure of the saw to the work makes it necessary to guard the adjacent edge of the saw above the base plate 10 and for this purpose I provide upon the casting 43 a fixed guard indicated at 79 which extends outwardly around the saw blade. This fixed guard 79 extends upwardly from the adjacent end of the casting 43 and is also curved in an arc centered about the axes of the connections 24 and 41 as seen in Fig. 1. To make this enclosure at this point complete, a narrow guard strip 80 is fastened by thumb screw 81 upon the lower portion of the guard 79 and depends therefrom down into or nearly into the adjacent end of the saw slot. The guard strip 80 is also to serve as an index for guiding the saw along a mark on the lumber, and its length is adjustable with variations in the angle of tilt about the axis of the rod 15. For this purpose the guard strip is slotted to receive the thumb screw.

A housing or cowl indicated generally at 82, made up of two separable sections, encloses the engine and casting assembly substantially completely but at one end the housing has an opening 83 (Fig. 2) adjacent the handle 66 so that a comfortable grip may be obtained thereon. This opening 83 further gives access to certain controls of the engine as will later appear. A gasoline tank 84 is built into the upper portion of the housing and has the usual vented filler cap 85 and it will be noted that the housing has a portion 86 which partially encloses the swinging guard 70 as well as an opposite side portion 87 which extends around and encloses the engine. Since the precise details of the construction of this housing or cowl are not important to the essence of my invention, they will not be further described herein.

As best shown in Fig. 5 the engine has a piston 88 operating in its cylinder 89 and driving a counterbalanced crank pin 90 upon the crank shaft 32 by means of a connecting rod 91. Combustion is provided for in the cylinder by a conventional spark plug 92 having a cable 93 which extends into and is operatively connected to the magneto assembly 34. This magneto assembly is of the impulse type and for its operation and for starting the engine there is provided a starter cable sheave 94 (Fig. 6) biased in one direction by the usual spring 95 and provided with a flexible cable 96 leading out to a starter handle or knob 97 (Fig. 2) located conveniently alongside the main operating handle 66. A pull upon this starter handle 97 will turn the engine over and at the same time actuate the magneto to provide ignition in the usual manner.

A conventional carburetor 98 is bolted alongside the engine upon a reed valve plate 99, having conventional

reed valves 100 controlling the admission of fuel mixture from the carburetor into the crank case. The usual throttle of the carburetor is actuated by a bell crank lever 101 mounted upon the handle casting 25 and provided with an actuating rod 102 leading upwardly to a throttle trigger 103 (Fig. 1) in the handle. The carburetor has a choke lever 104 (Figs. 2 and 6) which is located inwardly of the handle 66 and is exposed by the opening 83 in the housing so that it may be manipulated by the hand grasping the handle 66. It will thus be readily evident that a right-handed operator holding the saw by the handle 66 may control the throttle trigger 103 with his index finger and the choke with his little finger while the left hand is free to operate the starter knob 97 in starting the engine. Combustion air enters the carburetor through a conveniently located opening 105 in the side of the housing remote from the saw 11 so that this air will not be mingled with chips or saw dust occurring in the operating of the saw. The air is furthermore filtered by a conventional tubular filter 106 which is supported in an isolated housing intake chamber 107 formed between adjacent portions of the housing wall and an irregularly shaped partition plate 108 as seen in Fig. 5. It will be readily understood that all air entering the tubular filter 106 must pass therethrough before entering the chamber 107 and flowing from this chamber into the carburetor.

The engine's cylinder has three exhaust ports 109 and two pairs of transfer ports 110 (Figs. 7 to 9) which, with a single exception later to be described in some detail, comprise a conventional loop-flow scavenging system. The exhaust ports 109 are located between the transfer ports 110 and said ports 109 open out through the wall of the cylinder block 31 into an irregularly shaped muffler 111. This muffler 111 is located within the housing and is shaped as shown in Fig. 5 to obtain the maximum possible muffling chamber size permitted by the space available at this point. From the lowest point of the muffler 111 there leads off laterally and downwardly an exhaust pipe 112 and this pipe passes through suitable openings and recesses in the castings 18, 19 and 20, and terminates finally immediately adjacent the working edge of the saw blade 11. See Fig. 6. The end 113 (Fig. 1) of the exhaust pipe 112 is cut off parallel with the saw blade and this feature constitutes an important part of my invention in that the exhaust gases issuing from the pipe at this point will to a large extent blow away the chips and saw dust occurring during the operation of the saw. It will be noted that within the muffler 111 the pipe 112 has an elongated slot 114 to allow the gases to pass from the muffler into the pipe and that this slot is so located that any condensation forming in the muffler may run out through the exhaust pipe.

Another very important feature of my invention resides in the manner in which the engine is cooled and it will be noted that the upper portion of the cylinder block 31 has the usual cooling fins 115. Cooling air for circulation about these fins 115 enters the housing through a suitably located opening 116 in its side as shown in Fig. 2 and passes through a screen 117 arranged as shown in Fig. 5 alongside the engine. On the opposite side of the engine and down at about the level of its crank case, as well as below the muffler 112, the castings 18, 19 and 20 have registering irregularly shaped openings 118 which provide a generally transversely extending air passage through which air may flow as indicated by the direction arrows in Fig. 6. In the casting 20 the just described opening 118 communicates with an arcuately shaped discharge opening 119 which opens finally through the outer face of this casting immediately adjacent the inner surface of the saw blade 11 and as close as possible to the center thereof. The disk friction of the rapidly rotating saw blade is utilized to pull air out through the opening 119 and discharge the air radially of the saw thus setting up a continuous circulation of air which is taken in through the opening 116 and passes through the screen 117 about the cylinder head and muffler and finally radially outward from the saw. Thus I attain proper cooling for the engine without the use of a fan and with substantially complete enclosure of the engine.

As previously mentioned there is one feature of the exhaust and transfer ports 109 and 110 which I consider to be novel and advantageous, as will now be described.

It will be understood that the fuel mixture is compressed in the engine crank case on the down stroke of the piston

and enters the cylinder above the piston when it uncovers the transfer ports 110, which are connected by suitable passages to the interior of the crank case. Previously, however, to this transfer of the mixture the piston uncovers the exhaust ports 109, which are purposely located higher up the cylinder wall, so that the burned gases may in large part be exhausted before the new mixture begins to enter. Then as the new charge enters it has a loop-flow scavenging action to further exhaust the burned gases as is well known to those skilled in the two-cycle engine field. It may be noted that the distance through which the piston moves after first starting to uncover the exhaust ports and before it starts to uncover the transfer ports is known as the blow-down and will be so referred to hereinafter.

It is, of course, very desirable that the port opening be as rapid as possible, with reference to the piston travel, and the conventional way of expressing the port opening is as an integration of the exposed area of the port with respect to the duration of opening, and is expressed in square inches (or square centimeters) per degrees (of crank rotation). Thus, it will be readily appreciated that the greater this integrated area can be made, the better, consistent with structural and manufacturing limitations and without sacrifice of effective piston stroke.

A circular port is the simplest from the manufacturing standpoint whether it be bored, drilled or cored with a circular core. In accordance with my invention, the ports 109-110 are all circular in cross section but are formed at angles to the cylinder axis such that they incline inwardly and upwardly toward that axis or obliquely with respect to a plane normal to the axis, in the direction of the cylinder head, as seen clearly in Figs. 8 and 9. The intersections of the circular ports with the cylinder wall are now such that they vary from normal ellipses where they emerge through the wall and this variation is such that there results a widening of the upper parts of the ports which are open for the longer time, and a narrowing of the lower parts of the ports which are open for the shorter time. The net integral will thus exceed that of an equal number of circular ports with their axes normal to the cylinder axis as will be understood. Thus, in effect, I secure a more rapid opening of the ports for a given piston movement, while maintaining the manufacturing advantages of circular porting. One advantage resulting from the shape of the port openings is the decrease made possible in the blow-down hereinbefore described. Since the integrated area of the exhaust ports is increased it follows that the distance through which the piston must travel before starting to open the transfer ports may be correspondingly reduced. As seen in Fig. 8, the blow-down is indicated at 120 and it will be at once apparent that a reduction in the distance 120 permits an advantageous lengthening of the working stroke of the piston. Obviously, too, the increase in integrated area of exposure of the transfer ports is an advantage in that each fresh charge of fuel mixture enters more rapidly and its scavenging effect upon the burnt gases is correspondingly increased.

With the single exception of the center exhaust port the axes of the ports pass through the cylinder at some distance from the axis thereof or enter in directions other than radial with respect to the axis. The widening of the upper parts of the ports is more pronounced in the ports, the axes of which are the greater distance from the cylinder axis, as clearly shown in the drawing.

As shown in Figs. 4, 5 and 6, the mounting plate 14 has a projecting ear 150 adjacent the saw slot but inwardly thereof, and this ear extends out above an end portion of the plate. Through a conventional staked nut 151 a screw 152 is threaded down through this ear so that it may clamp in place an L-shaped saw guide 153. Said guide has an elongated channel 154 to receive the screw and has a depending end 155 adapted to run along the edge of the board and accurately guide the saw. The guide may be readily adjusted to any position according to the width of the strip it is desired to saw from the board, as will be understood.

The saw blade is clamped between a flanged collar 156 (Fig. 6), which is keyed to the crank shaft 32 by a key 157, and a washer 158 held by a cap screw 159. The saw is piloted on the shaft and is driven by the friction between the collar and washer, the rotation being in such direction that slippage will tend to tighten the cap screw.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modi-

fications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. In a cooling system for an air cooled engine arranged to turn a circular saw, means forming an intake for cooling air, means forming an air passageway to receive air from said intake and pass the air in heat exchanging relation to the engine, and the said passageway exhausting adjacent the center of one side of the saw to thereby utilize the centrifugal force imparted by the disk friction between the air and the saw to induce air flow through the passageway.

2. In a powered hand saw: a frame assembly having a rear end and a manipulating handle for said end; an internal combustion engine having a crankshaft and a carburetor at the rear of said engine; a saw blade on said shaft; means for pivotally connecting the engine at the rear end of the assembly about which the engine may be pivotally adjusted so as to vary the exposure of the saw blade to the work; adjustment means adjacent to the front of the engine and frame assembly for adjusting the engine relative to the frame about said pivot; means for locking said adjustment means in adjusted positions; and a guard for the saw pivotally mounted about the axis of the saw blade so that said saw blade may be exposed a predetermined depth.

3. In a portable saw of the character described: a frame structure; an air-cooled internal combustion engine, including a crankshaft; pivotal and flexible means securing the engine to the frame; a circular saw blade mounted directly on the crankshaft to provide a flywheel effect for the engine from said saw; means forming an intake for cooling air; means forming an air passage to receive air from said intake and pass said air in heat exchange relation to the engine, said passage having an outlet adjacent the center of one side of the saw blade to thereby utilize the centrifugal force imparted by the disk friction between the air and the saw blade to induce airflow through the passage; and an exhaust manifold for the engine having a discharge opening adjacent the periphery of the saw blade so that the exhaust will blow away sawdust and chips resulting from the operation of the saw.

4. In a portable hand manipulated power driven circular saw: a frame structure; an air-cooled internal combustion engine on the frame, said engine including a crankshaft; a circular saw blade mounted on one end of the crankshaft to secure direct transfer of rotative inertia from the rotating blade to said engine whereby said rotating blade operates as a flywheel for said engine; and means forming a passage for the circulation of air in heat exchange relation to the engine, said passage having an outlet adjacent the center of one side of the saw blade to thereby utilize the centrifugal force imparted by disk friction to adjacent air so as to induce airflow through the passage.

5. In a portable hand manipulated power driven saw: a frame structure; an air-cooled internal combustion engine mounted on the frame, said engine having an exhaust manifold; a circular saw driven by said engine, said exhaust manifold discharging at a location to blow away sawdust and the like from in front of the saw blade; and means forming a passage to circulate air in heat exchange relation with the engine, said passage having an outlet adjacent the center and at one side of the circular saw blade to thereby utilize the centrifugal force imparted by the disk friction between the air and the saw to induce airflow through the passage.

6. In a portable hand manipulated power driven saw: a frame structure; an air-cooled internal combustion engine mounted on said frame, said engine having an exhaust manifold and a crankshaft; a circular saw blade mounted directly on the crankshaft to provide a flywheel for the engine; means forming a passage for circulating air in heat exchange relation to the engine, said passage exhausting adjacent the center of one side of the saw to thereby utilize the outward flow of air adjacent the saw disc as it rotates to induce airflow through the passage, the exhaust manifold of the engine having its outlet located closely adjacent and substantially parallel to one side of the saw blade for blowing sawdust and the like away from in front of the blade.

7. In a portable hand manipulated power driven saw: a frame structure; an air-cooled internal combustion engine, including a crankshaft; flexible and pivotal means connecting the engine to the frame structure; a circular saw blade mounted directly on the crankshaft to provide a flywheel for said engine; and means providing a passage for the circulation of air in heat exchange relation to the engine, said passage having an outlet located adjacent the center of one side of the saw blade so that air will be drawn through the passage by the air moving outwardly adjacent said side of the saw blade as result of disk friction.

8. In a portable circular saw: a frame and housing structure; an air cooled internal combustion engine on the frame and in said housing; a circular saw blade driven by the engine and entering partially into said housing; the housing having an air inlet for delivering cooling air to the engine; and walls defining a passageway to receive the air after it passes about the engine, said passageway terminating in an opening adjacent the center of one side of the saw blade whereby the rapidly rotating blade will draw air from about the engine.

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Number	Country	Date
675,704	France	Nov. 8, 1929
917,683	France	Sept. 23, 1946
586,608	Great Britain	Mar. 25, 1947