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National College of Art and Design

Faculty of Design

Department of Industrial Design

CHAINSAW DESIGN

by

Kenneth O'Leary

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and Design and Complementary Studies in
Candidacy for the Degree of B.Des in
Industrial Design**

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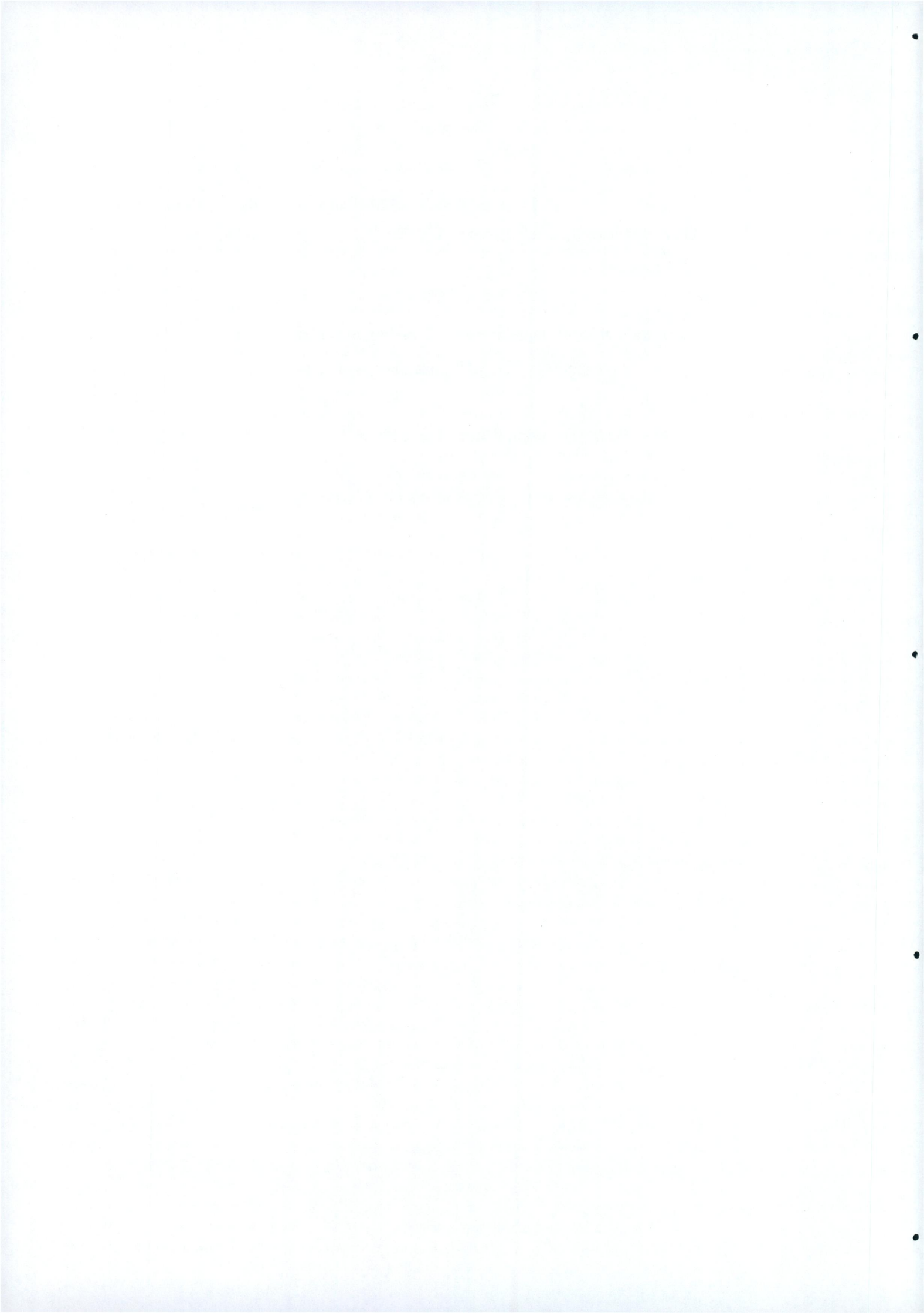
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LIST OF PLATES

<u>Fig.</u>	<u>Plates</u>	<u>Pg, no.</u>
1.	Mechanical concept for cross cut saw, 1824	9
2.	R.M. Wade, Drag saw, 1902	10
3.	Andreas Stihls, Electric chainsaw, 1926, Two-man	11
4.	Dolmar, Petrol powered chainsaw, 1927, Two-man	11
5.	Teles, Gasoline powered chainsaw, 1934, Two-man	12
6.	Teles, Electric powered chainsaw, 1936, Two-man	12
7.	Andreas Stihl with his first one-man chainsaw "The Contra", 1950	17
8.	Stihl professional chainsaw	19
9.	A sectional view of a Husqvarna chainsaw	22
10.	Husqvarna 42, Home-user saw	23
11.	Shindaiwa 488, Home-user saw	23
12.	How depth gauge, working corner, and top plate work together	25
13.	Stihl, rapid micro, high-technology cutting	25
14.	Husqvarna professional chainsaw, 262xp, shown separated in two mouldings anti-vibration mechanism	27
15.	Schematic chart of diaphragm carburettor	28
16.	How the diaphragm carburettor works	28
17.	Canadien, North American chainsaw, 1954	30
18.	Solo Rex, Tyrannosaurs, 1954	30
19.	Pioneer 450, North American Chainsaw, 1953	31
20.	Sankey Aspin, chainsaw, origin and date unknown	31
21.	Wright saw, Model GS5020A, 1957, reciprocating blade	32
22.	Schematic view of two-stroke engine	35
23.	Medium weight Stihl saw, with catalytic convertor, 1989	36
24.	1200 platinum coated cells	37
25.	Testing catalytic convertor	37
26.	Catalytic convertor in situation	37

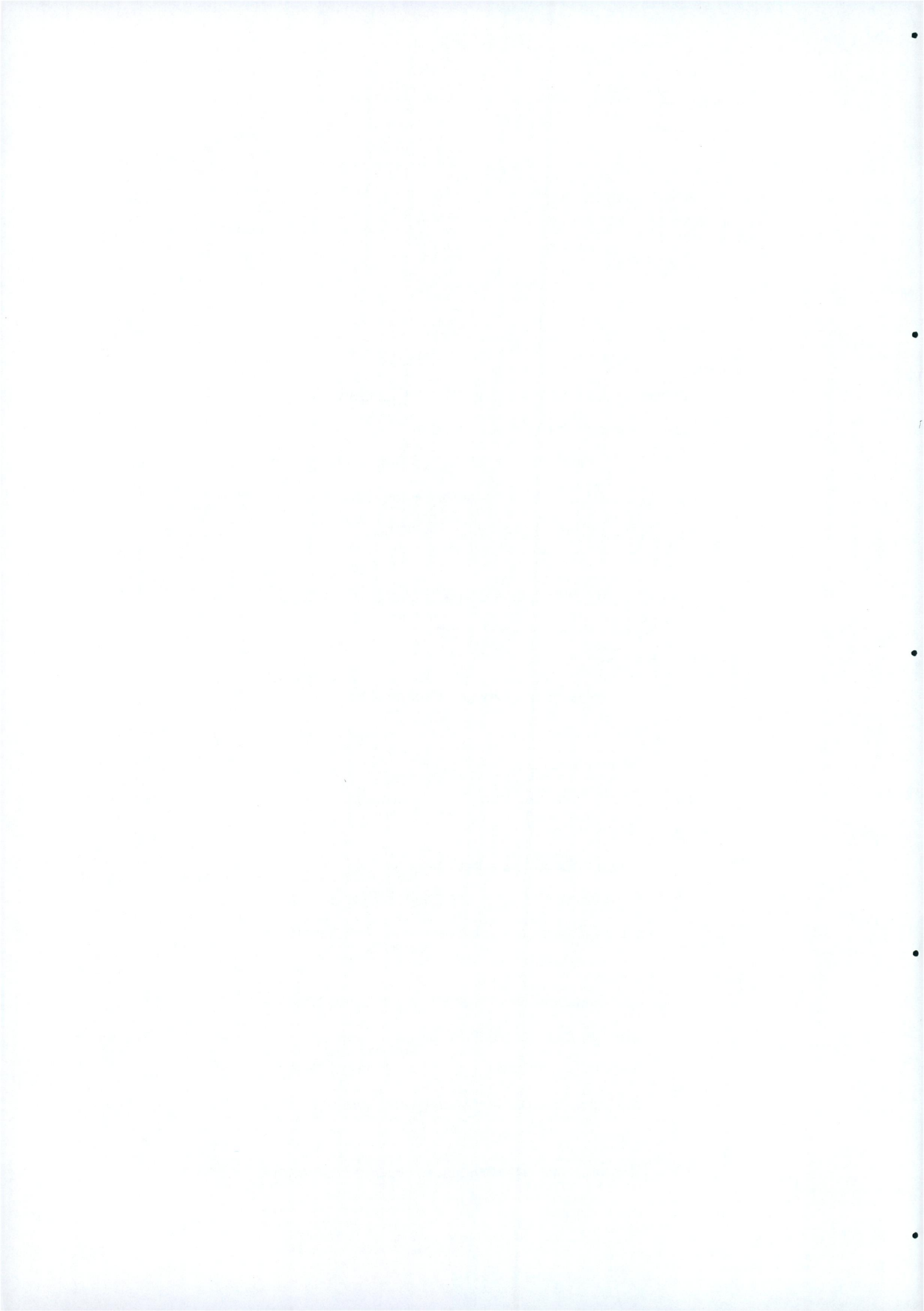


<u>Fig.</u>	<u>Plates</u>	<u>Pg.no.</u>
27.	Field of rape-seed	39
28.	Bioplus chain oil from rape-seed, 99.8% bio-degradable	39
29.	Sectional view of Ematic chain lubrication	39
30.	Redesigned chain	40
31.	Clearing Rhododendron in Killarney National Park	43



CONTENTS

	<u>Page No.</u>
Acknowledgements	1
List of Plates	2
Introduction	6
Chapter 1: An Historical Analysis of Chainsaw Design	
1.1 The concept of mechanisation	9
1.2 From drag saws to the end of World War II	10
1.3 The development of the one-man chainsaw	13
1.4 The refinement and experimentation era	14
Chapter 2: Stylistic Evolution (Why do chainsaws look the way they do?)	
2.1 Form	17
2.1.1 The relationship between man and form	18
2.2 Function	21
2.3 Style and colour	22
2.4 Ergonomics and safety	24
2.4.1 Noise and vibration	26
2.5 The diaphragm carburettor	27
2.6 Case studies of early one-man chainsaws by leading manufacturers and relatively unknown manufacturers	29
Chapter 3: Chainsaw Design and The Environment	
3.1 The use of technology to save itself	33
3.2 Technological developments in chainsaw design in the pursuit of optimum safety and conservation of life	34
3.3 Research and development to reach a compromise	36



3.4	Positive and negative working aspects of chainsaws	40
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Chapter 4: The Marketing of Chainsaws and Their Market

4.1	An investigation of the chainsaw market and marketing strategy using all the constituent parts of a successful marketing strategy as guidelines	44
4.1.1	Is the modern chainsaw the right product?	45
4.1.2	Where is the chainsaw market and is the chainsaw market in the right place?	46
4.1.3	At the right price or value for money?	48
4.1.3.1	Choice of power and value for money	49
4.2	Chainsaw technology including research and development	50
4.3.1	To promote the chainsaw in the right way	53
4.3.2	Consumer safety: Selling safe power	53
4.3.3	Promoting safety apparel and protection devices	54
4.3.4	Safety: Safety awareness videos and Safety awareness literature	55
4.4	Environmental protection and energy saving materials	56
4.5	Chainsaw design and the environment	57
	Conclusion	58
	Bibliography	60



Introduction

On completion of a final year project of a battery operated chainsaw for use by Tree Surgeons it came to my attention that there was a significant lack of Literature available on chainsaw design. A considerable amount of research had been compiled and the suggestion of writing a thesis on chainsaw design was a logical progression. Owing to the area of chainsaw design (tree surgery) undertaken it became all too clear that, not unlike every other product on the market today, chainsaws have not escaped the watchful eye of environmental awareness. Other factors including safety have to be dealt with because the chainsaw is very often considered the epitome of danger and destruction. Being a highly engineered product the chainsaw shape is bound to a strict functional form, therefore a literature search of form and function applies. To gain a greater understanding of these issues and their moral implications it was necessary to study Design For The Real World by Victor Papanek and also Green Design by Dorothy Mackenzie. Also a greater understanding of the parameters under which highly engineered products have to perform and the environment in which the product has to perform led to Industrial Design in Engineering by Charles H. Flursheim and Style In Product Design by Graham Vickers. All of these Literature searches led to a greater understanding of the role marketing plays in the development of any product, especially chainsaws, and The Managers Handbook by Ernst and Young proved invaluable as a guideline to examining the marketing strategy used by chainsaw manufacturers. As with any thesis an historical analysis of chainsaws was necessary to lay the groundwork. Stationary engine and chainsaw age, both periodicals, proved invaluable in the supply of historical information. Other sources of literature and information included advertising material by manufacturers, also correspondence with manufacturers, accident information bureaus, dealers, old machinery collectors and historians in the field of antique saws.



We live in a high technology society, this means that our way of life, our standard of living and the wealth of our country is dependant upon the use of sophisticated products. It is our duty to try to ensure that the design of these products work well, look good and are safe to use. We must also try to ensure that the manufacture, use, recycling if possible and finally the disposal of these products will both benefit society and have the minimum effect on the environment.

This thesis is intended to portray the evolution of the chainsaw from a two man cross cut saw to a modern one man state of the art machine. It is also intended to question whether today's innovative breakthroughs in technology and attitudes brought the desired operating, safety and efficiency requirements to the modern chainsaw.

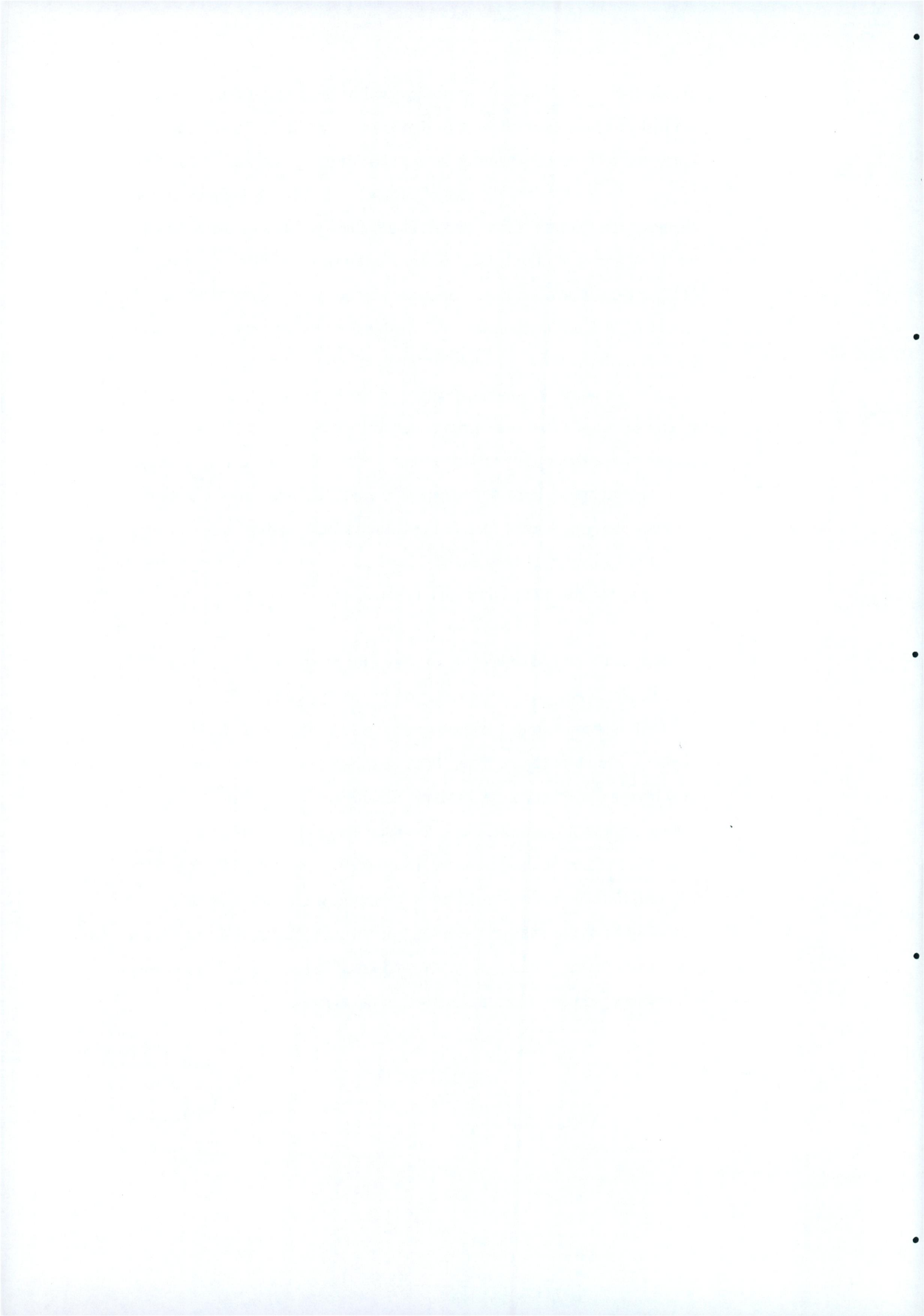
Innovative mechanical design of the early 1800s, attempt to portray some of the primary woodcutting methods. Early mechanisation of the two man cross cut was attempted to reduce the laborious task of wood cutting but was not successful until the invention of the internal combustion engine.

The change from reciprocating blade to the chain evolved around 1926, but this first chainsaw was still a heavy cumbersome machine. The change in manufacturing materials from cast iron to Aluminium along with the introduction of the two stroke engine heralded the one man chainsaw. Further refinements in the chain design, the introduction of the centrifugal clutch and the development of the Diaphragm Carburettor brought the machine to the stage which has changed little since.



The Stylistic evolution of the chainsaw will be dealt with from 1949 when the first one man chainsaw was designed by "Homelite". The characteristic shape and form of the chainsaw as we know it today appeared in the form of "Andreas Stihls" first one man chainsaw. Is it because Andreas Stihls chainsaw the "Contra" incorporated all the characteristics of the chainsaw we know and is used today that make it better or more efficient, or is it because a chainsaw is a highly engineered product and as such can only be fabricated in a predetermined form? If this form in any way changes could it result in the sacrifice of safety or function? Do factors such as temperature, noise, vibration contribute to the form of the chainsaw and if so in what way? These elements under which the user must work such as temperature and humidity and also the machine inflicted nuances such as noise and vibration, draw our attention to environmental issues affecting chainsaw design. A brief look at the conservation qualities of the chainsaw and an investigation of how the chainsaw has remained a product of the nineties in contrast to its contradictory reputation.

Environment issues have become the basis for most if not all product design. Not "one" product can claim to be totally "green". The process involved in producing the product must make an effort to be "green". Timber is the basis of our civilization, machines to cut timber therefore have become inherent to our society. The question being, How can a product such as a chainsaw, that plays such a significant role in the destruction of our natural resources, incorporate environmentally friendly additions to their products in an effort to appear green and boost sales?. The marketing of chainsaws and the selling of chainsaws requires a formulated psychology which is based on safety, and green issues and is a supporter of reforestation and development research in these areas.



CHAPTER I: An Historical Analysis of Chainsaw Design

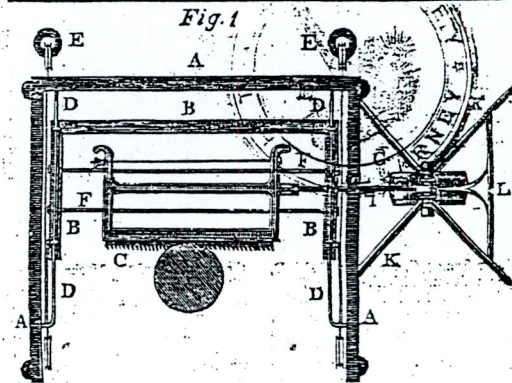
1.1 The Concept of Mechanisation

In 1824 a designer or mechanic called Dixon Vallance, formulated a concept for a mechanical cross cut saw. This was the first attempt at reducing the laborious task of use with a two man Cross Cut saw. The concept of a swinging pendulum to provide the motion can be seen by the illustration (Vallance, 1824, p. 49).

Mechanics Magazine, Museum, Register, Journal, & Gazette.

Read not to contradict and confute, nor to believe and take for granted, nor to find
talk and discourse; but to weigh and consider.—Lord Bacon.

No. 32.] SATURDAY, APRIL 3, 1824. [Price 3d



NEW CROSS-CUTTING SAW.

Libberton, near Carnwath, Scotland,
Feb. 4, 1824.

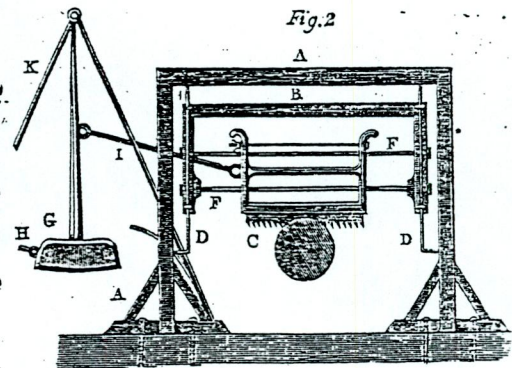
GENTLEMEN;—I send you herewith the plan of a Cross-cutting Saw, a contrivance of mine for cutting standing timber, and of course acting horizontally; the parts are marked as in the inventor's own specification subjoined: the pendulum frame is in this figure shown to correspond with the horizontal view of the rest of the machine, looking down on it.

The saw may be made of any length, from two feet to six or eight feet, and from one inch and a half to two or three inches in breadth. It should be nearly one-eighth of an inch thick in the face, and thin in the back. It requires little setting.

Gentlemen, as you have seen the first of this invention, I hope you will do me the justice of giving it early publicity. I am

Your most obedient servant,
A Humble Mechanic,
DIXON VALLANCE.

Vol. II.



inner frame; C, the saw; D D D D, the rods on which the inner frame slides; E E, the weights which keep the saw to the tree; F F F F, the rods on which the saw slides when moved by the pendulum; G, the pendulum; H, the handle; I I, the shaft between the pendulum and the saw; K K, the pendulum frame.

Fig. II. The saw is in this case adapted to the cutting of trees when lying on the ground. The frame is fixed on both sides of the tree firmly to the ground, with four long iron pins. The saw is put in motion by moving the weighty pendulum between two springs at opposite sides of the frame. In this case no weights are required to keep it into the wood, the weight of the frame being sufficient for that purpose.

The length of the pendulum may be according to the length of the saw, from six to twelve feet.

Description of the Drawing.

Fig. 1 is a horizontal view of the whole apparatus, arranged to cut standing timber, and of course acting horizontally; the parts are marked as in the inventor's own specification subjoined: the pendulum frame is in this figure shown to correspond with the horizontal view of the rest of the machine, looking down on it.

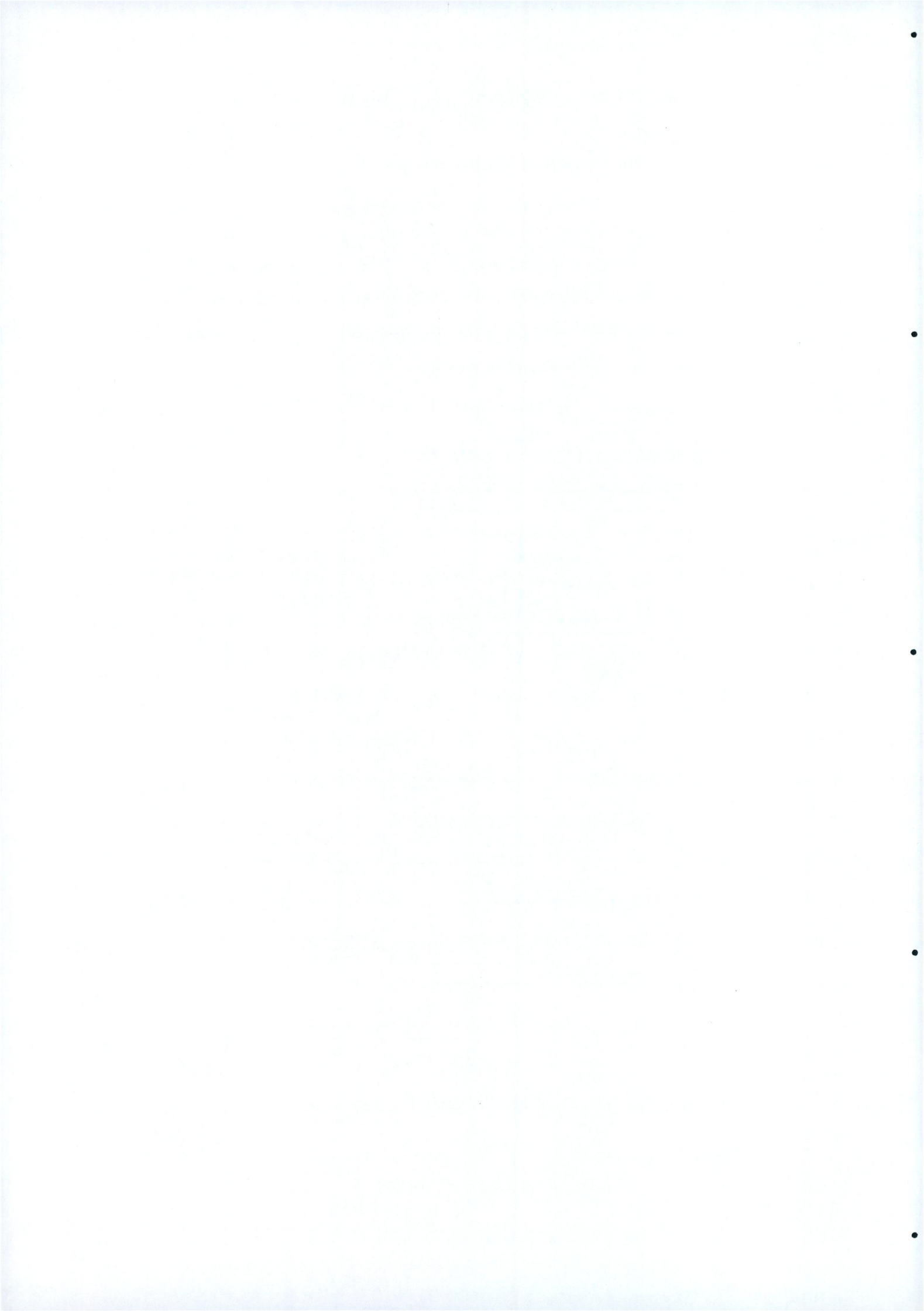
Fig. 2 is a vertical arrangement of the same apparatus, for cutting lying timber, and is an elevation, in which the pendulum frame is seen in its vertical dimensions.

The Inventor's Specification.

Fig. I. The saw slides on two steel rods, put in motion by a weighty pendulum. The rods are attached to the outer frame, which is firmly fixed to the ground with four long iron pins.

A A A, the outer frame; B B B, the

Fig 1 Mechanical Concept, For Cross Cut Saw In 1824



1.2 From Drag Saws to the End of World War II

Since the invention of the steam engine harvesting equipment had been gradually mechanised. The harvesting of timber by mechanical means was not successful until the introduction of the internal combustion engine.

The first reasonably efficient mechanised saw was the then standard cross cut saw adapted to be driven by the internal combustion engine. This was called a drag-saw. Drag saws were first invented by R. M. Wade around 1865 and continued manufacturing them until the 1950s "when up and coming lightweight chainsaws forced the older style heavyweight saws to fall out of favour" (Stationary Engine, 1987, p. 6).

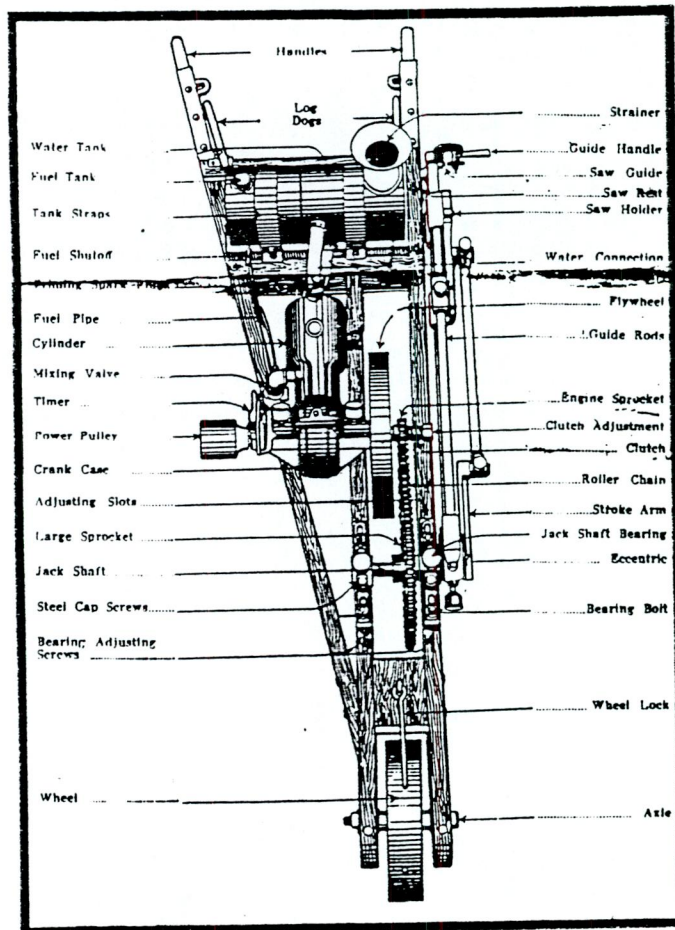


Fig. 2, R.M, Wade, Drag Saw, 1902



In 1926 Andreas Stihl, born 1896, in Stuttgart, Germany, introduced the idea of a chain instead of a reciprocating solid blade saw and the chainsaw was developed or evolved from that period. The first saw was an electric saw, but while it made the saw very manouverable as opposed to an internal combustion powered engine, a power source had to be close at hand, as a result this was not the answer to all the problems (Stihl Promotional Catalogue, 1990, p. 2).

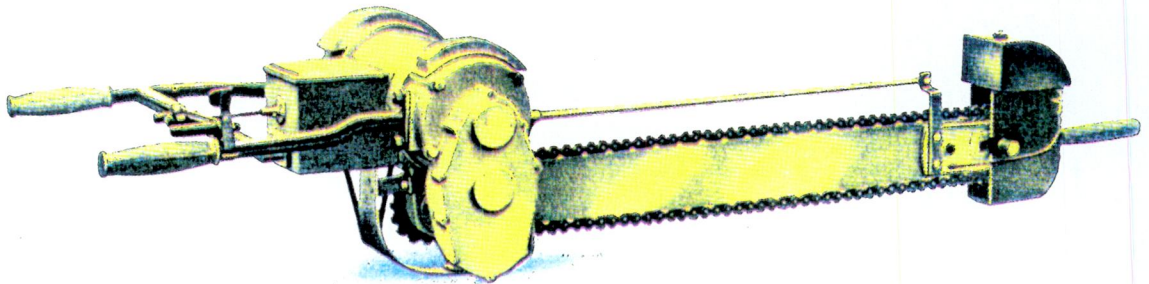


Fig.3, Andreas Stihls Electric Chainsaw, 1926, Two Man

In 1927 the first gasoline powered chainsaw was designed by Emil Lerp, also a German who was later to set up a company called Dolmar designing chainsaws. Dolmar, being called after a local landmark, Mount Dolmar. (Chainsaw Age, 1990, p. 7).

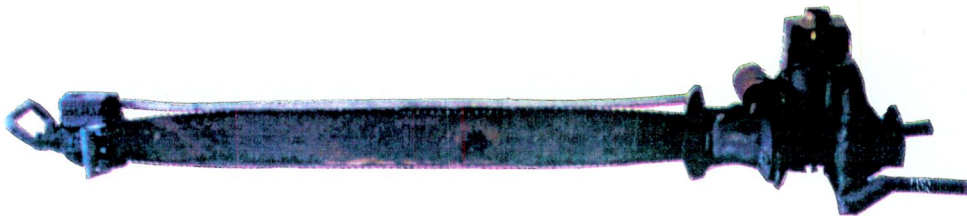


Fig.4, Dolmar 1927, Petrol Powered Chainsaw, Two Man

Chainsaws of this period 1929 were very heavy and cumbersome. The engines were cast-iron, four-stroke engines, which were slow reeving, requiring a gear-box, and a gravity type carburettor which meant the engine could only be operated in one position, that is upright only. This meant that when the cutting angle had to be altered, the bar and chain had to be rotated in relation to the engine. This in turn involved extra mechanism and consequently extra weight. The weight was (50 kg) and required two persons to operate; the chainsaw being a Stihl Two-Man Saw, 1927 (Stihl Promotional Catalogue, 1990, p. 2).

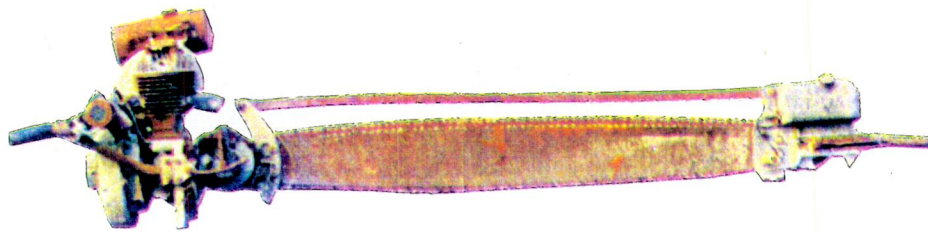


Fig.5, Teles, Gasoline Powered Chainsaw,1934, Two Man

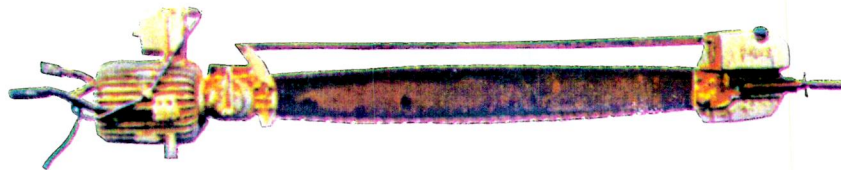
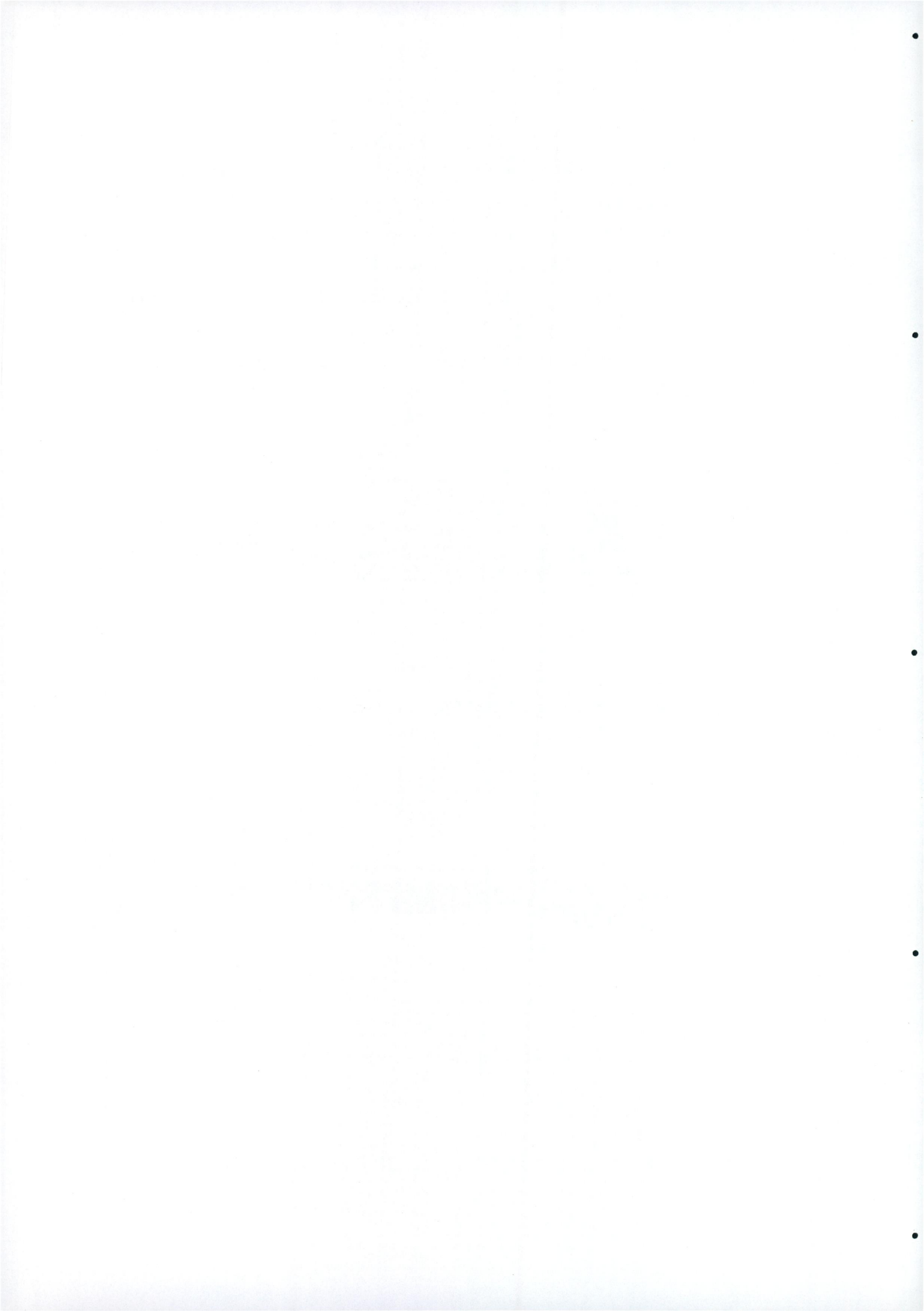


Fig.6, Teles, Electric Powered Chainsaw,1936, Two Man



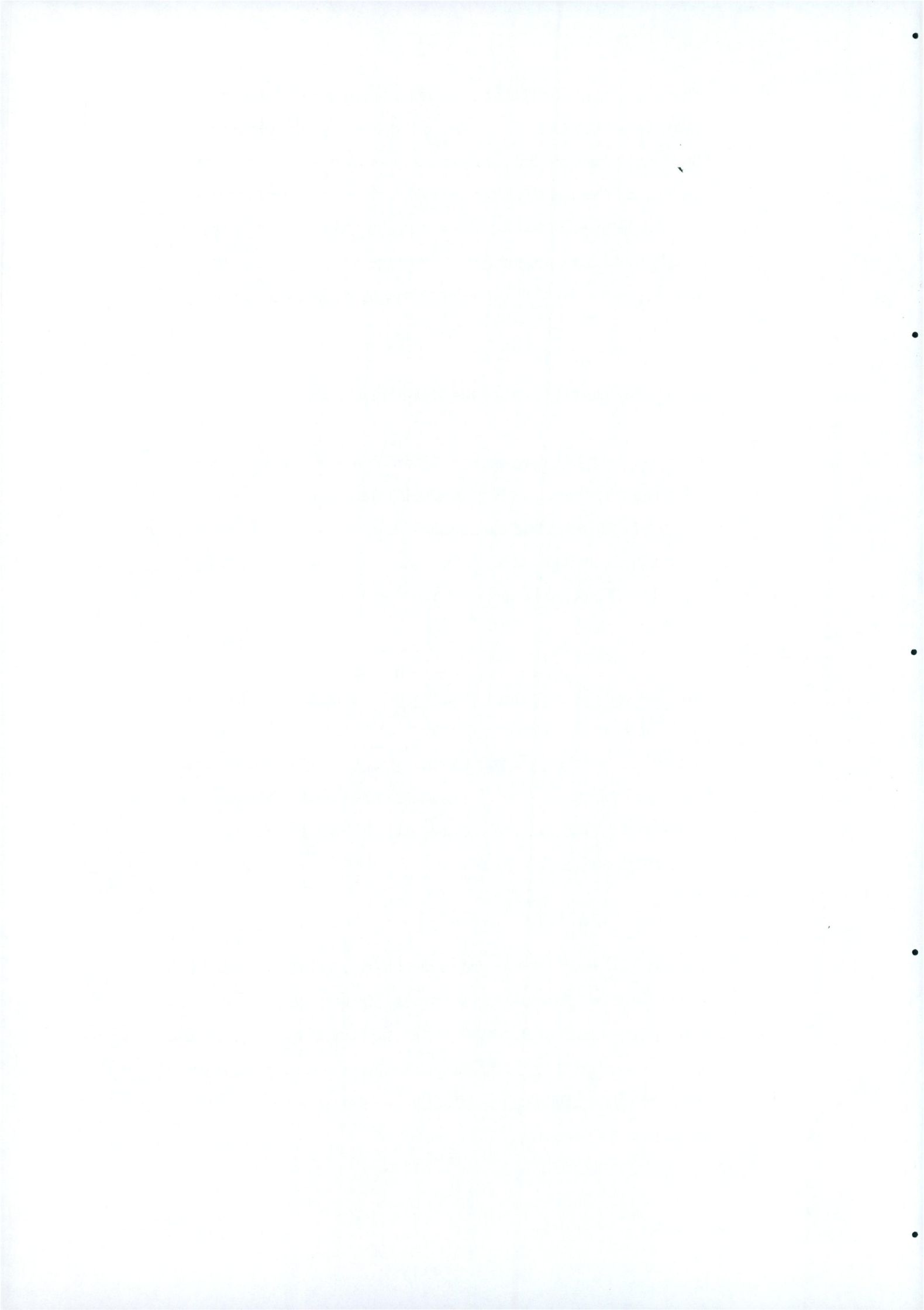
Up to the mid-1930s chain lubrication was primitive. The cutting was inadequate. The tooth design was still that of the solid blade reciprocating format and therefore did not meet the requirements of a high speed chain cutting saw. In the 1930s the centrifugal clutch was developed which enabled the engine to idle without activating the chain. The problem of weight was a big consideration at this stage of development. So it was a natural progression to use aluminium casting where possible.

1.3 The Development of the One-Man Chainsaw

Great technological developments following the end of World War II in 1945 led to further changes in processing metals and other materials . These advancements and the introduction of the 2-stroke engine heralded the arrival of the one-man chainsaw which was first introduced in 1949 by Homelite (Homelite Promotional Material, 1991).

This saw was the first major breakthrough in chainsaw design. This design was still relatively heavy and the vibration from the engine caused the operator early fatigue. It was very noisy, as one can appreciate when hearing two-stroke engines of today and to use a modern phrase, it was not user friendly. The two-stroke engine was still troublesome and inefficient eventhough two-strokes were in operation since the beginning of the century.

The first chipper chain emerged in the 1950s. This was a crude formation of the chain we know and use at present. Irrespective of this development and the importance of its mature design, no manufacturer of chainsaws in this era have laid claim to the design, yet every chainsaw manufacturer, then and today, uses a chipper chain in one format or another. It revolutionised chainsaws.



From the mid-1950s further advancement in the quality and design of castings, and the elimination of gears from chainsaws reduced their weight considerably. This was largely due to the development of the centrifugal chainsaw clutch designed by Stihl in 1935 (Stihl Promotional Catalogue, 1990, p. 2).

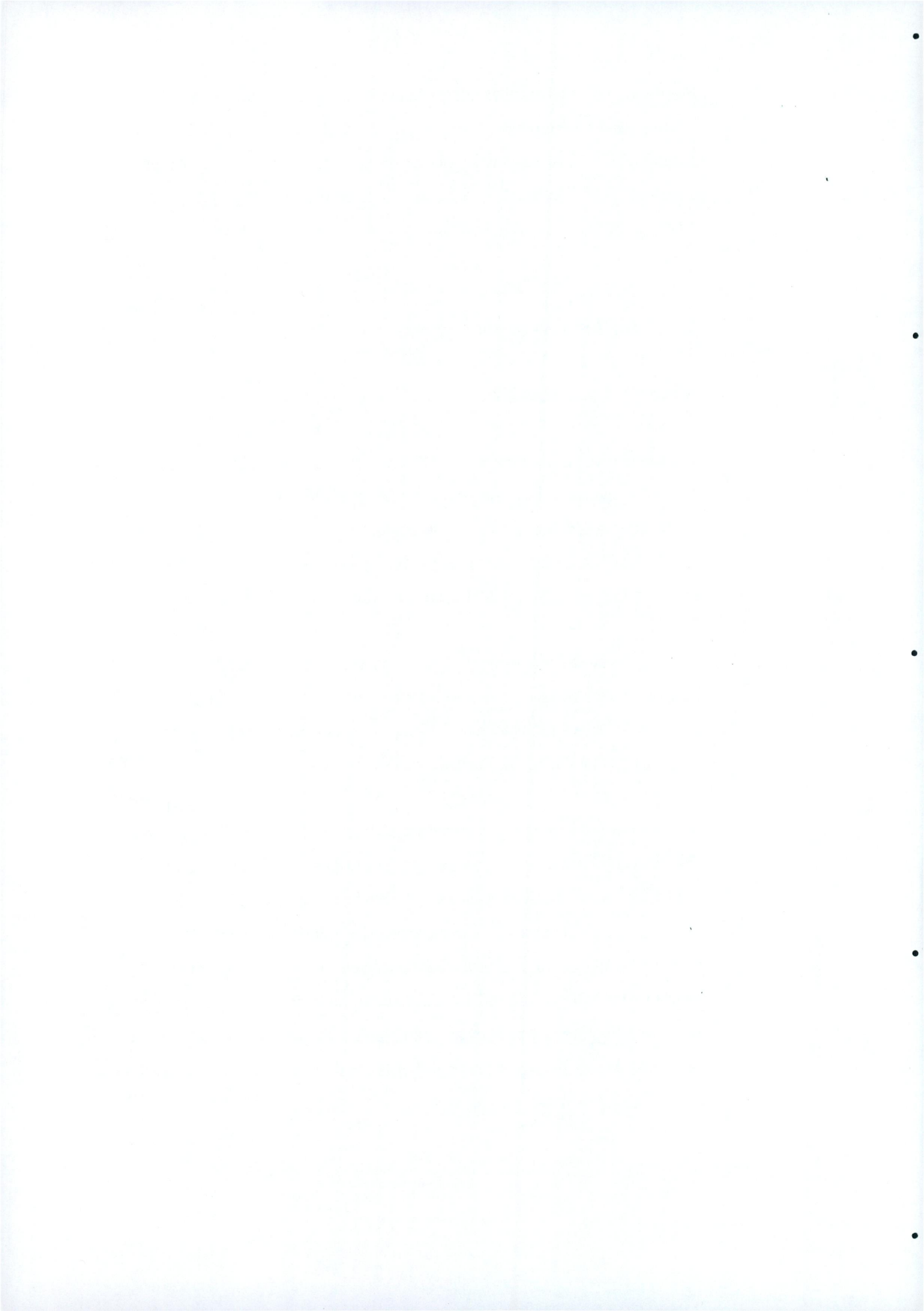
1.4 The Refinement and Experimentation Era

Aspects of Manouverability:

The weight was a problem with chainsaws up to and including the early 1950s. Manouverability was also a hinderance, Dolmar, as they were known at the time, began using all position diaphragm carburettors which allowed the chainsaw to be held at any angle during the cutting process without affecting the performance of the engine (Chainsaw Age,1990, p.7).

By 1959 Stihl had realised that their product had reached its functional aesthetic. This means that it had reached a milestone in that it reflected its ability to cope with the job it was designed to do. There was very little visual or design change in the following five years.

In 1964 the Stihl company patented an antivibration system. This was the first of many refinements introduced to ensure that user satisfaction and user safety were of a high standard. In 1968 Stihl introduced an electronic ignition to their chainsaws. The electronic ignition would adjust the ignition timing to suit engine load at any given time. This innovation in chainsaw technology allowed the chainsaw to be started easier, achieve maximum lugging power at every speed, and it consumed less fuel. It also prevented excess revving of the engine if the carburettor setting was incorrect (Stihl Catalogue, 1990, p.2).

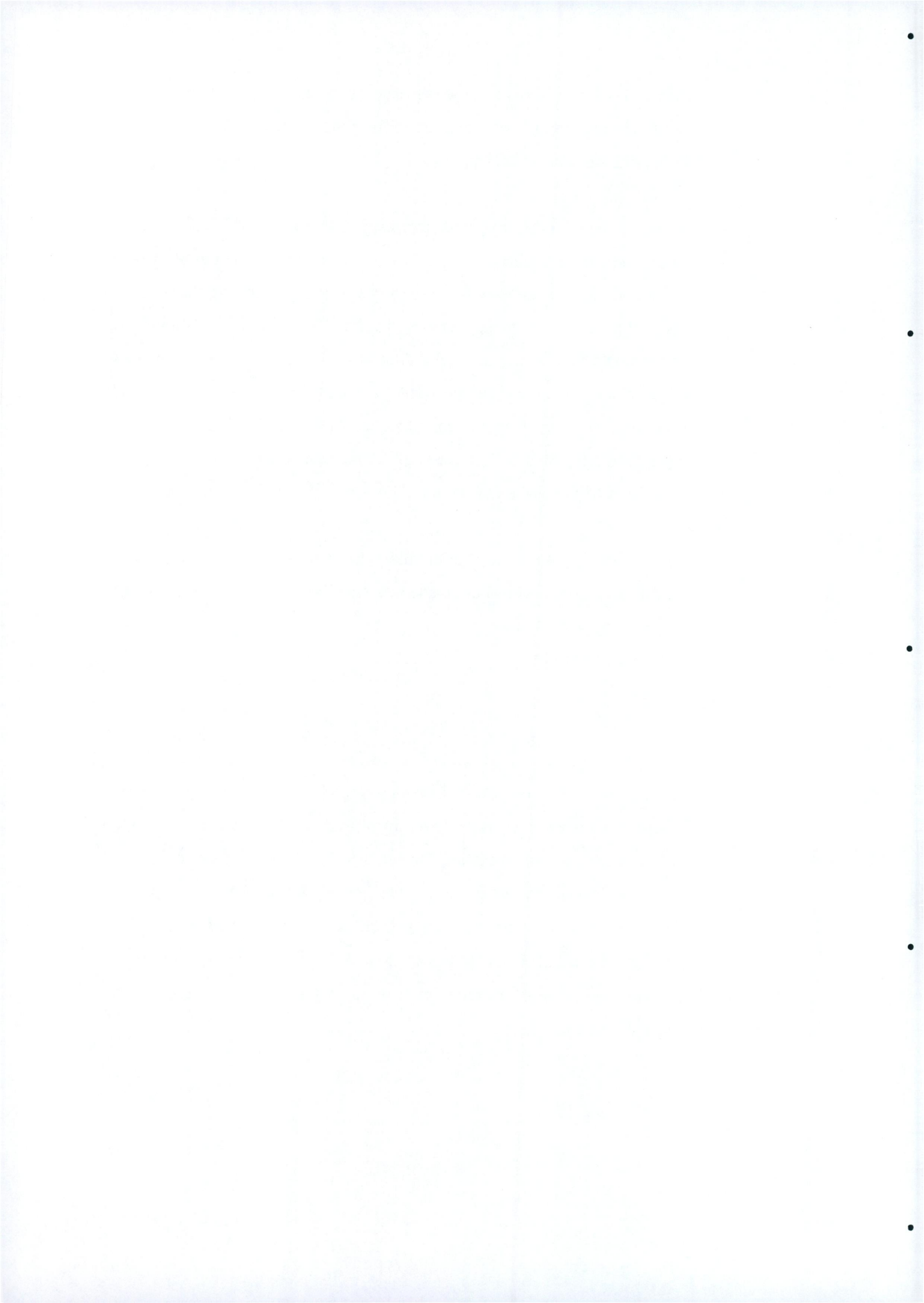


Then in 1969 a refined version of the saw-chain self-lubricating system manifested itself on a Stihl chainsaw. This system improved at a later date and so did the chain lubricant.

During the late 1960s/early 1970s increasing awareness in safety led Stihl to the introduction of a chainbrake and safety throttle lock. The throttle would only work when the safety throttle lock was depressed, insuring the user was in full control of the chainsaw at this time. The chainbrake worked in conjunction with a handguard and a drum resembling that of the brakes on a car. If and when the chainsaw would kickback, the left hand which would be holding on to the wrap around handle would kick the hand guard forward, which would in turn activate a clamp around the drum, halting the momentum of the chain and stalling the engine (Frank Jones, Interview).

This first chainbrake worked on the basis that if the chainsaw throttle was not depressed, the chain would come to a stop due to a brake which worked on inertia against an outer drum.

Three years later in 1975, Dolmar became known as Sachs Dolmar and set up a company to design and make chainsaws. This same year, 1975, Sachs Dolmar introduced a chainsaw driven by a wankel rotary engine. It received much acclaim for being revolutionary, free from excess engine vibrations, less noisy, lighter and easy to use (Chainsaw Age, 1990, p.7). The wankel rotary engine chainsaw was an experimental chainsaw. It experienced difficulties due to the engines seizing and problems with the reliability and servicing of such products. It was a commercial disaster. (Frank Jones, Interview).



The most recent development by Stihl is the Ematic System, which reduces the amount of oil needed to lubricate the chain. The Stihl Ematic System stops this waste. It basically consists of a redesigned chain, guide bar and a variable or reduced-flow oil pump. This Ematic System has greater advantages not just for performance but also for environmental and safety issues which will be dealt with throughout this thesis and which have become the basis for product design at present. (Stihl Catalogue, 1990, p. 2).



CHAPTER 2: Stylistic Evolution

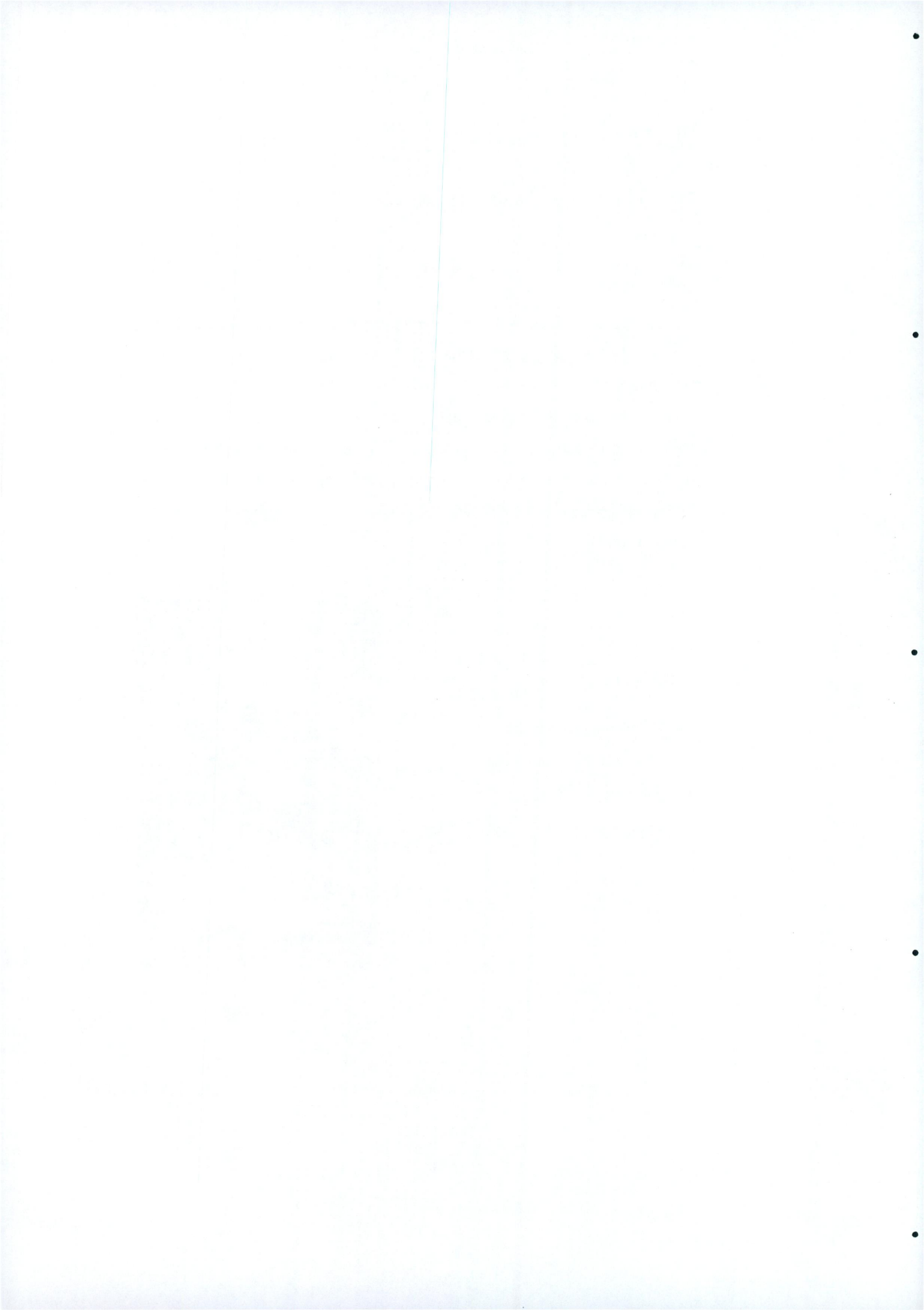
Why do Chainsaws look the way they do?

2.1 Form

The chainsaws we know today are much more advanced from what people were using 44 years ago, not to mention 68 years ago when the first two-man chainsaw was being used. Andreas Stihl was not the first to design the one man chainsaw, but was the first to make the characteristic shape of the chainsaw his design. The Chainsaw is an engineering design, therefore its appearance falls within the parameters of its working ability. If changing or altering the position of its working components will undermine its performance, is it possible to redesign the chainsaw?

**Fig.7, Andreas Stihl With
His First One Man Chainsaw
"The Contra" 1950**





The Successful Layout

A vertically mounted two-stroke petrol engine.

A grooved guide bar along which the chipper chain (butterfly chain) slides.

A rear handle to be held by the right hand.

A wrap-around handle to be held by the left hand.

A centrifugal clutch to allow the chainsaw to idle (the chain remains stationary until the throttle is depressed).

Other refinements such as safety throttle lock and quickstop inertia tripped chainbrake were introduced since 1950 but could not be considered part of the characteristics of the successful design. It is this form which people the world over recognise as the basic chainsaw format.

2.1.1 The Relationship between Man and Form

There are a number of criteria affecting the form of any product, especially in relation to the potential user.

1. Psychological
2. Function
3. Ergonomics + Form
4. Styling
5. Materials
6. The Marketplace



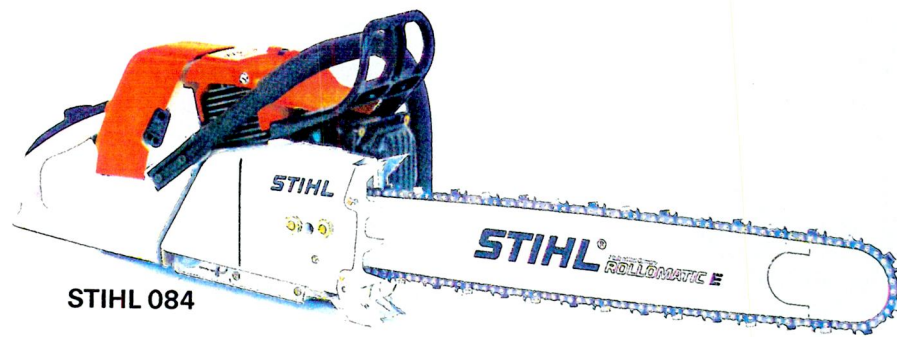


Fig 8, Stihl Professional Chainsaw

Psychology

When first seeing the product, there is an immediate gathering of information by our senses. Form imparts this information. It is fair to say that most people on this planet have seen or have been exposed to images of a chainsaw. Even if this was not the case and people never saw a chainsaw before, the immediate reaction towards the chainsaw would be that it was to be held by both hands, that it is a cutting instrument, that it has the potential to be dangerous, and is functional.



Function

The ability of form to impart such information as function is a factor which could not be done without. It is also a help when the very nature of the functional requirements of the chainsaw (the layout of the elements of the chainsaw) suppresses any efforts at imparting an alternative image of function, not that chainsaws need any more help at imparting information through form.

Ergonomics

Ergonomics affect the form of the chainsaw and is usually seen as rounded casings, safety guards and handle positions. Ergonomics relating to human interface with the chainsaw effect its form and so too do irritation factors such as noise and vibration which will be dealt with in the safety paragraph. To take account of the weight of the two-stroke engine, the wrap around handle is placed just above the centre of gravity and the handle for the right hand is placed at the rear of the engine in line with the guide bar as though it were an extension of ones arm.

Styling

As competition between chainsaw manufacturers increases and because their products are so similar, more emphasis is being placed on style and colour, chainsaws being so limited as regards form. Therefore style encompasses slight curves, grilles, colour and tactile qualities.



Materials

As regards the form of the chainsaw in relation to materials, there are no limitations except for the covering of the engine, which is usually an aluminium casting.

The Marketplace and Form

The Sale of chainsaws depends on how well a product can speak for itself, and the chainsaw is a statement of its capabilities. Therefore it is easier to manage a product which evolves rather than one that is revolutionary.

2.2 Function

Function is of utmost importance in chainsaw design. Function has never been sacrificed for style or to make the chainsaw more aesthetically pleasing. If function were in any way sacrificed so that a style or aesthetic be achieved for marketing and advertising purposes, it would be an action paralleled only by murder. In most peoples opinion chainsaws are very dangerous. A chainsaw in some way reflects what it was designed to do. No matter in what form they are seen, one can always recognise how to use them and what they do, this is of sorts a psychological ergonomics. As a designer an awareness of visual balance is important, since a sense of stability in a design is more readily accepted by the human mind than instability. It is a difficult process to design something which is surrounded by a stigma of imminent danger. Therefore adding a feeling of strength and sturdiness and power along with a balanced feel reassures the user. First and foremost a chainsaw must be efficient otherwise the danger involved in using the chainsaw may not be worth the risk.



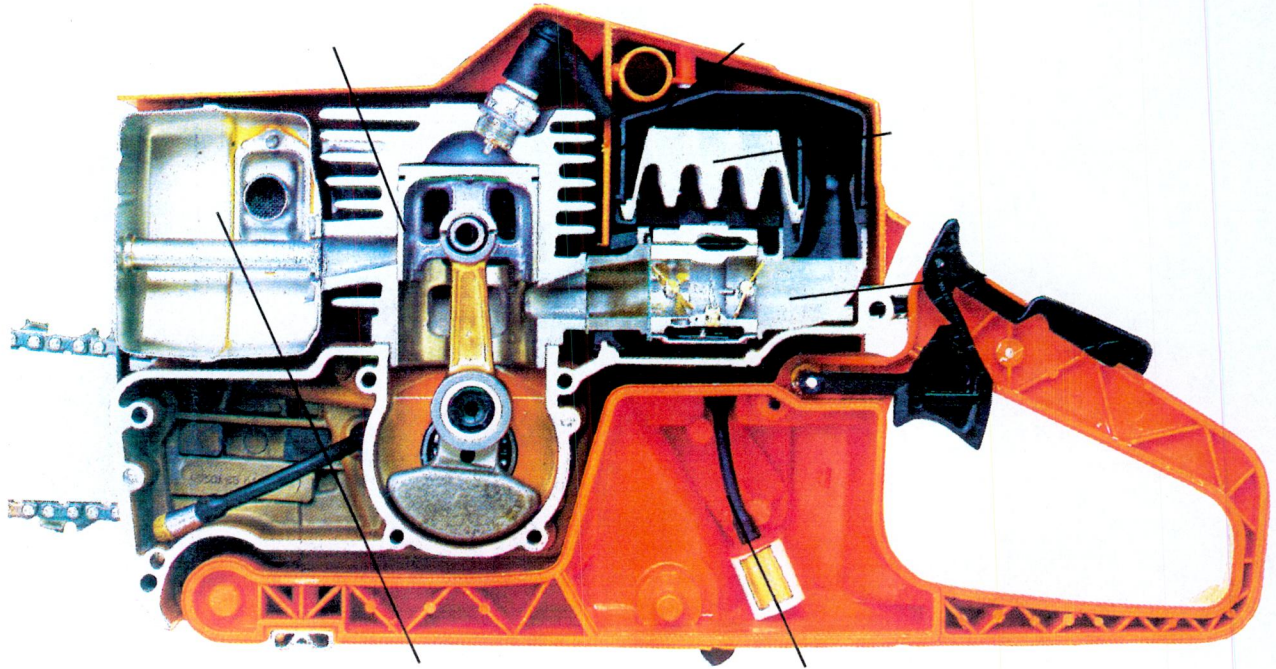


Fig.9, A Sectional View Of A Husqvarna Chainsaw

2.3 Style and Colour

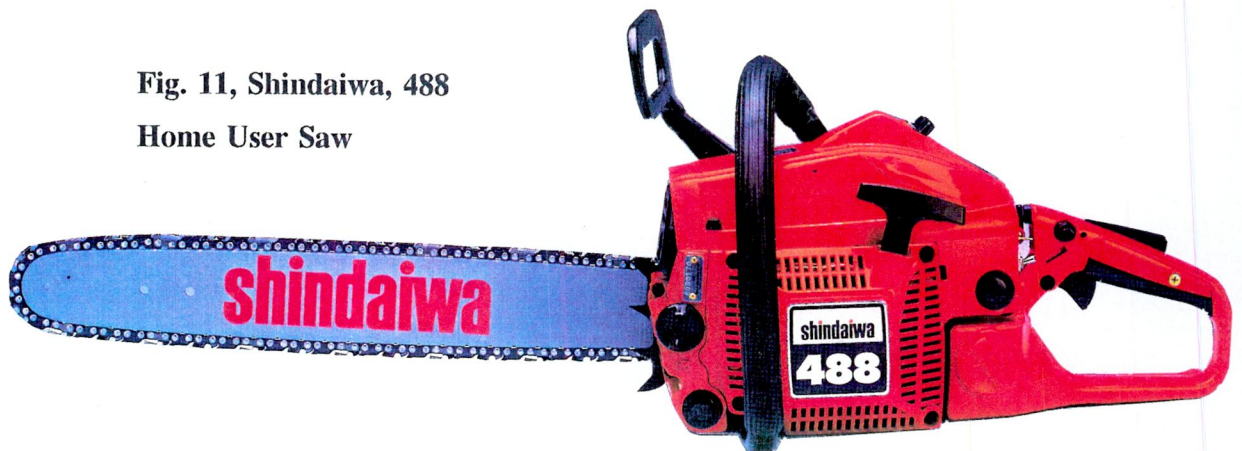
The true style of any particular chainsaw will differ whether addressing the tactile qualities, ergonomics, finish or colour. Colour is the ingredient of a chainsaw which imparts to the customer a sense of liveliness, power and viciousness, these descriptive words are correctly used if the chainsaw is the colour red, orange or yellow, which the majority of chainsaws are, save a few smaller manufacturers of chainsaws such as Black and Decker who have a dark green electric chainsaw on the market. The cutting chain of the chainsaw has much the same mental effect on the consumer. There is no choice regarding this element, a cutting chain has to be used in conjunction with a guide bar. Stylistic features have changed very little in the last 35 years of evolution of the chainsaw. STIHL retains its bubbly casings with split colouring of orange and white, which has become synonymous with Stihl. Sachs Dolmar looking very like Husqvarna and



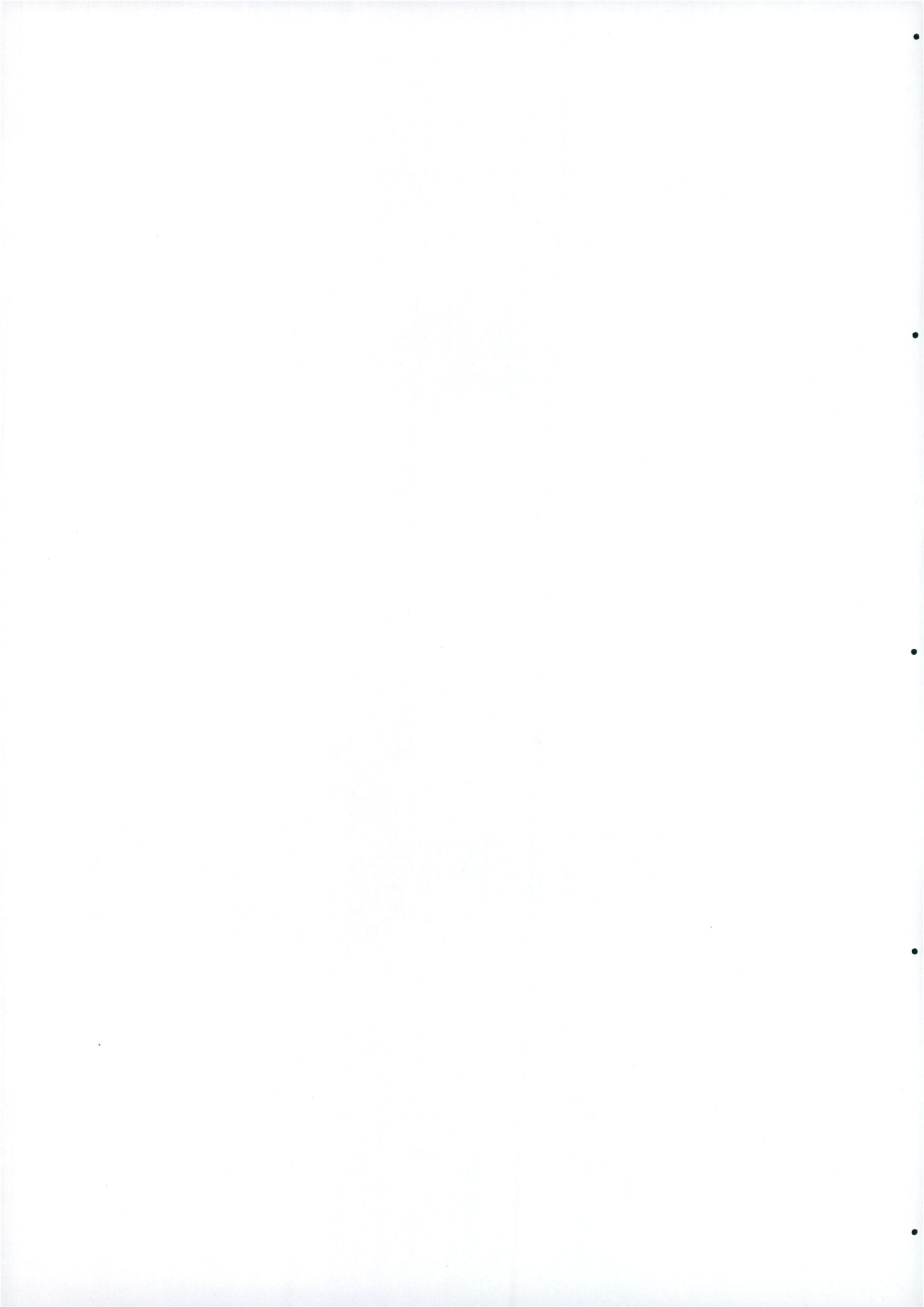
Shindaiwa and Oleo-Mac. Husqvarna with a black and orange matt finish, Shindaiwa with a black and red gloss finish.



**Fig. 10 Husqvarna 42
Home User Saw**



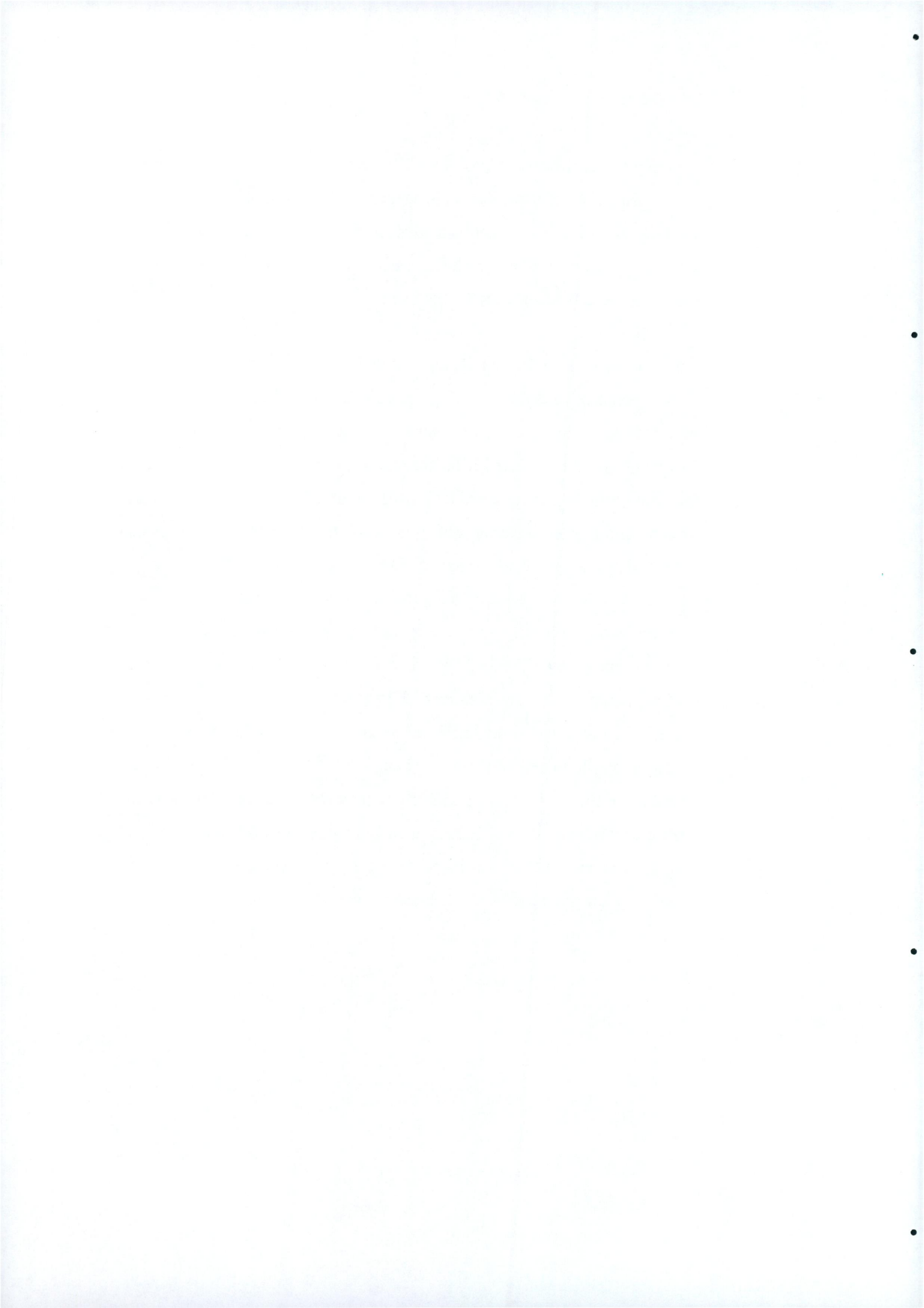
**Fig. 11, Shindaiwa, 488
Home User Saw**



2.4 Ergonomics and Safety

Primarily the chainsaw is a product which is used outdoors and is subject to the elements as is the user. It is elements such as Temperature, Noise and Vibration, which affect human responses to situations of danger. A reduction in the affect these elements has on the user will increase safety. These can be considered ergonomic criteria.

It is parts such as the cutting chain itself which cannot be changed because of its importance to the look of the chainsaw and its efficient function that are no longer escaping close scrutiny and subtle changes to increase safety, maximum safety is achieved if kickback is reduced. To reduce "kickback" the chain must be cutting wood and not glancing off it. Therefore the more efficient and sharper the chain, the more wood it cuts in reduced time, and less accidents occur. It has long been known that the longer the user is working with the saw the more fatigued the person becomes due to vibration and nauseous fumes. The longer a person works with the chainsaw the greater likelihood of an accident. Therefore the reduction in working hours will reduce accidents. Firstly, an analysis of the redesigned chain, which will lead us on to the reduction of Vibration and Noise. Owing to the introduction of C.A.D (Computer Aided Design) and advanced research techniques it is now possible to obtain optimum capabilities from cutting chains. The cutting links of a chain, comprise of an ingenious design. The cutting tooth incorporates a depth gauge, a working corner and a top plate, as illustrated. (Chainsaw Age, 1989, p26).



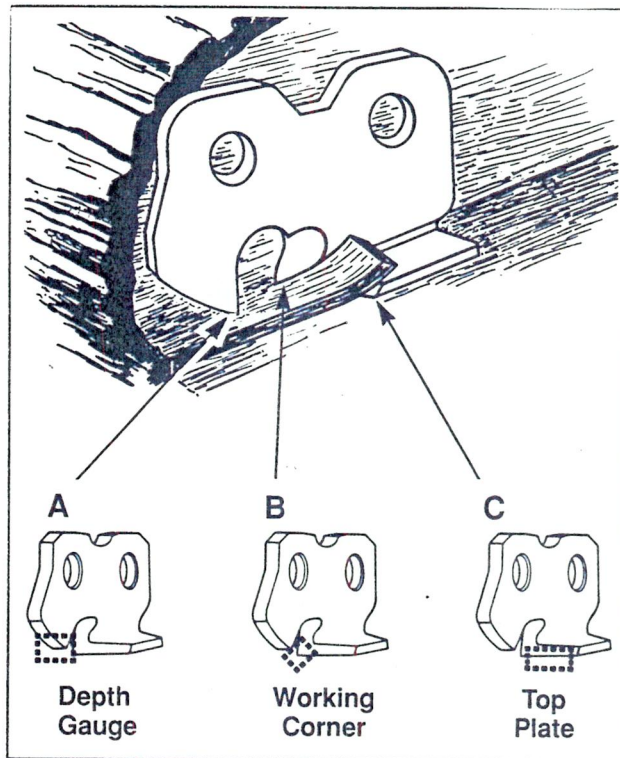


FIGURE 12—How depth gauge, working corner, and top plate work together.

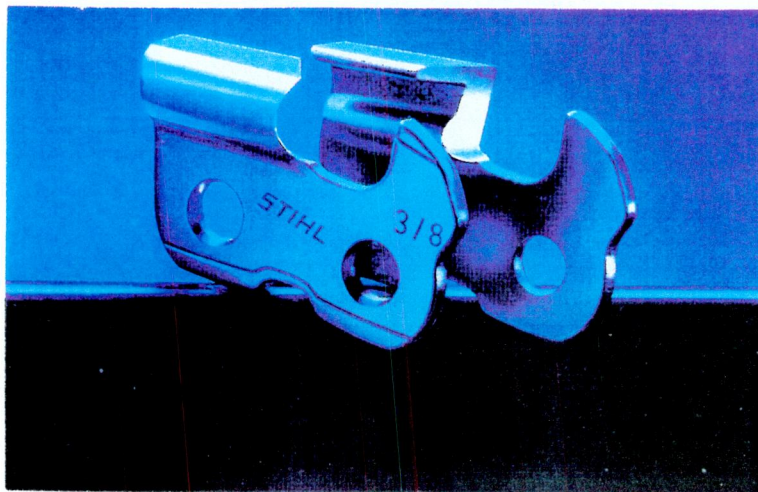


Fig 13, Stihl, Rapid Micro, Hightechnology Cutting

the depth gauge only allows the tooth take a predetermined depth of cut, otherwise the chainsaw would catch in the wood and kick back. The working corner is the part that cuts into the wood and forces it up along the

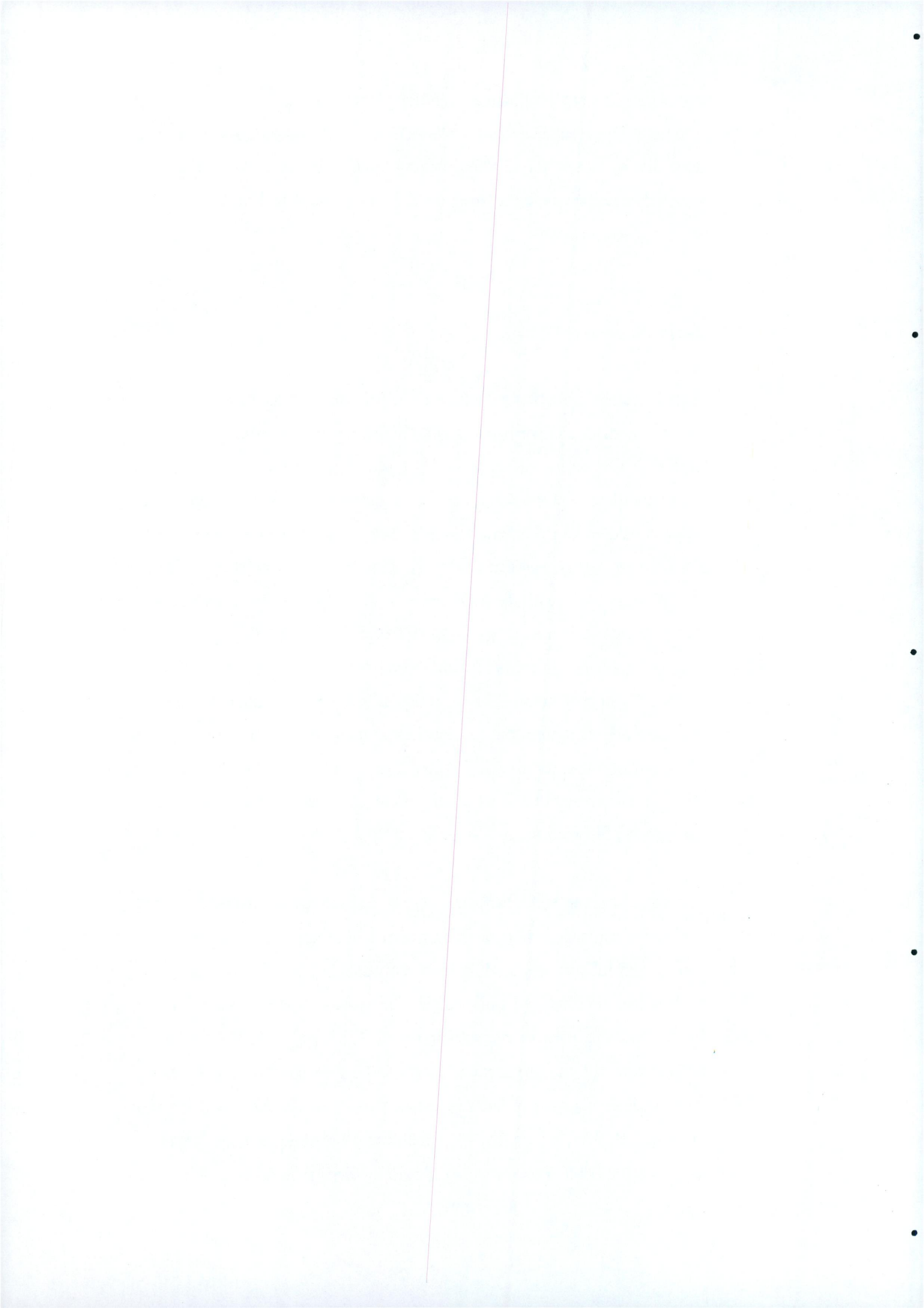


top-plate. It is small refinements in the geometry of the tooth that make it a more efficient cutter and safer alternative. Stihls promotional catalogue advertise stihls new Rapid Micro cutting tooth which combines these parameters and new cutting design which has reduced kickback by 25% (Frank Jones, Interview).

2.4.1 Noise and Vibration

Although noise pollution as will be mentioned in the Chainsaw design and the environment chapter is not a life threatening or ecology-destroying problem. It is an increasing source of discomfort to people. However the noise from heavy professional chainsaws and even domestic chainsaws can cause considerable irritation and a real impairment of the quality of life. For the user it may prove to be deadly. The loud vibrating noise of the chainsaw is at war with the users nerves. The improved noise reduction of many chainsaws is a welcome relief to the professionals and the casual user's neighbours. Improved materials and fabrication techniques contribute to the reduction of noise. The reduction in size of the elements of the chainsaw allows more room for mufflers to quell the irritating noise factor. Ear protection is a partial solution, but is not 100% effective. The irritating noise in tandem with constant vibration can cause the user to become dangerously fatigued.

The vibration is in some part, removed by separating the chainsaw in two mouldings and suppressing the vibration reaching the users hands via springs and rubber inserts. Vibration can result in the user contracting (VWF) vibration induced white finger. Its symptoms are numbness of the fingers and a pain on recovery (Flurschein, 1983, p97). V.W.F. in conjunction with the use of a chainsaw can be very dangerous to the user, who becomes unaware of feeling, distance and balance. Cold will increase the effect of V.W.F. therefore the handles of all chainsaws are enlarged so as to accommodate a user wearing gloves. Working outdoors in winter, and



being subjected to these elements it is necessary to incorporate the comfort of electrically heated handles. Manufacturers have recognised these factors as being the major causes of accidents and thus have dealt with them accordingly. Other factors such as the noxious emissions from the two-stroke engine is also a factor affecting the user of the chainsaw. This constitutes an environmental issue concerning the design of the chainsaw rather than an ergonomic or safety issue.



Fig 14, Husqvarna Professional Chainsaw, 262xp, Shown Separated In Two Mouldings Antivibration Mechanism

The Diaphragm Carburettor

Most chainsaw Companies today manufacture almost all of their machines and components, even down to the electronic ignition system. One component which almost all companies purchase is the carburettor. This up to the mid 1940s was the gravity or float design. Any machine using this type of carburettor could only be used in the vertical position. With the introduction of the diaphragm type carburettor the chainsaw could be used in any position. This works on the system of metering the fuel by an inlet valve which is in turn controlled by the difference in pressure between that



at the Venturi and the atmosphere. The carburettor has its own pump whose movement is caused by pulsation from the engine. The leading manufacturer of Diaphragm carburettors is **Tillotson Limited, Tralee, Co. Kerry, Ireland**. Their customers include; Stihl, Oregon, McCulloch, Husqvarna, Pioneer, Solo, Sachs Dolmar and many other chainsaw manufacturers. Tillotson produce 1.5 million carburettors annually, mainly for distribution to chainsaw manufacturers.

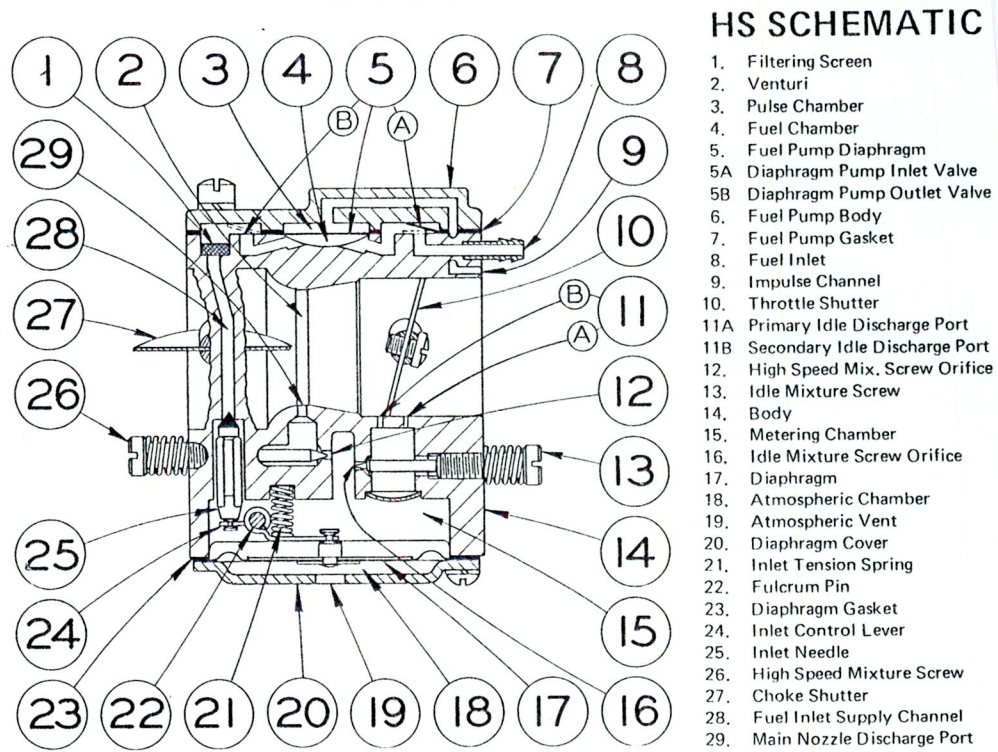


Fig.15, Schematic Chart Of Diaphragm Carburettor

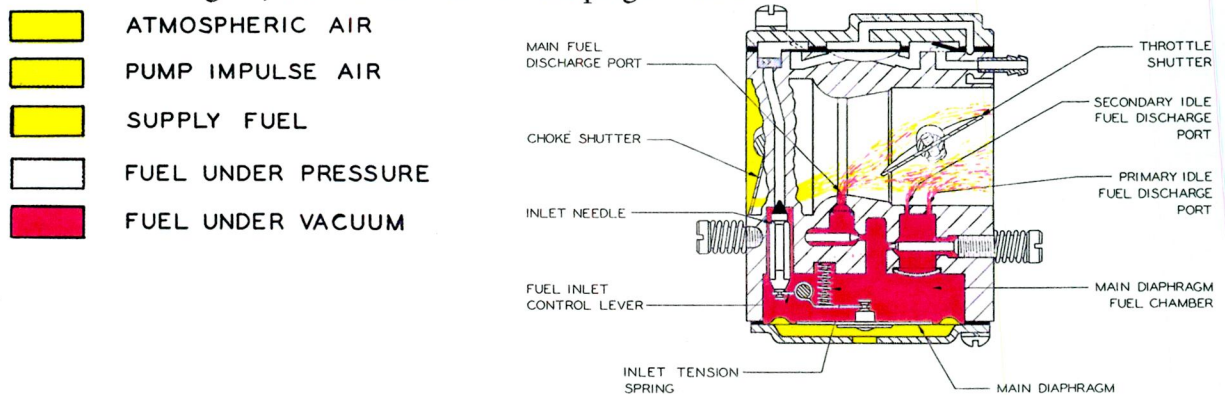
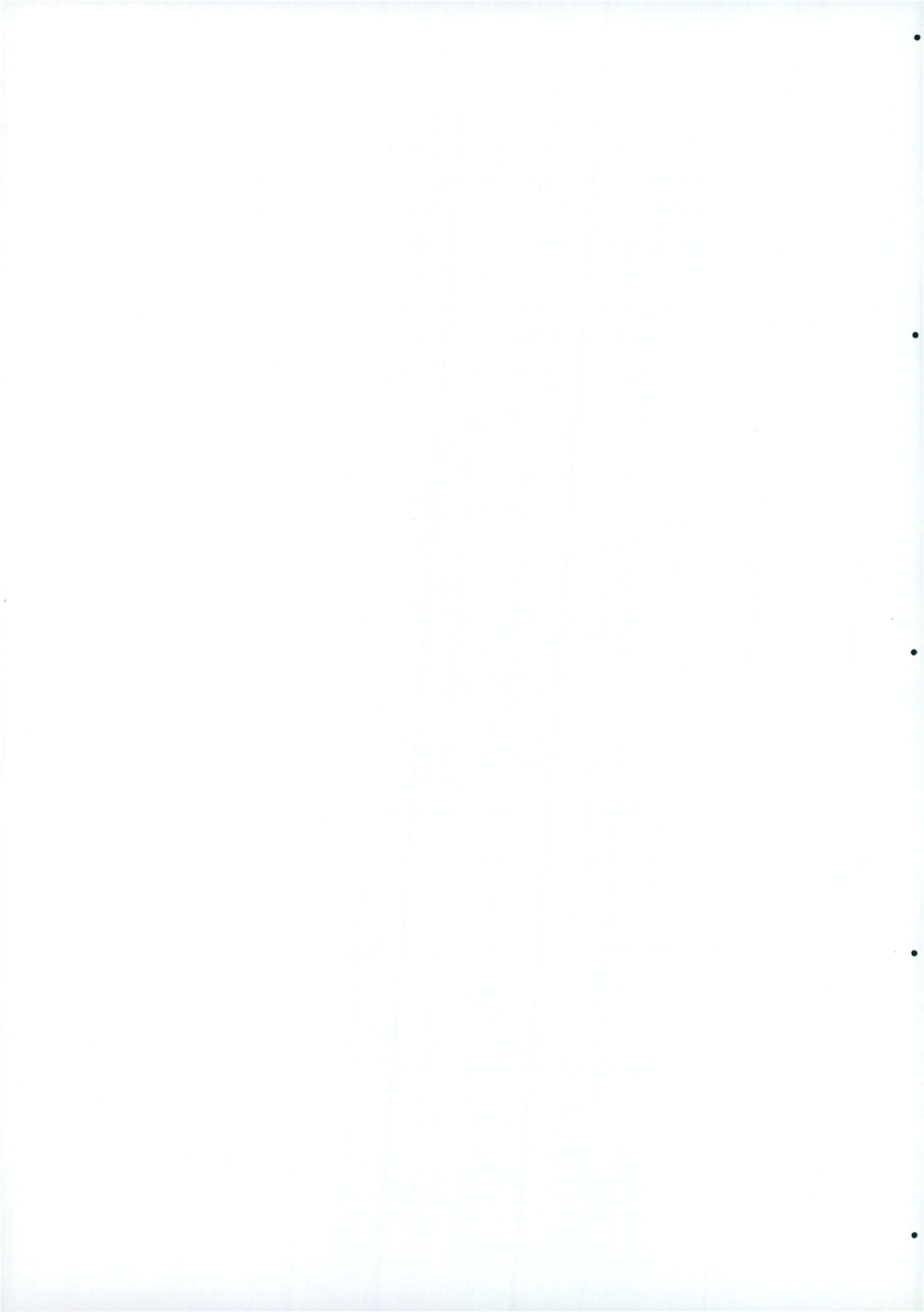


Fig.16, How The Diaphragm Carburettor Works



Diaphragm carburetors revolutionised chainsaw design. The problem of limited manoeuvrability had been solved. (Tillotson, Tralee, Interview and promotional Catalogues)

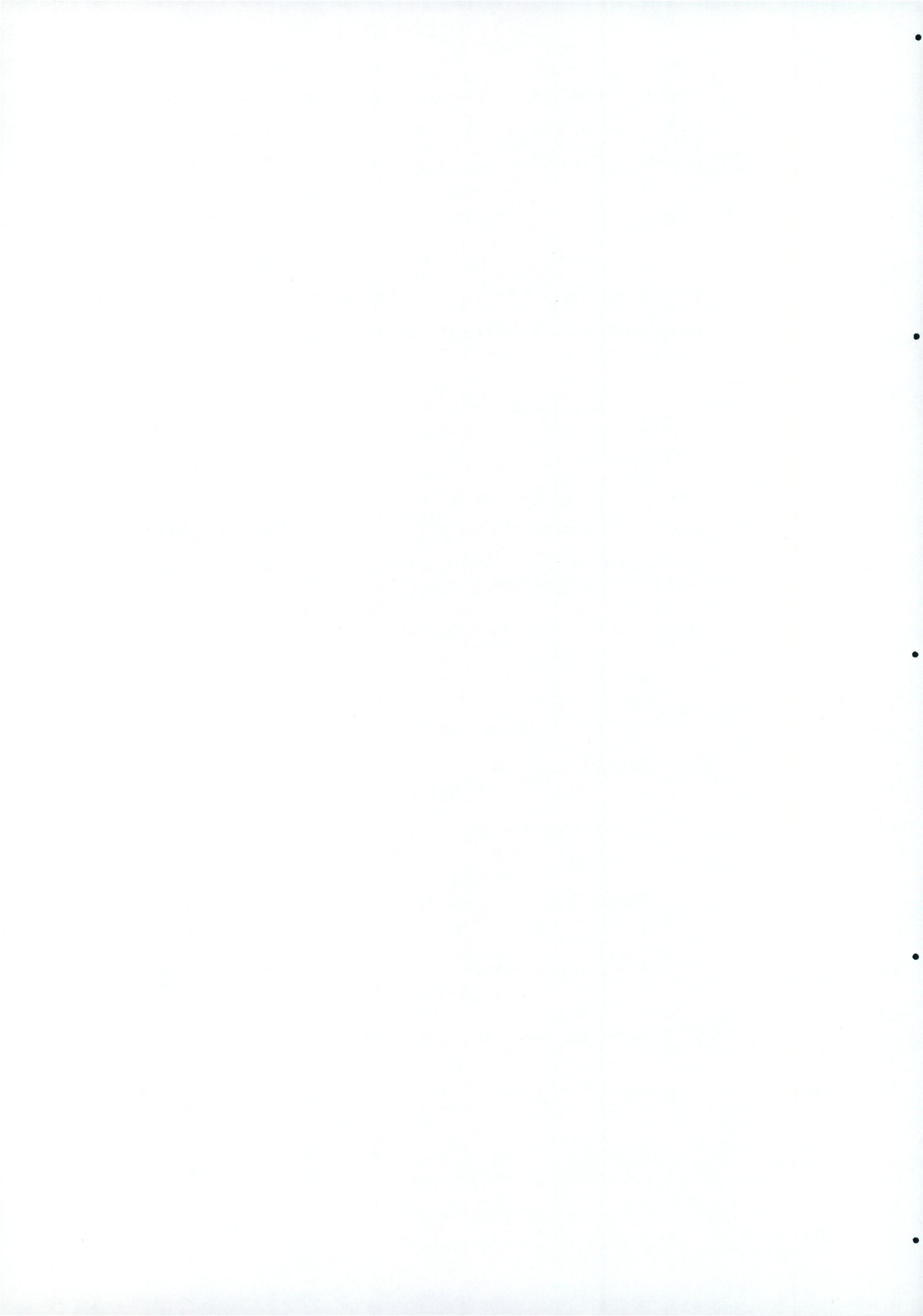
2.6 Case Studies Of Early One Man Chainsaws By Leading Manufacturers and Relatively Unknown Manufacturers.

Introduction

The form of all the chainsaws that are used within the text of this section have the characteristic form as that, of a "chainsaw". The saws all have a guide bar and chain, save one which will be dealt with in due course.

The saws and manufacturers of the chainsaws that are illustrated, are

1. Stihl Contra.
2. Canadien.
3. Sole rex Tyrannosaurs.
4. Pioneer 450.
5. Sankey Aspin powersaw.
6. Wright saw, model GS 5020A



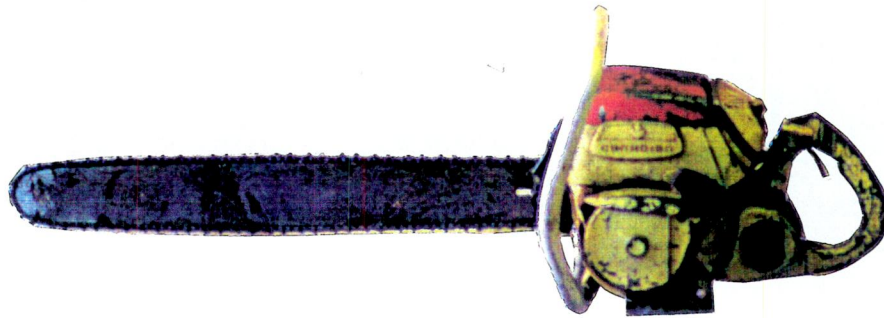


Fig.17, Canadien, North American Chainsaw, 1954

All of which are contemporaries.

The Canadien is a North American produced chainsaw which was produced in the mid 50s. The form, colour and characteristics of which abide by the predetermined layout of elements, which provide the most efficient outcome. The solo-rex also abides by these rules and goes one step further by introducing a product name such as Tyrannosaurs Rex as a sort of psychological ergonomics. If people fear the saw and its name, they may be more careful while using the saw.

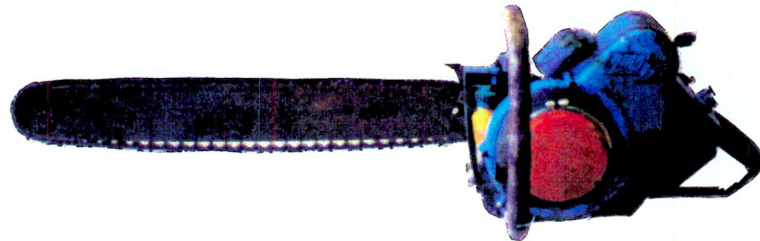
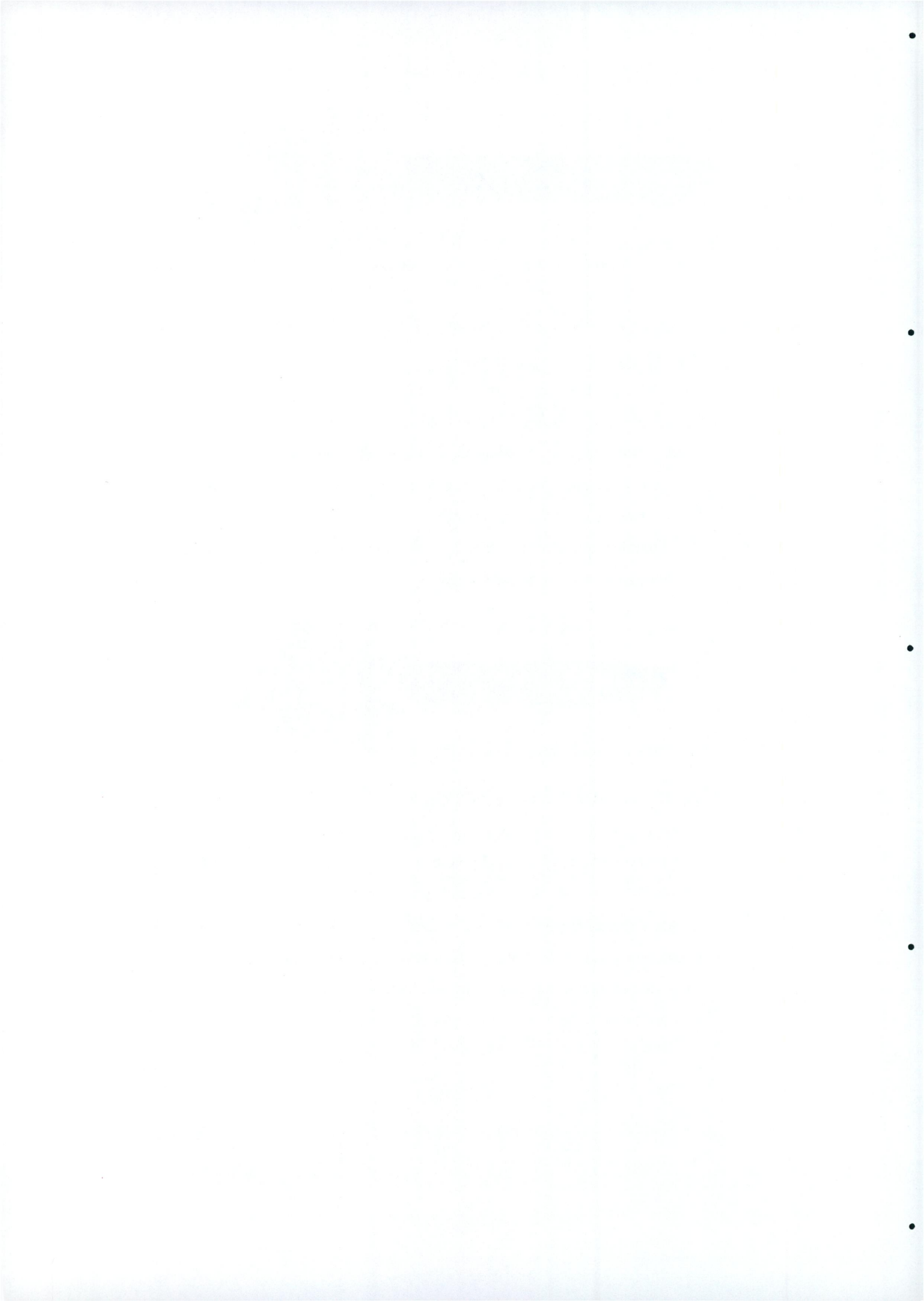


Fig.18, Solo Rex Tyrannosaurs, 1954

The Pioneer 450 is of a bland colour which says little to the user of its capabilities. The styling of the casing is over enthusiastic and bears an uncanny resemblance to the over embellished products designed during the streamlining era in the states. The styling of same would cause one to loose confidence in its capabilities and predate it by 20 years, except that it was not possible to produce the one-man chainsaw 20 years earlier.



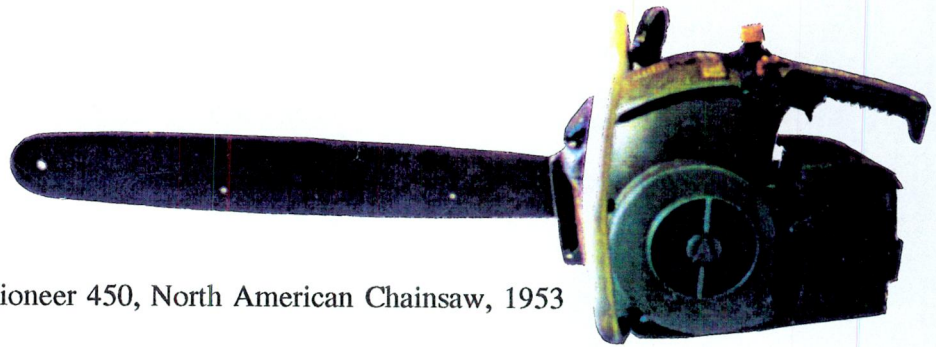


Fig.19, Pioneer 450, North American Chainsaw, 1953

The Pioneer is a North American saw, the same as the Canadien, from the mid 50s, yet the Canadien is of a clean design and has no unnecessary or unwanted styling. The Sankey Aspin power saw of which little is known, is the latter saws contemporaries but remains Neanderthal in appearance. Its colour is not one which says Be careful. The rear handle does not say Use me, and the whole saw is incased in a cage.

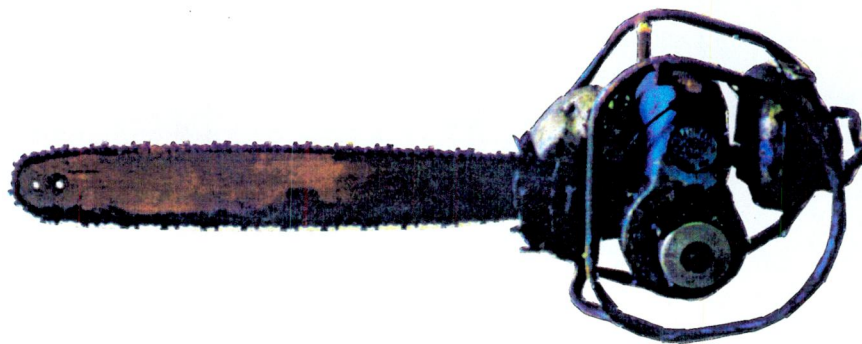
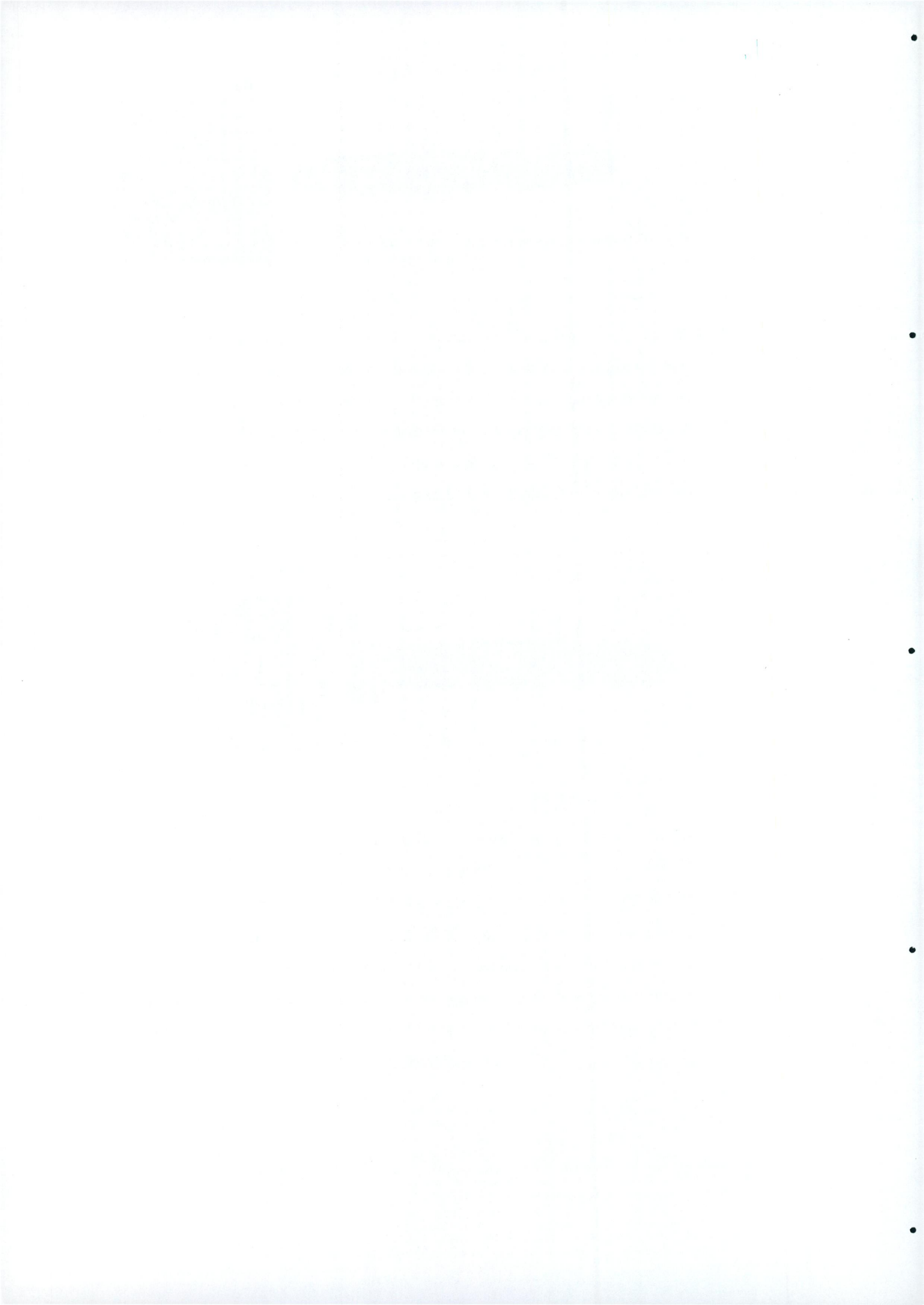


Fig.20, Sankey Aspin, Chainsaw, Origin And Date Unknown

The Wright saw which can be seen in the illustration, is not a chainsaw, but its Manufacturers and designers in the 50s considered it an option to the dangerous chainsaws. The saw is of reciprocating rip blade. Besides being terribly ugly in style it is of a light brown metallic colour. Its performance is described by a dealer of the saw in the 50s as and quote "Good for cutting soft wood slowly," (Jones, Frank, Interview).



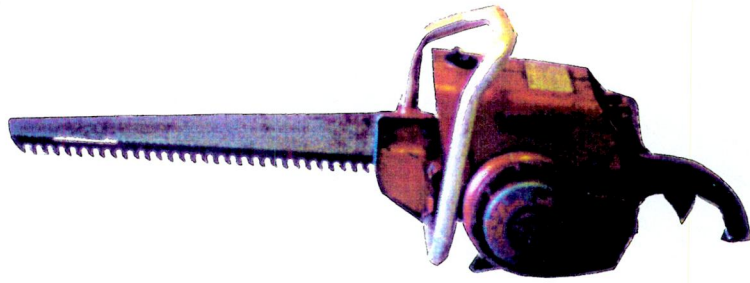
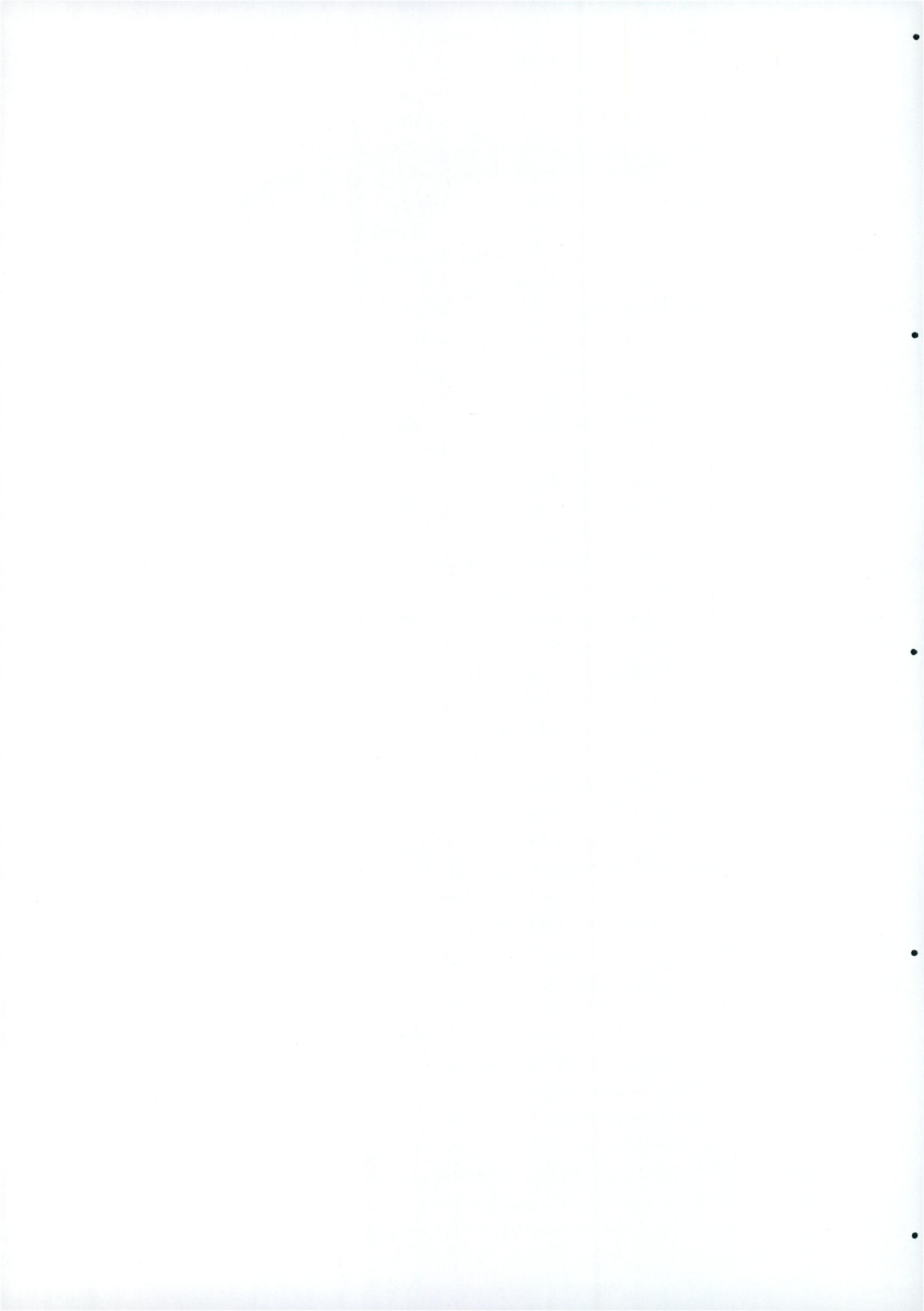


Fig.21, Wright Saw, Model GS 5020A, 1957 Reciprocating Blade



CHAPTER 3: Chainsaw Design And The Environment.

3.1 The Use of Technology To Save Itself

IN AN AGE OF MASS PRODUCTION
WHEN EVERYTHING MUST BE PLANNED
AND DESIGNED, DESIGN HAS BECOME
THE MOST POWERFUL TOOL WITH
WHICH MAN SHAPES HIS TOOLS AND
ENVIRONMENT (AND BY EXTENSION,
SOCIETY AND HIMSELF). THIS
DEMANDS HIGH SOCIAL AND MORAL
RESPONSIBILITY FROM THE DESIGNER.
(Papanek, 1970, preface, p xxii)

In 1970, when Papanek first suggested that designers should be responsible for the moral and social repercussions of their designs, seemed ludicrous to many and if anything a Utopian ideal. At present, environmental issues have become the basis for design the world over. People have been using technology and science to develop, design and enhance products, but with advancement came its own problems. Now we have to use technology to put people and the environment first and incorporate the scientific knowledge gained in the developments of such products to better use in order to survive in a world put at risk by such developments in the first instance. To remain a viable product, chainsaws must firstly meet the demands made by the consumer.

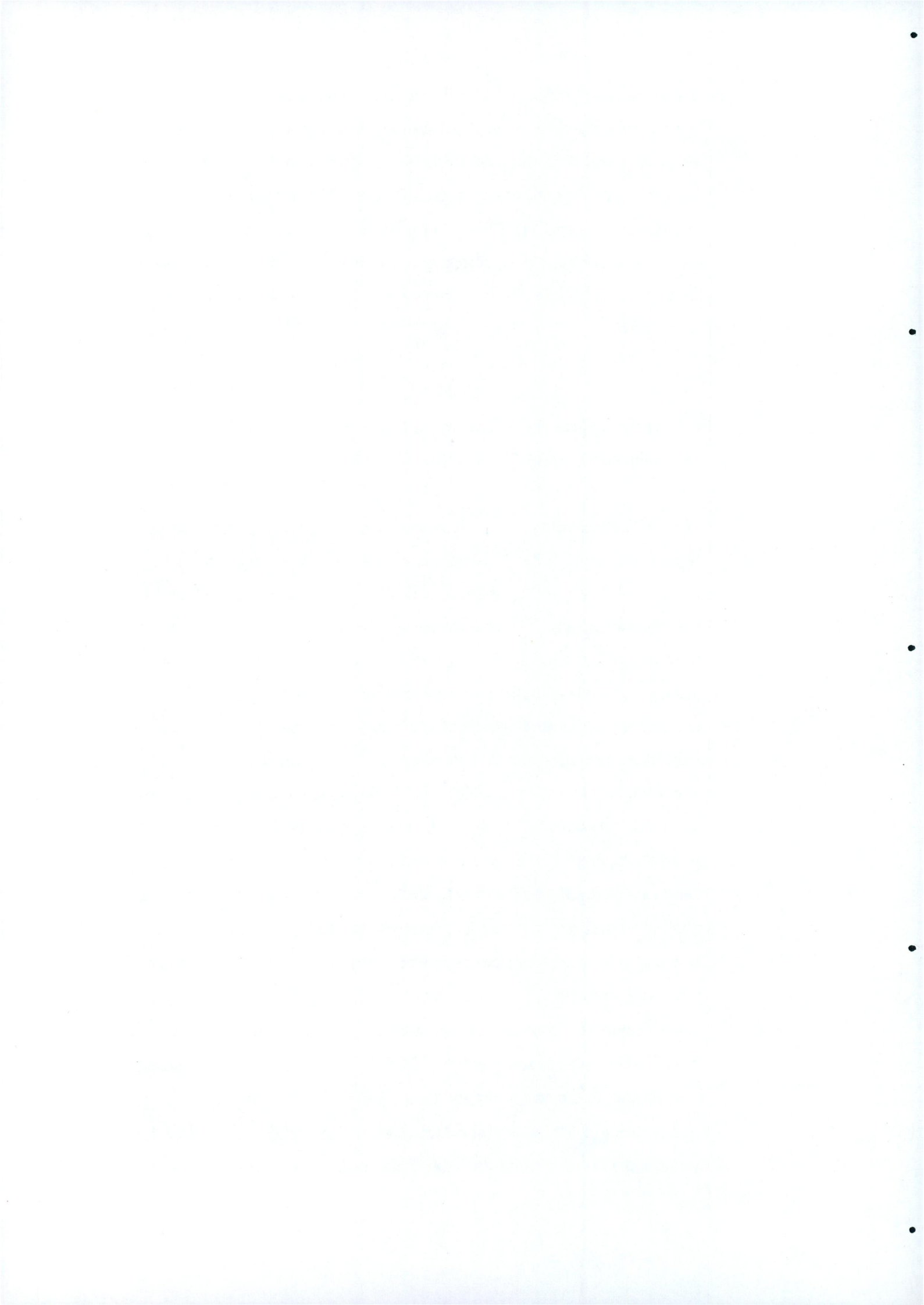
The demands of the people combined with government law are not lenient. For instance, in California, proposed emission rules could mean a statewide ban on two-stroke engines. The state of California is forcing ahead to develop stringent regulations affecting the design and/or marketing of small engines and small engine equipment. The regulations developed in 1990 and to take full effect in 1999 if not 1994 are so stringent, that if chainsaws



and all relative garden and leisure equipment with two-stroke engines, might not meet the standard required. If chainsaws do not meet the required standard it will be detrimental to California states significant timber industry. The cost, according to a California timber association would be 70,000 lost jobs and \$15 Billion in lost sales. Therefore technical progress has to be achieved with consistent and systematic research and development using such cases, like that in California as a reference (Jones, Frank, Interview).

3.2 Technological Developments In Chainsaw Design In The Pursuit Of Optimum Safety And Conservation Of Life.

Most of the technological developments have already been mentioned in the history chapter, so a detailed analysis of more recent developments will suffice. To begin with, a greater appreciation of what has been achieved will become evident if an explanation of why the two-stroke engine has not been changed or altered. After World War II when experimentation in the process of metals and alloys was made possible, owing to larger investments in the development of weapons. It was possible for the motor industry to capitalize on the illgotten spoils. These illgotten spoils were alloys (Aluminium Alloys) which were highly resistant to high temperatures and cyclic pressures. The two-stroke engine, at the time was manufactured primarily from an iron alloy, usually cast iron. With the introduction of these new alloys it was possible to create a smaller two-stroke engine, that was lighter and stronger than its predecessors. It also allowed the engine to be run at higher compression ratios which in turn made for an altogether, faster and more efficient engine. Much the same as the saw, since it was first invented, the internal combustion engine has stood the test of time and it was unlikely to change overnight. The two-stroke engine which is used in chainsaws and motorcylces and the majority of small power tools is a greater threat to the environment than it would first appear to be. This is because, the oil to lubricate the engine has to travel through the casing of



the engine in a mixture with the petrol to the compression chamber, where it is then ignited. What makes the engine even more inefficient is that, after each firing, the mixture travels to the compression chamber and forces the exhaust out through the exhaust port along with a percentage of the incoming mixture. The deadly fumes of the two-stroke engine are characteristically bluey-white which is due to the burning of the oil and the petrol together. The fumes from the engine can cause the user to become nauseous and can irritate ones eyes.

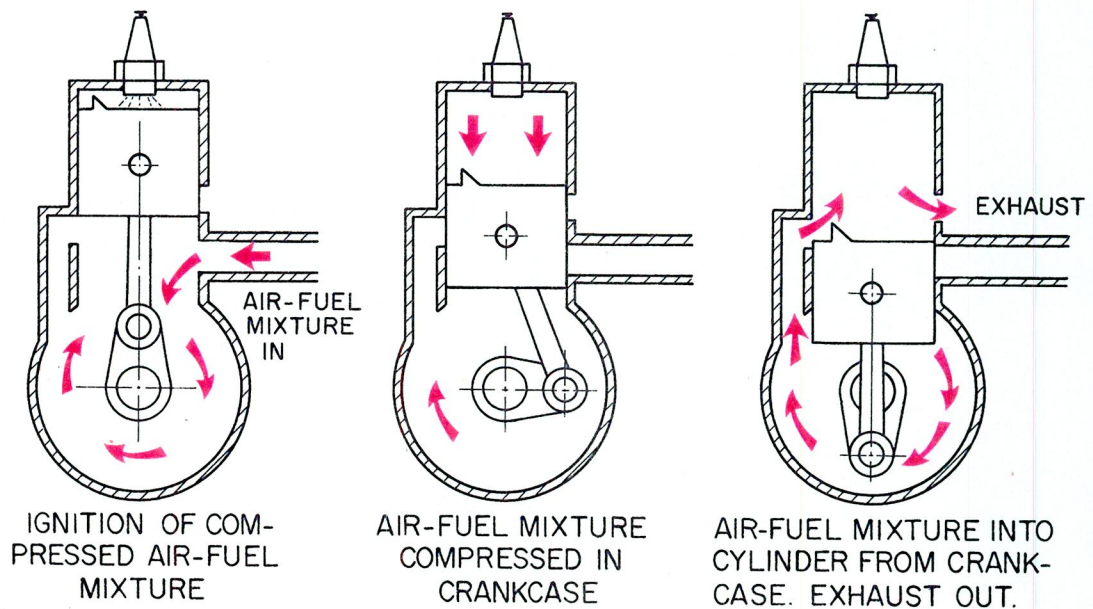
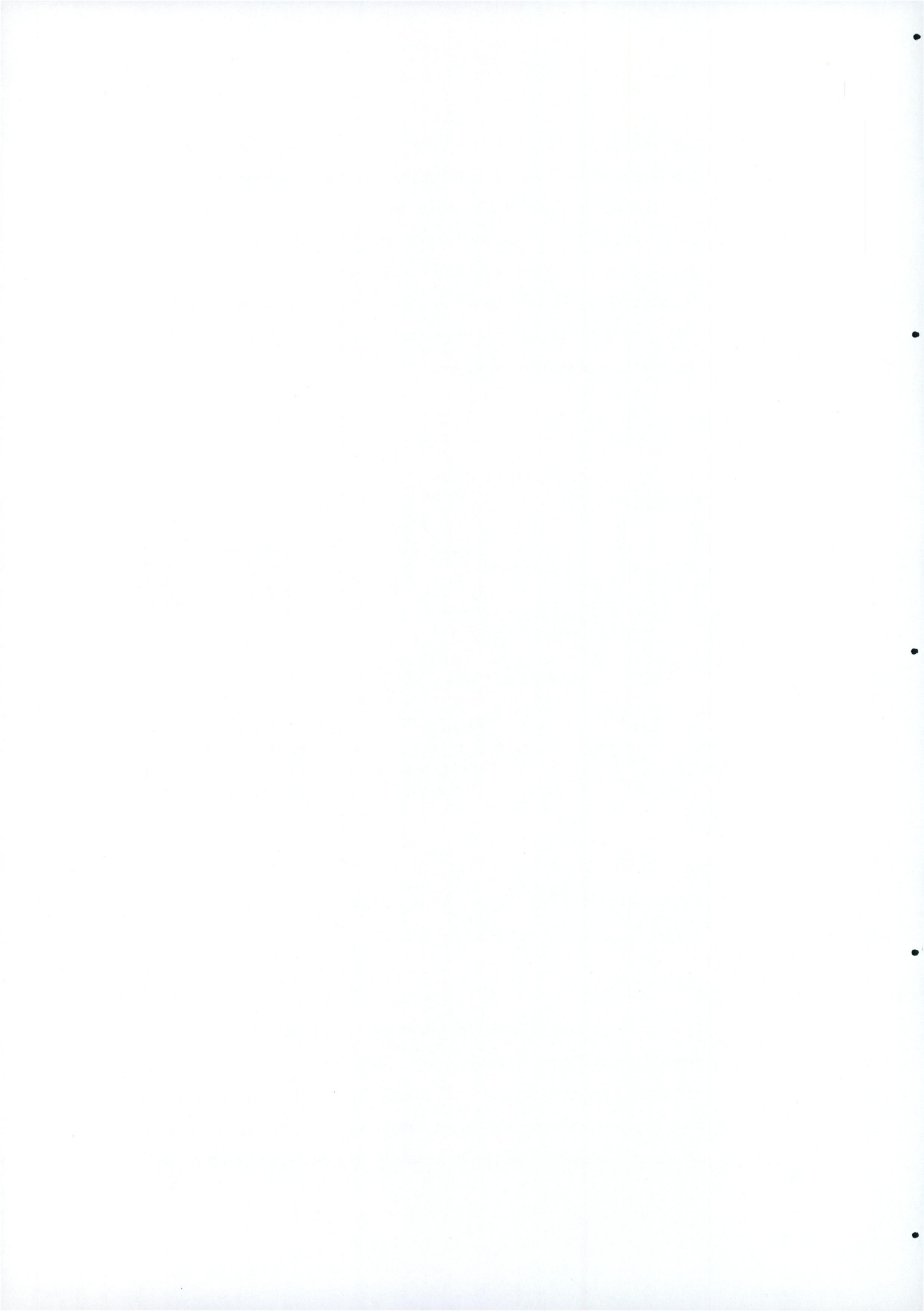


Fig.22, Schematic View Of Two Stroke Engine

Bearing this in mind, it is the strength of this invention that has made everything possible, so alternatives rather than cures have been formulated. The alternatives such as Catalytic Converter, Rape-seed oil for the chain. A more concentrated lubricating oil for mixture with the petrol and redesigned compression chambers and pistons to reduce the loss of firing mixture into



the atmosphere. These rules and redesigns not only apply to chainsaw manufacturers but also to other manufacturers of products using two-stroke engines, but for chainsaw manufacturers who are dealing with the knowledge that their product is a participant in the destruction of our natural resources, a greater emphasis is placed on these problems.

3.3 Research And Development To Reach A Compromise

It is concerns such as safety and the environment that have companies like Sandvik Windsor dedicating four percent of profits to research and development, and Stihl who have 250 employees also in research and development. It is the introduction of Catalytic Converter into a chainsaw design that proves that manufacturers have clearly taken these factors seriously.

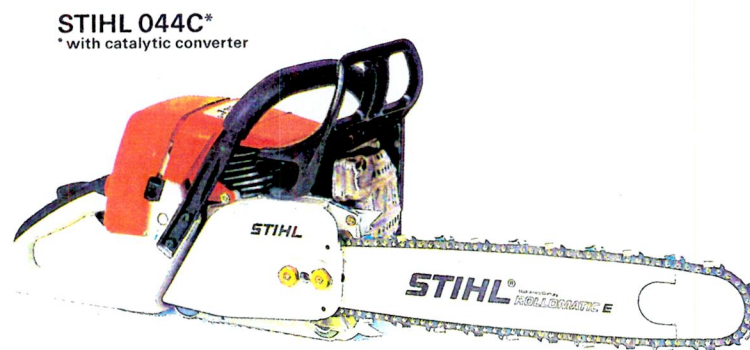
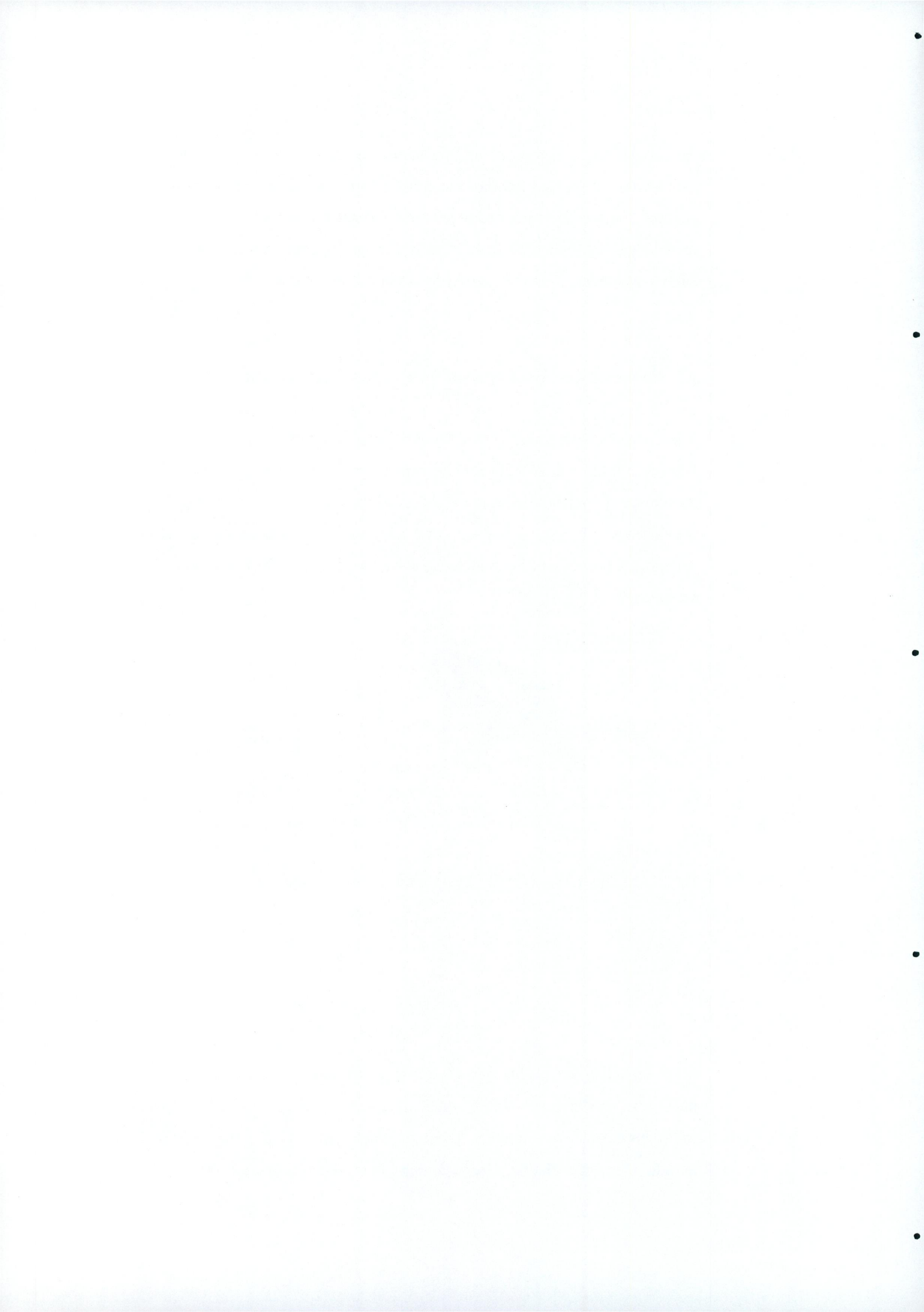


Fig.23, Medium Weight Stihl Saw, With Catalytic Converter

Stihl launched the worlds first chainsaw with Catalytic Converter for chainsaws in 1989 even before some car manufacturers had introduced them into their cars. This is quite a milestone when one considers that even in automobiles with relatively large engines, one notices a dramatic loss of



power and increased engine temperatures. It is so important to chainsaw manufacturers to gain an advantage in this environmentally aware society, that chainsaw manufacturers sacrifice their chief criteria which is "power to weight ratio". Heat, equivalent to the chainsaw engines output is produced during the chemical conversion process in the 1200 platinum coated cells of the convertors. It was feared this would effect the ergonomics of the chainsaw which is all important. These factors were overcome due to extensive field trials and bench trials (Stihl Promotional Catalogue, 1990,p2).

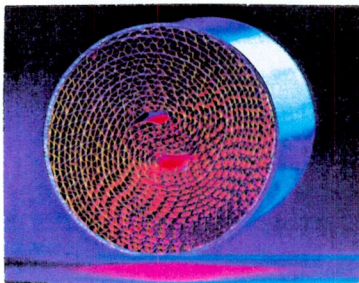


Fig24, 1200 Platinum Coated Cells

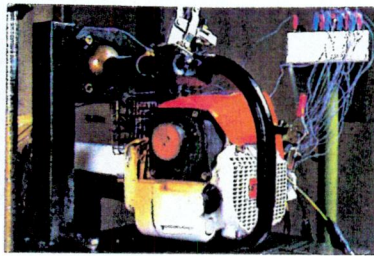


Fig25, Testing Catalytic Converter

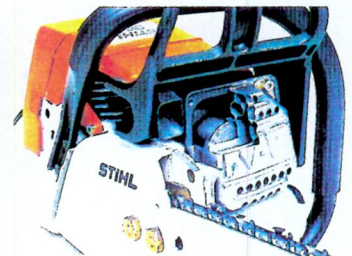


Fig26, Catalytic Converter in Situation

Rape seed-oil

The chainsaw, whether it is engine driven or electric powered needs to have an oil lubricant to allow the cutting chain move smoothly around the guide bar. This has been, for a long time, a factor which was overlooked by the chainsaw manufacturers and conservationists alike. A compromise was reached, and the compromise ironically came from a plant. The rape-seed

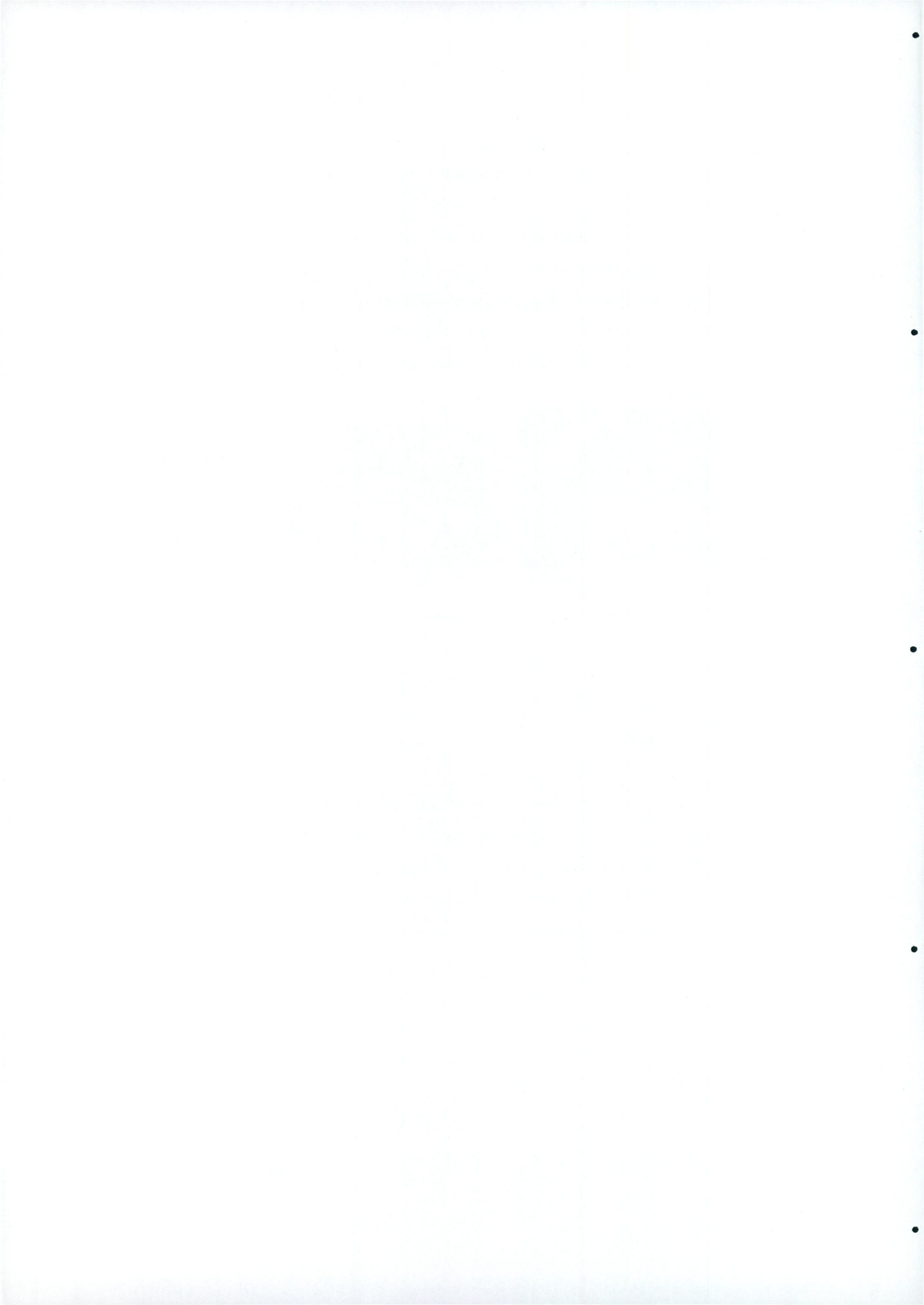




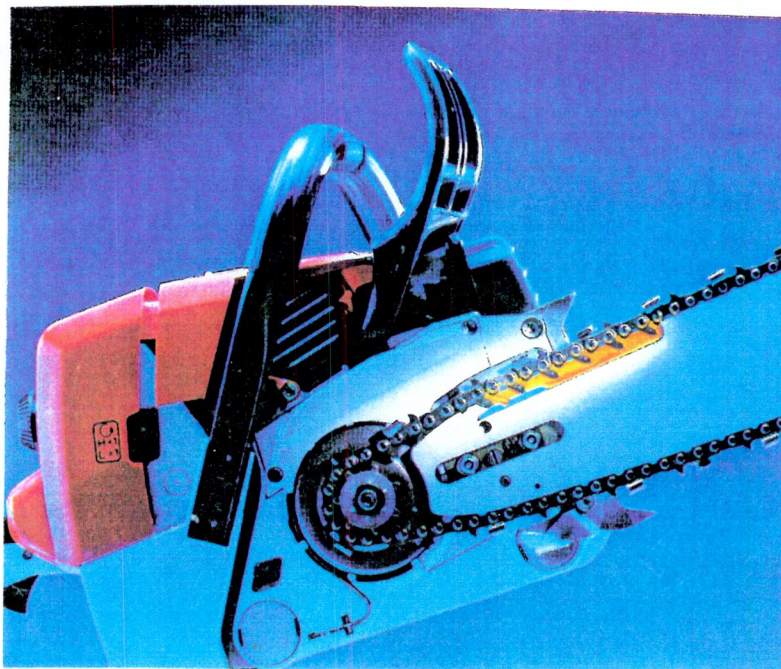
Fig.27, Field Of Rape Seed

plant has long been known for its use as a substitute for synthetic and mineral oils in many areas. There was a need for a more concentrated oil than rape-seed oil. The research and development team at Stihl set about the task of making a high grade oil with the properties of a good chain lubricant, from rape-seed. The result was 99.8% biological product (Jones, Frank, Interview). Over 90% of this oil decomposes within three weeks of its use. Therefore it is of no threat to life or plants of any form. Unsatisfied with winning the "Blue Angel" award which is a seal of environmental quality by the federal department of the environment. (Stihl Promotional Catalogue, 1990, p4).



Fig.28, Bioplus Chain Oil, Made From Rape Seed,99.8% Degradable

Stihl set about reducing the amount of oil used by a chain in use. This was done by redesigning the oil pump to reduce the quantity of oil being used.



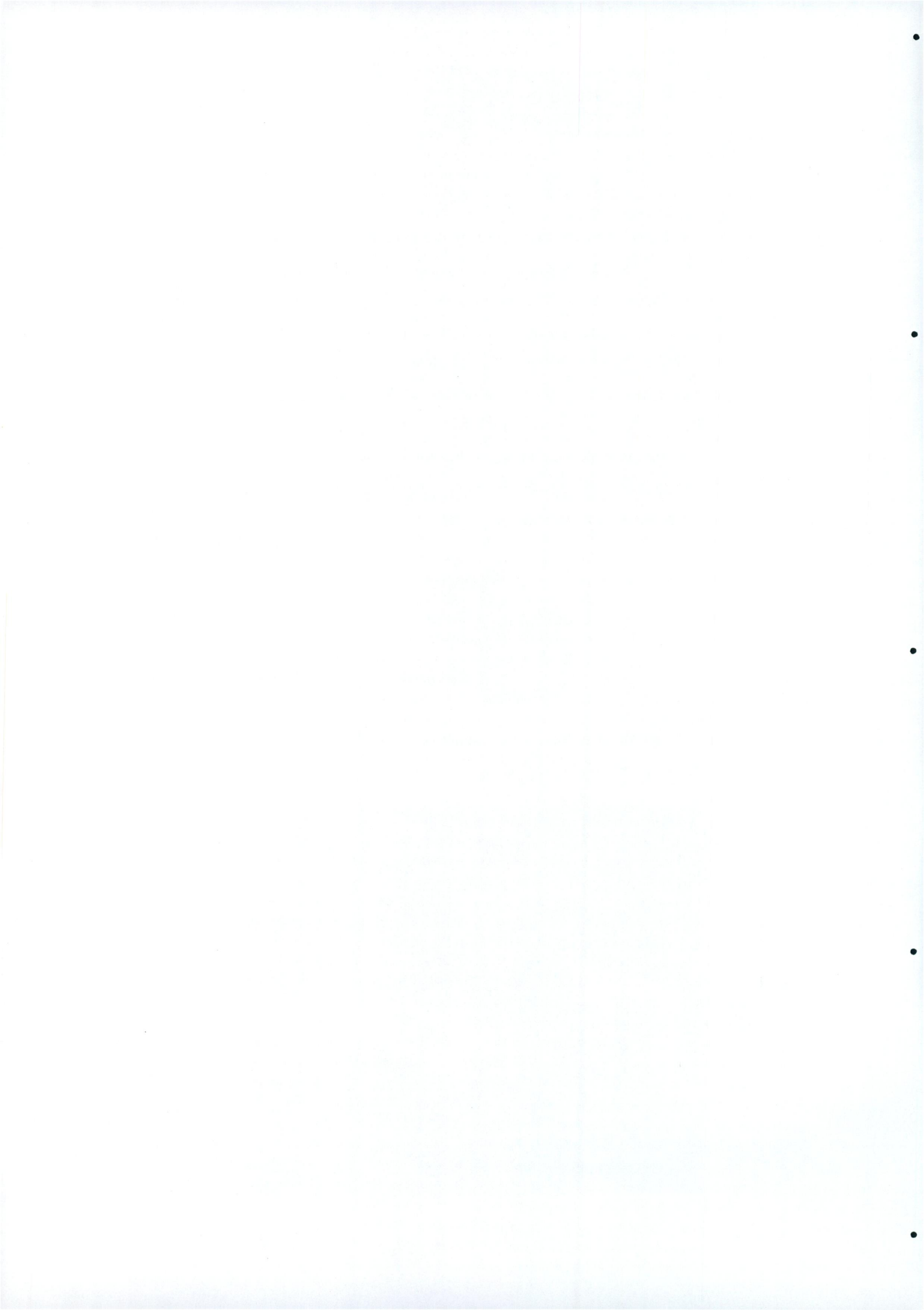


Fig.29, Sectional View Of Ematic Chain Lubrication

The chain was then redesigned to allow the oil to reach the most important parts and not insignificant areas. One of the reasons that this environmentally dangerous aspect of chainsaws technology might have been overlooked for so long is that the Manufacturers were probably trying to combat the main problem of the two-stroke engine which had yet to be improved! It would seem compromise has become the order of the day.

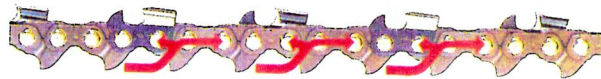
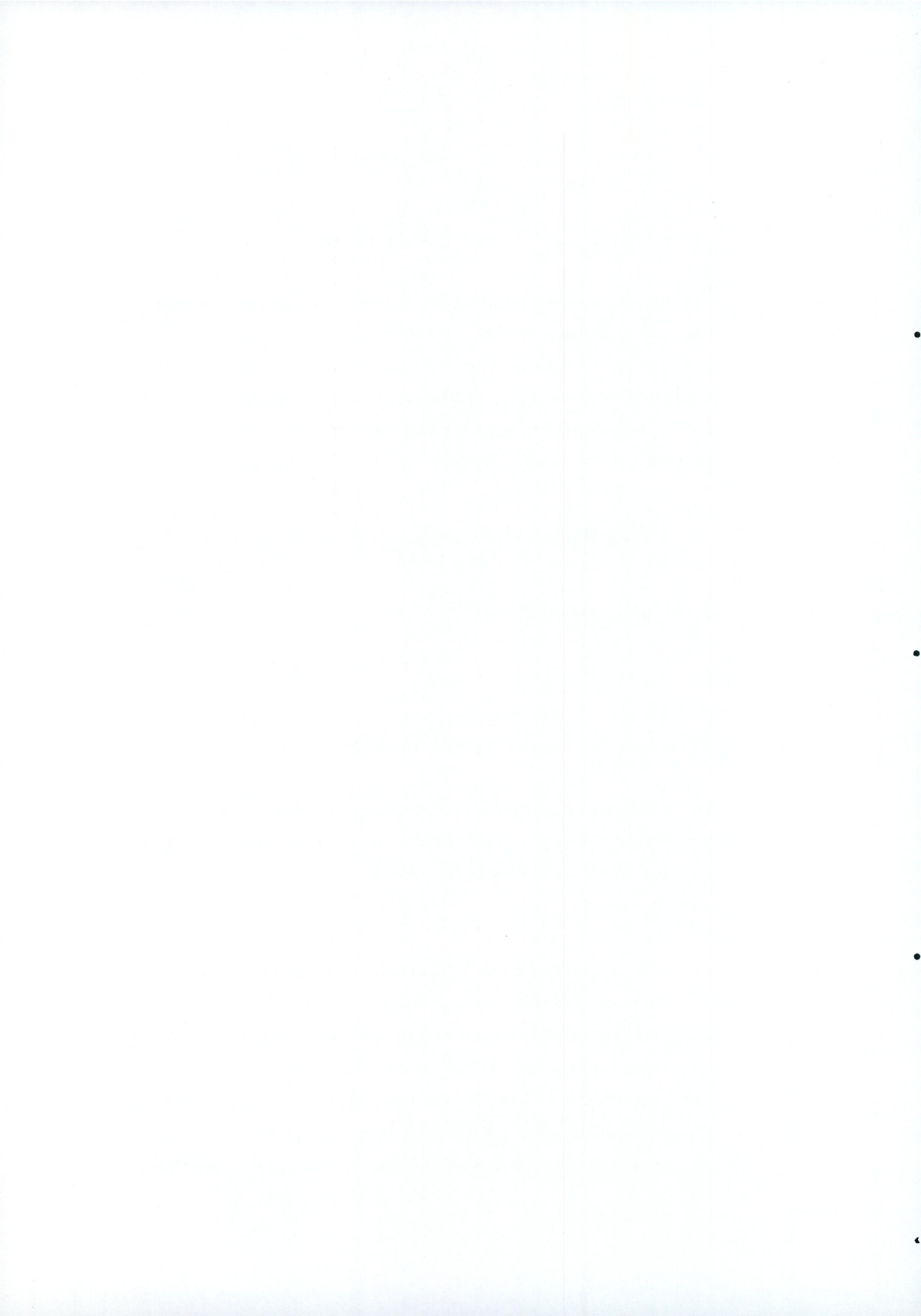


Fig.30, Redsigned Chain

3.4 Positive And Negative Working Aspect Of Chainsaws

The conservation of our environment not only deals with the obvious issues, such as the depletion of our rainforests but also the preservation of life or to put it broadly the maintenance of our planet and its inhabitants, and the sustension of such.

- The argument for the use of chainsaws begins when species known to us are threatened by extinction. As was already mentioned the fight against the Rhododendron, which is choking our Natural Oak forests and blocking out light, which is necessary for the preservation of life on the forest floor. The chainsaw is quick and efficient, yet leaves a lasting effect on the atmosphere due to the emissions of its two-stroke engine, but allows life on the forest floor



and the forest itself live on borrowed time.

Tree Surgery

Tree surgery encompasses such aspects as road safety, removing diseased branches from trees, and the pruning of trees that may be old or dangerous in order to prolong their life and enhance its appearance and inevitably its environment.

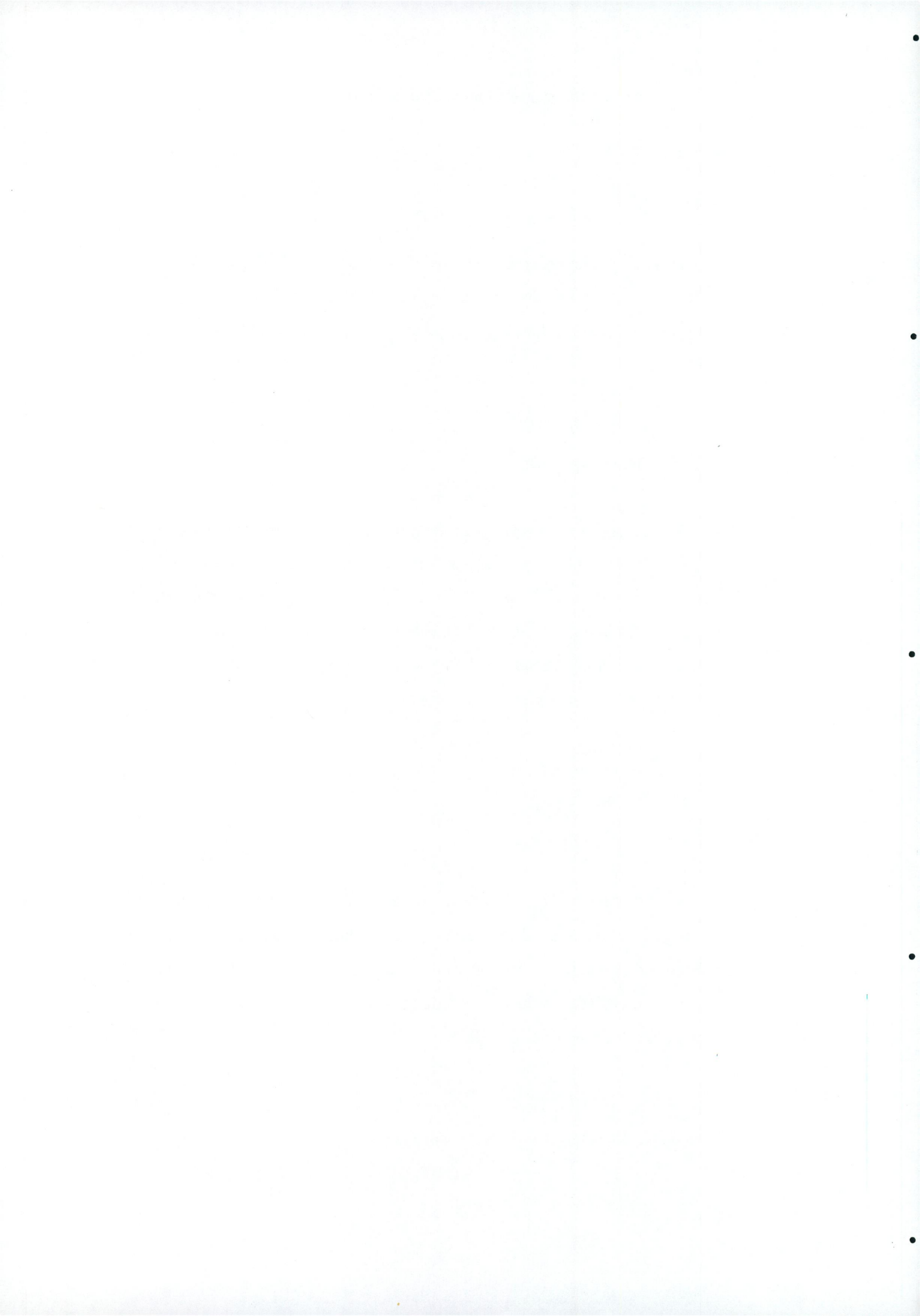
Fire Fighting Equipment

The chainsaw is a power tool adopted by fire fighters because of its efficiency and speed in situations where time is of the essence. Its only difference is a special chain which is of the same characteristics as that of an ordinary chainsaw, yet with carbide tipped cutting links. The links are also placed closer to reduce kickback. It is the fastest cutting device in vehicle related accidents, plane, train and car.

Versatility In Use

This is evident in the commercial logging industry when larger equipment such as the hydraulic shears can not cope or can not reach difficult areas. This occurs when trees are on a hill, or a tree is too large for the shears to cut. The chainsaw reduces the damage done to the surroundings compared with the larger equipment.

Negative Working Aspects Of Chainsaws



- The primary negative aspects of chainsaws in use would have to be the element of danger surrounding the use of chainsaws. There is no denying chainsaws have the potential to do great harm.
- The role chainsaws play in the depletion of our natural resources.
- The emissions from the two-stroke engine are some of the worst from any type of engine.

To some conservationists the chainsaws strident buzz symbolises mans war with nature. It overawes the slow rhythm of axe and handsaw and splinters the country peace sought by so many. When assessing the advantages and disadvantages of the chainsaw, it becomes clear that its uses are incongruous as much as what it pretends to be or is claimed to do. Contradictions abound. One such contradiction is where conservationists find themselves felling Sycamore where it is alien to the forest, or cutting through Rhododendron thickets originally planted for pheasant cover, but which now threaten to choke old oakwoods. Unexpected developments, currently the spread of Dutch Elm disease force conservationists to reassess their priorities, adopt new tactics and use new tools. Consequently the chainsaw has become the most frequently used power tool on conservation tasks. The threat that the rhododendron is imposing on what is considered the largest remaining area of native oak forests in the country and contained within Killarney National Park, requires a constant but discreet use of chainsaws by the park employees and local volunteers as the users of the park demand fresh air, peace and quiet.

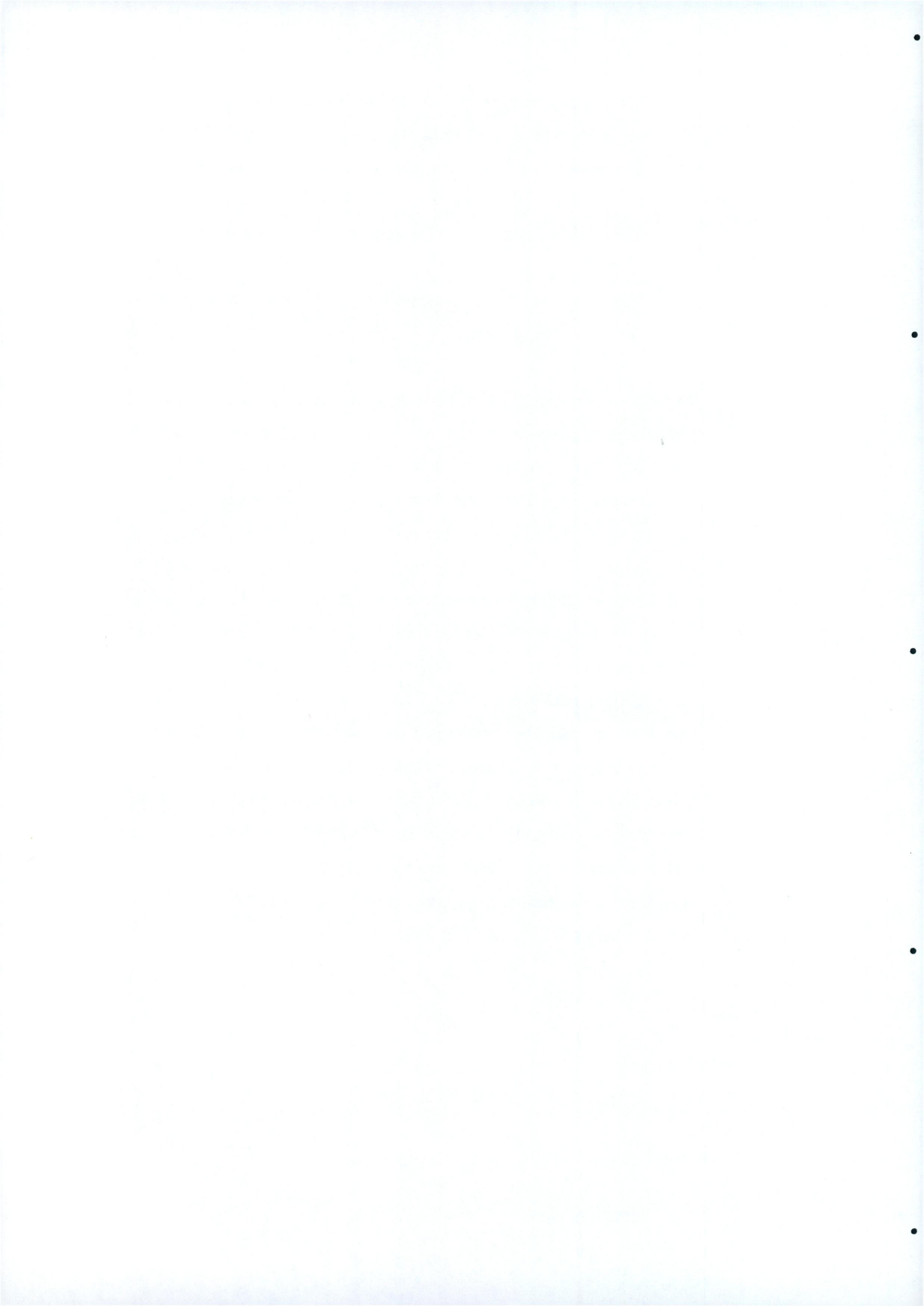
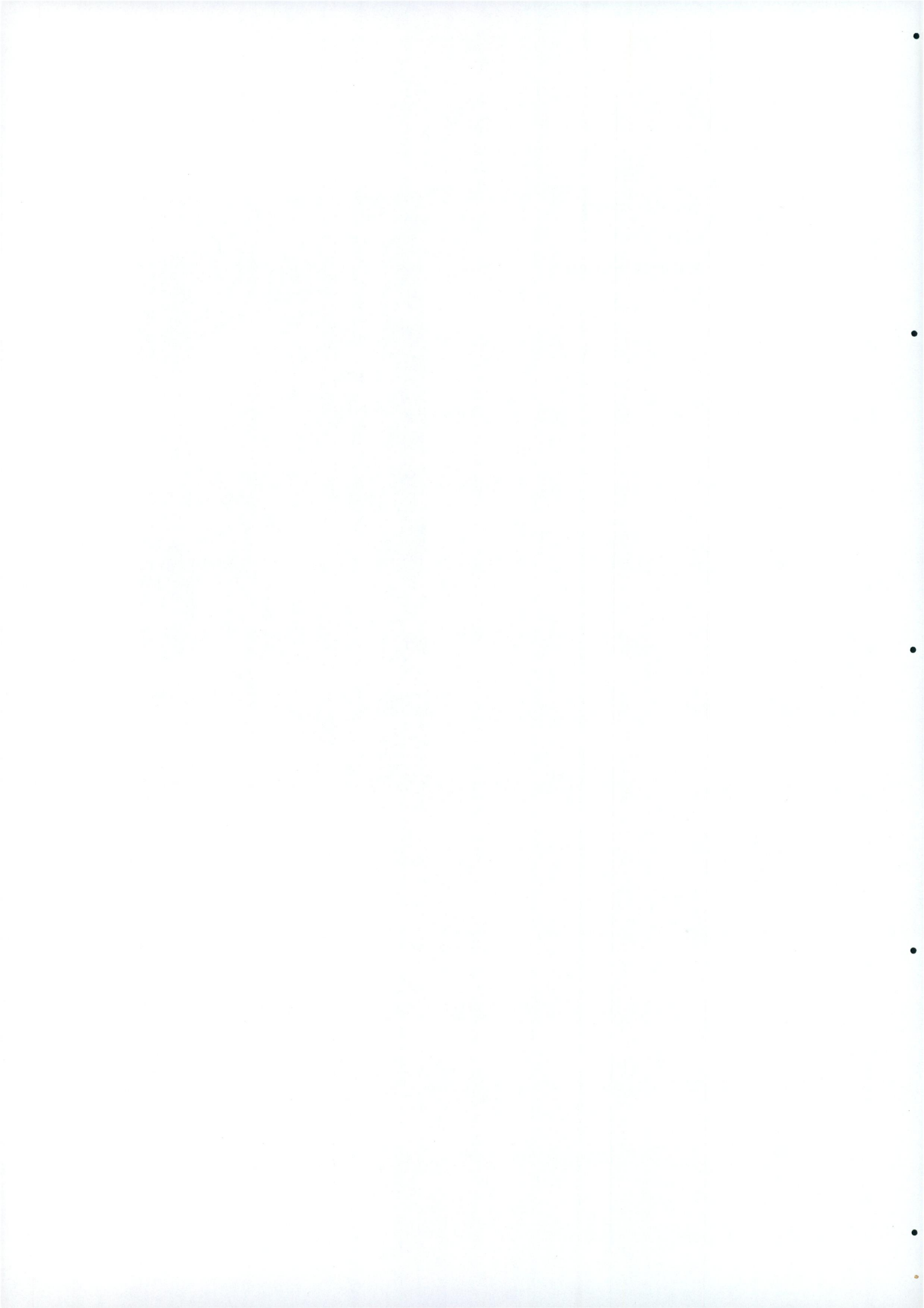


Fig.31, Clearing
Rhododendron In
Killarney National
Park





Chapter 4: The Marketing Of Chainsaws And Their Market

Introduction

Manufacturers continually meet the demands of the public by adding new products, changing existing ones and discontinuing others. Marketing is so important to industry to-day that there is a greater percentage of people in marketing research and marketing which up to relatively recent times would have been perceived impossible.

Government officials use market research to develop regulations regarding product safety, therefore the law of the country added to the environment factor is becoming increasingly important in the chain saw design and sales.

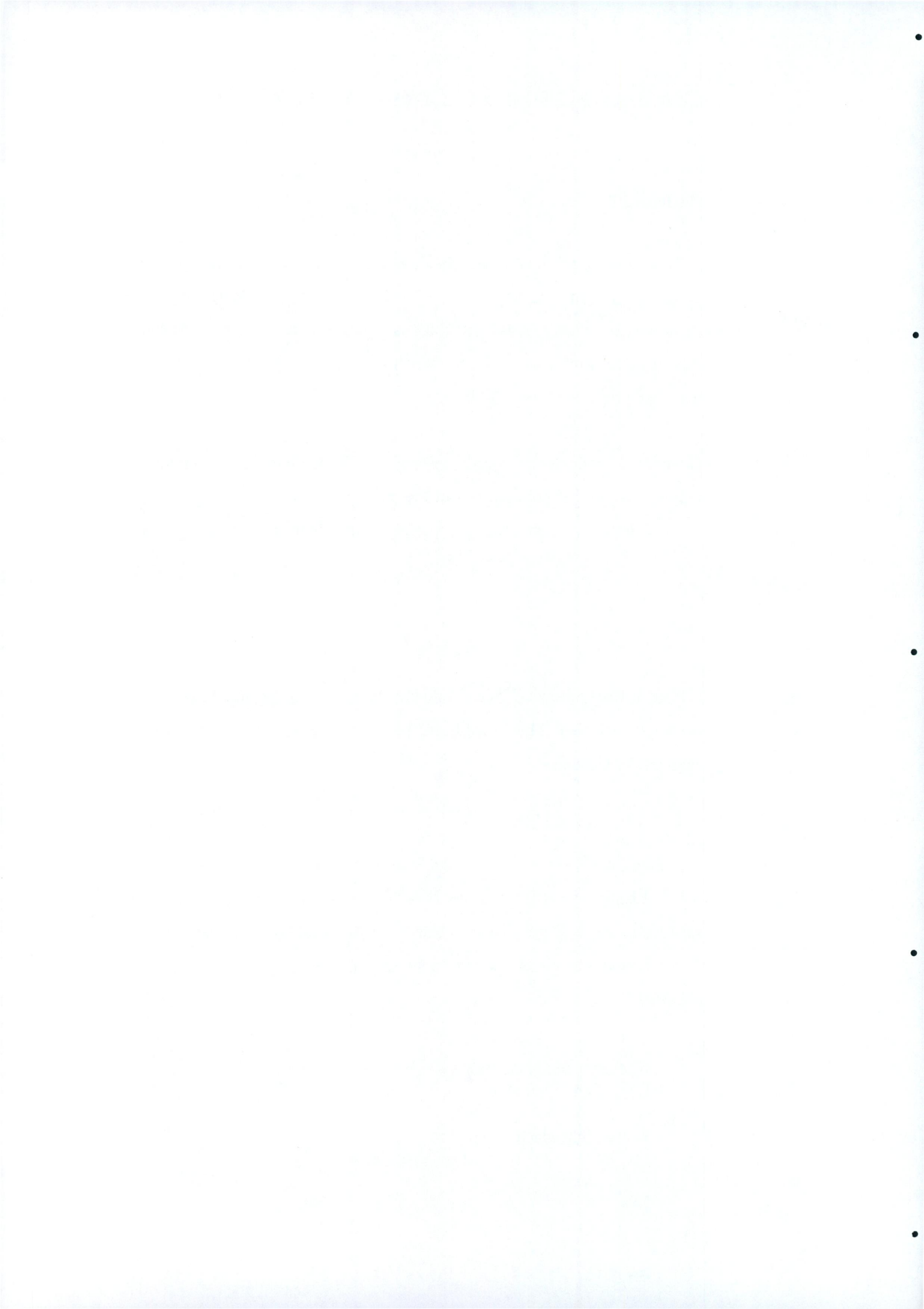
4.1 An Investigation Of The Chainsaw Market And Marketing Strategy, Using All The Constituent Parts Of A Successful Marketing Strategy As Guidelines

The simplest answer to "what is marketing ?" is that it is a process by which a company satisfies the needs of its customers at a profit which satisfies its needs (The Managers Handbook, Ernst and Young, page 96).

The necessary constituent parts of a successful marketing strategy are to be able to sell:

The right products.

In the right place.



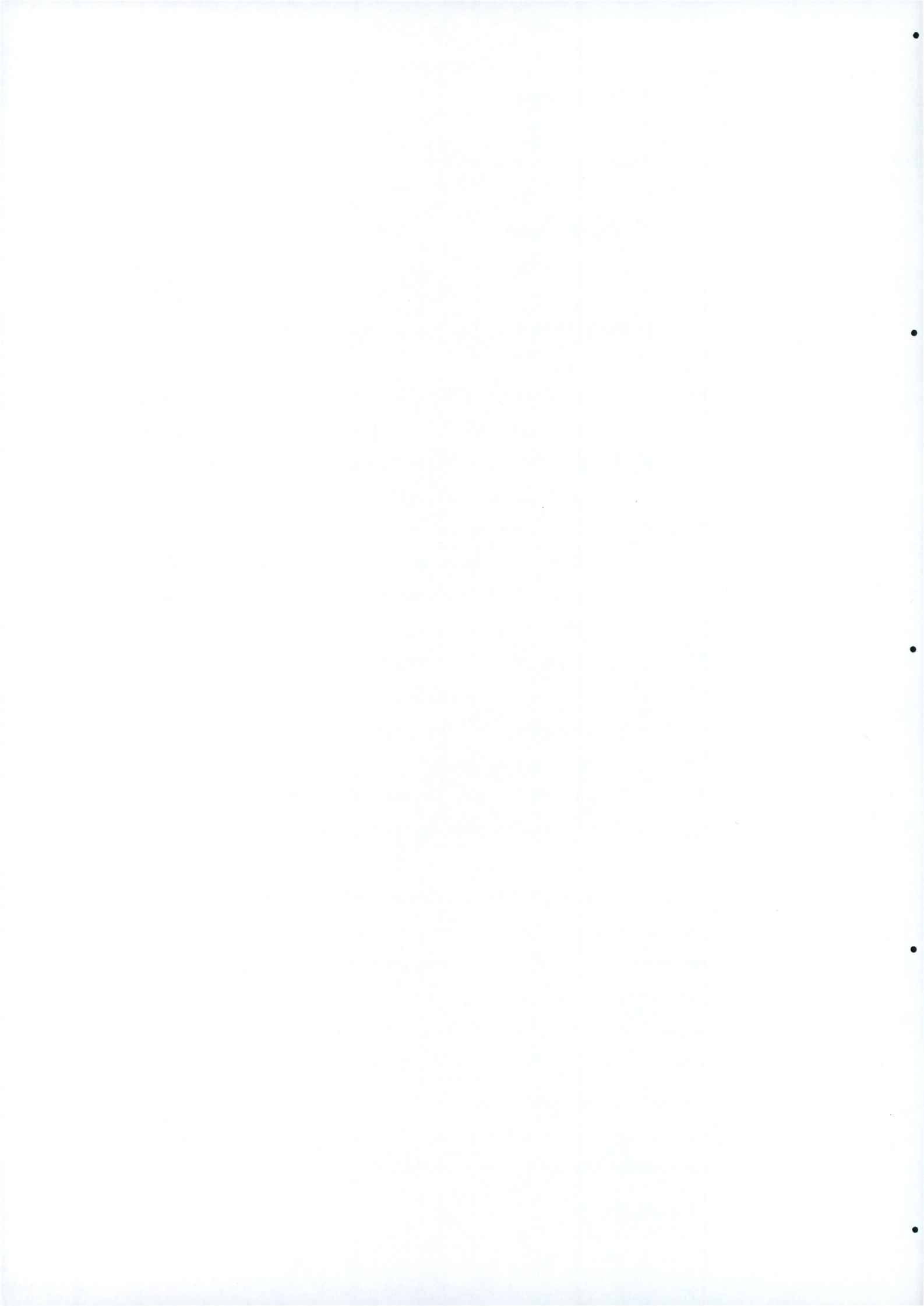
At the right price.

Promoted in the right way.

To the right people.

4.1.1 Is The Modern Chainsaw The Right Product?

Back in 1926 one of Andreas Stihls aims was to reduce physical effort by means of the chainsaw, his other aim was to ease the work of the chainsaw operator. The principal objective of technology is to serve mankind. The new range of saws incorporate technology which was developed to make working with a chainsaw easier and safer. This is complimented by outstanding power to weight ratio's and human engineered styling to strict ergonomic standards. The main concentration was on reducing weight. The inevitable results were chainsaws of compact lightweight construction. The modern chainsaw has done more than any other to alter cutting methods and to increase cutting efficiency. With the great range, and attachments available there are very few cutting jobs that cannot be carried out with chainsaws. Almost all chainsaws are powered by a direct drive two-stroke petrol engine. The developments and improvements in chainsaws over the past few years have been dramatic. From heavy slow cutting sometimes unreliable saws which vibrated so much that they fatigued the machine and the operator, to a vast sophisticated range of saws for every situation. The major improvements have been in the speed of cutting and the reduction of weight and vibration. The noise problem is still there and is still a subject for consideration by manufacturers internationally. Some have already reduced noise without any real effect on power. Electric chainsaws are produced by most if not all the manufacturers and claim to be powerful light weight and quiet running. However they are not as versatile as two-stroke engines. Through six decades the chainsaw has proved that it has an impressive record of rugged



dependability and durability.

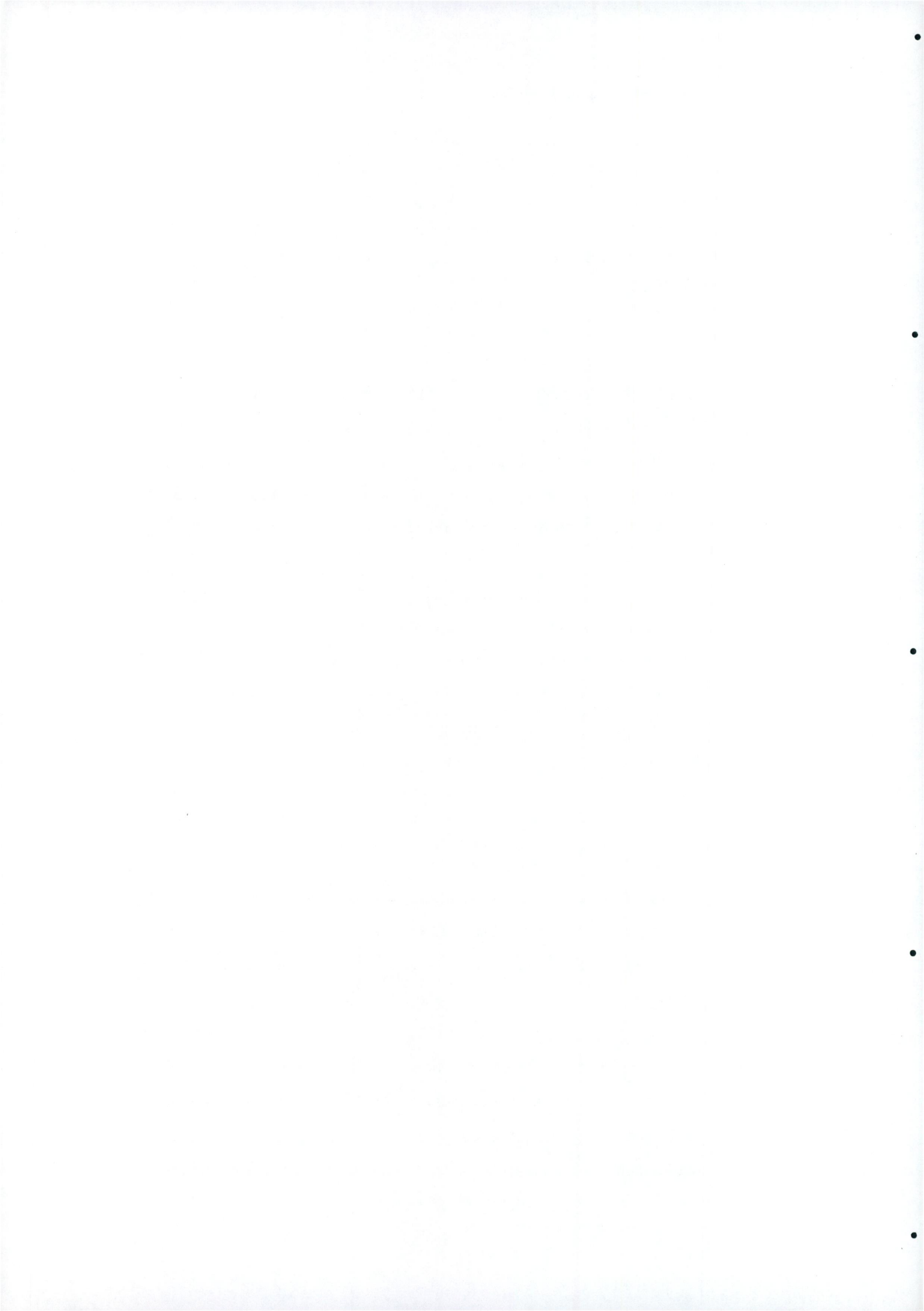
There is no feasible alternative in the foreseeable future.

4.1.2 Where Is The Chainsaw Market And Is The Chainsaw Market In The Right Place?

Lest we forget - chainsaws for the U.S. market pre 1955 were almost exclusively manufactured in the U.S. and Canada. That is only forty years ago (Chainsaw Age Magazine). North America is the worlds largest chainsaw market. It accounts for almost every second chainsaw sold. It is understandable that the sales efforts of the whole chainsaw industry are concentrated on this market. Stihl in their 1990 catalogue boast of sales of several hundred chainsaws to the U.S.A. back in 1930 and this was followed by the establishment there of one of the very first foreign affiliates. However the decision to set up a production plant in the U.S. was not taken until 1975 with the opening of a chainsaw assembly plant in Virginia Beach. In the U.S. plant in 1977 they produced mainly farmer and home owner saws.

Stihl have been producing in Brazil since 1973 and since 1980 their chainsaws manufactured in Brazil are no longer sold solely in that country. With the assistance of the Parent Company considerable effort is being put into exports to the U.S., Europe, Africa and the remaining, its Latin America market with its great potential for the future there.

Stihl established an officiate in Scoresby in Australia in 1971 for sales and distribution to the Australian continent. In 1979, they added a production plant. The chainsaws produced there are designed specifically to meet the requirements of the Australian market. The key models are farmer and



home owner saws. Stihl exports its products to 130 countries including the peoples republic of China. There are five leading Manufacturers of chainsaws world wide. Stihl, Oregon, Sandvik - Windsor, Carlton and Sabre. Sachs Dolmar, Husqvarna, McCulloch, Jousered, Partners, Homelite, Echo and others also manufacture for a world market.

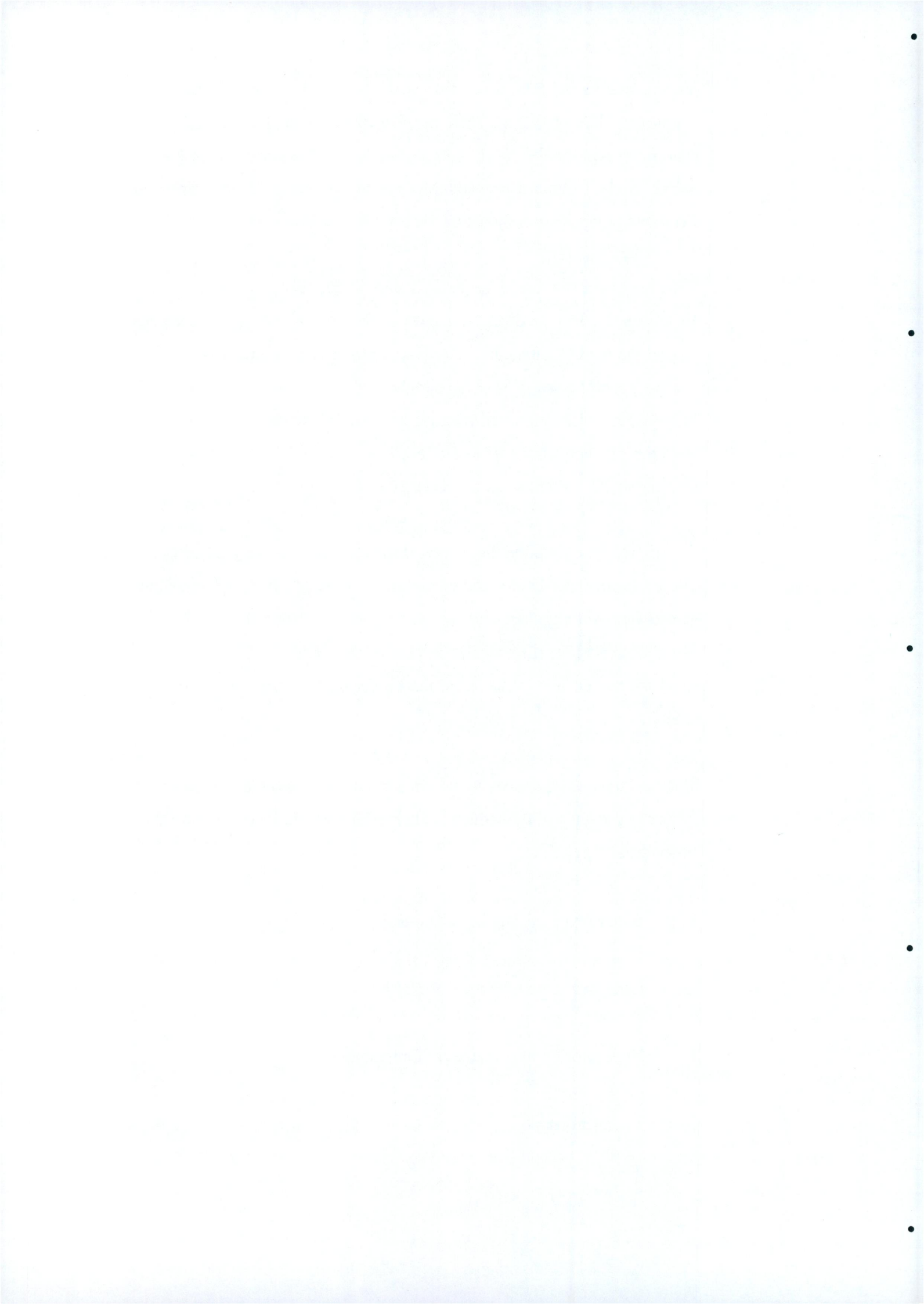
The Husqvarna saw brand has existed since 1959. For many years Husqvarna forestry products have been established in over eighty countries around the world. Literature: (Husqvarna promotional catalogue).

In 1949 Homelite introduced the first lightweight one man chainsaw and were the first company ever to produce over one million chainsaws in a single year (Homelite promotion Literature).

Taking into consideration that many of these companies are producing chainsaws for (thirty, forty and even sixty to seventy years) and some have gained worldwide acclaim and recognition, its not surprising that these manufacturers stake their reputation on a quality product. The chainsaw has stood the test of time in the world market for quality, durability and reliability.

Manufacturers of chainsaws world wide build their reputation in customer service and high quality products. Their efforts are designed to serve the customer better with a:-

1. Broad range of long life chainsaws.
2. Extensive sales support.
3. High priority parts and service programme.
4. Technical support.



5. Profit potential.

Chainsaw Selection:-

4.1.3 At The Right Price Or Value For Money.

In the 1990s all chainsaw manufacturers offer a comprehensive range of saws for widely diverse requirements and applications. They refer to their range of products as their family of saws.

Chainsaws:

Universal Saws, Logging saws, Farm saws and Electric saws.

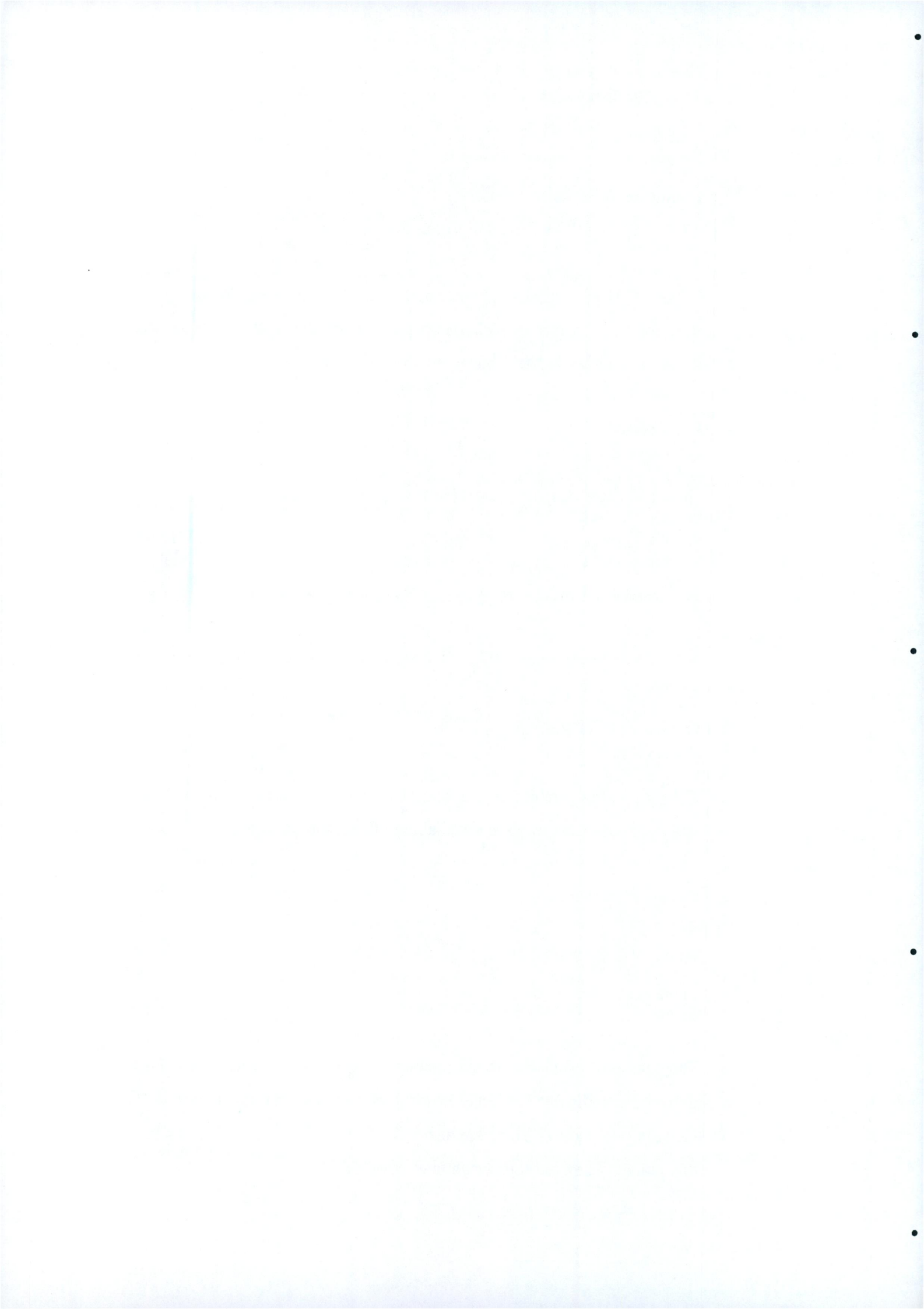
In each manufacturers range of chainsaws there is a selection of models. Each model has a duty rating.

Chainsaw: Duty Rating.

The duty rating depends on the kind of cutting to be done and how often it will be done. Chainsaws are available in three duty ratings.

Light Duty:

They are used primarily around the home on occasional basis. They are designed specifically for home owners and do it yourself enthusiasts, including the ladies. There are also a few quiet running electric saws in this rating. They are lightweight and powerful.



Medium Duty:

They are used around the home and farm or in the forest on a moderate basis. The engine in these saws were designed with power for felling, but the saw is light and handy for climbing.

Heavy Duty:

These saws were designed for heavy duty cutting in big timber and for frequent use. Although they offer high engine power they are still easy to handle.

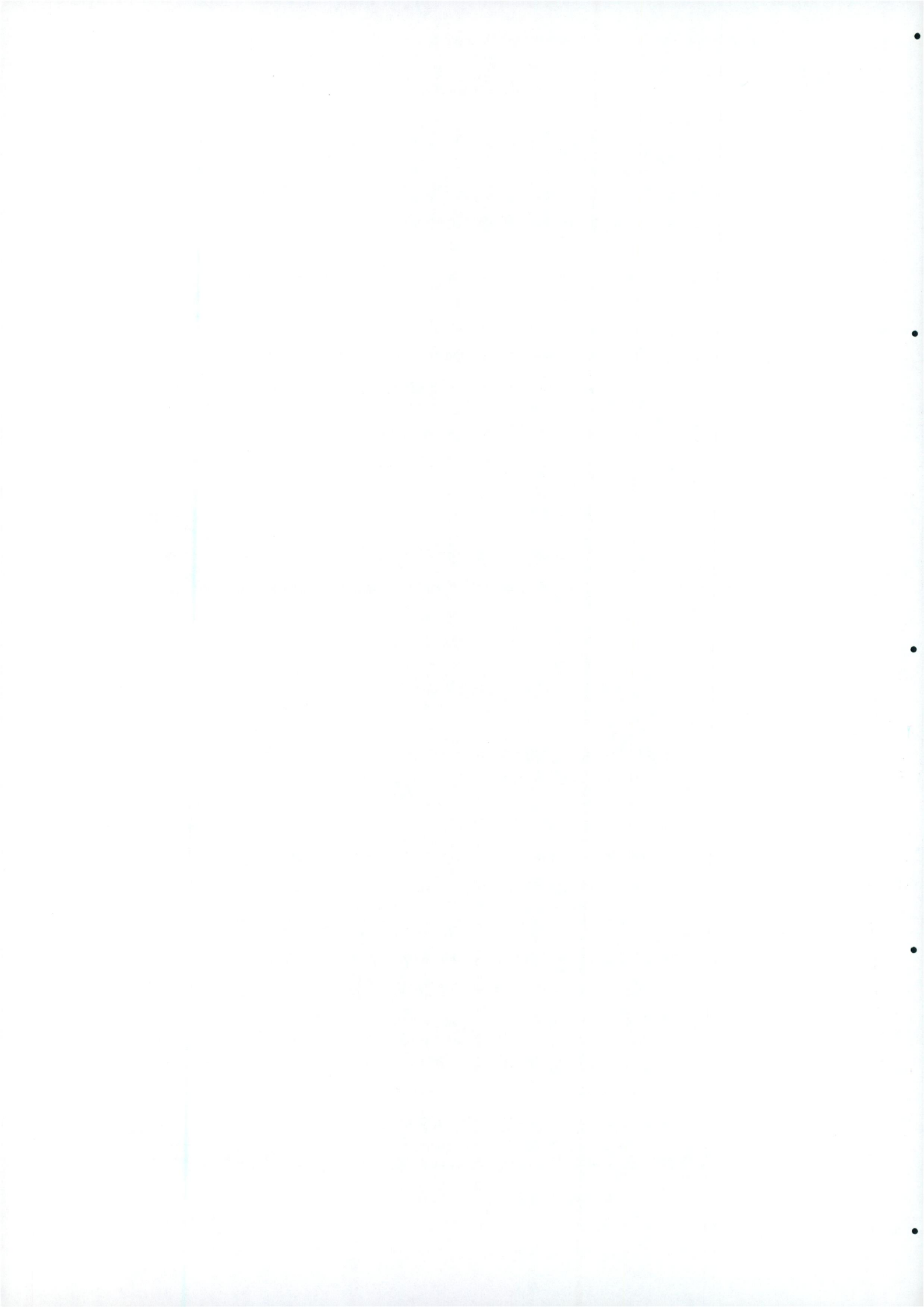
Electric Saws:

Powerful electric saws were designed for use in sawmills and carpenters shops. These saws are still found in sawmills and construction sites

4.1.3.1 Choice Of Power And Value For Money.-

The chainsaw range appears to have the right machines for every conceivable requirement not only in terms of power, but also with regard to specific needs of different groups of users. There are so many makes and models of chainsaws available consumer selections becomes difficult. Consumers make decisions all the time about whether products are right for them. If and when the type, size, colour and manufacturer has been decided, its important for the consumer to investigate the reliability of a local dealer or service engineer for the availability of spare parts. "If a saw is to be efficient it must be available at all times, normally this is the philosophy of good agents". (Forestry Literature)

Chainsaw manufacturers sell their products through selected distributors and dealers. A dealer can only be successful if he has suppliers who cooperate



with him to generate success as a team. If after taking into consideration so many options and the consumer thinks there is still a choice, then value for money must be considered. The cheapest and lightest may not be the best. Even the most expensive chainsaw may be value for money if it gives reliable service.

4.2 Chainsaw Technology:- including research and development

In a 1990 brochure, one of the worlds largest chainsaw manufacturers - Stihl - printed that:

"In 1971 the 2000th employee started work and the 1.5 millionth Stihl - a Stihl 020 AV - came off the assembly line" at this stage they had a yearly output of 340,000 chainsaws. These figures applied over 20 years ago. Technology has developed so fast in the last twenty years those figures are irrelevant in to-days world. Possibly a good comparison with chainsaw development is computers. They were both invented in the 20s and 30s, became major products in the 1950s and assumed their modern form in the 70s and 80s.

Research And Development

One of the worlds largest manufacturers - Stihl - and trendsetters in the chainsaw market have 250 employees or 5% of their workforce in research and development (Stihl Literature). Sandvik - Windsor an American chainsaw company give 4% of all profits to development and research departments (Chainsaw age magazine). This reflects the importance of research and development in the chainsaw industry to-day. Critical success factors lie somewhere in what Michael Porter in "Competitive advantage" defines as the Value Chain - research/design development, production, marketing/sales and distribution.



Value chain

Critical success factors always lie in the chains of activities that add value to the product or service.

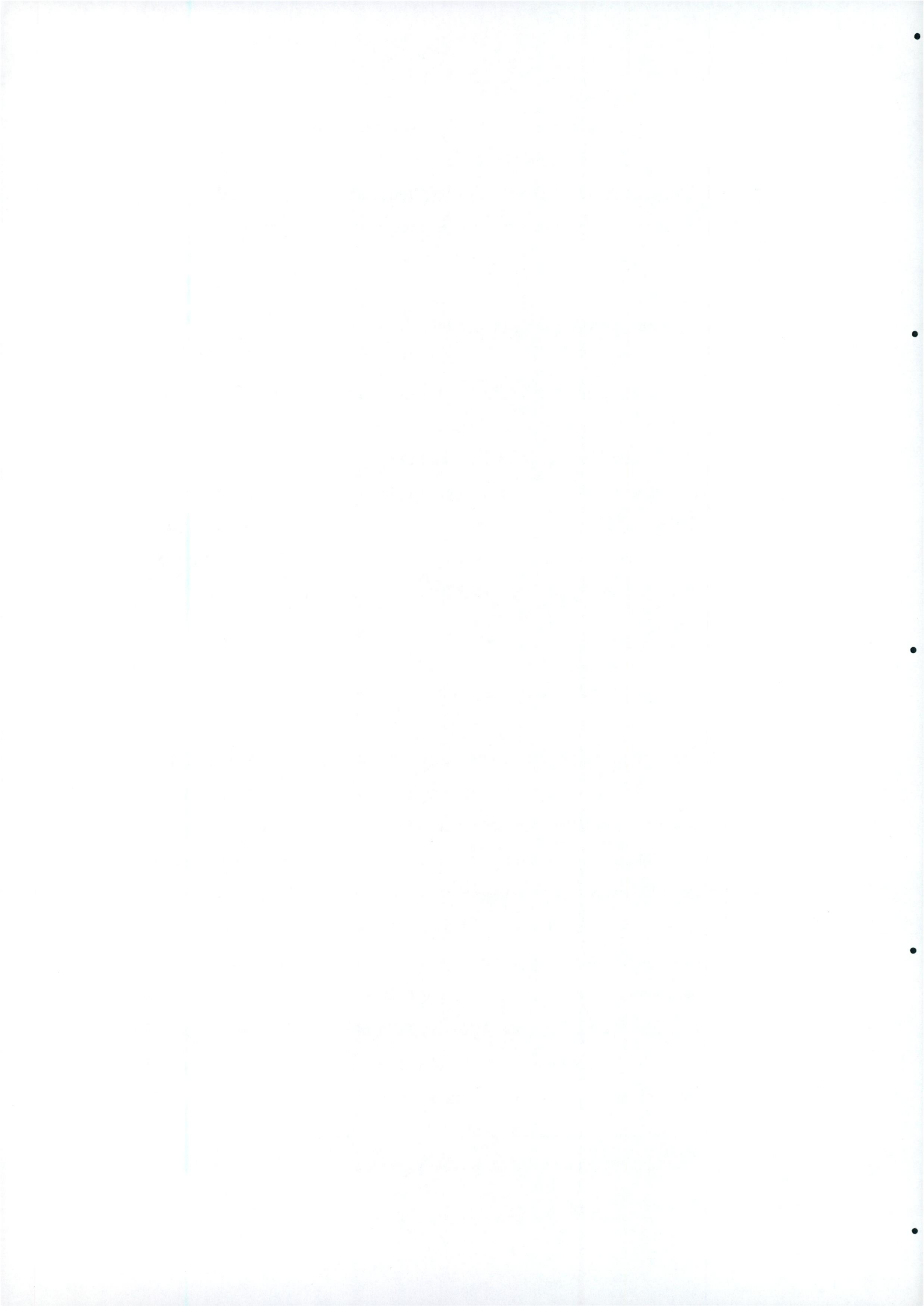
(Research/design), (Development), (Production), (Marketing/sales distribution) (Managers Handbook, Ernst and Young. Page 34).

Research, Development, Production

This is a somewhat simplified sequence of a products life. Research creates a starting point for a long series of interconnecting and interacting functions which conclude with an end product in this case the chainsaw and the consumer for whom it was designed. The work of research and development cannot be clearly defined. They work hand in hand. Both serve to enhance the utility value of a product. The efforts in both research and development have a crucial impact on product quality.

Best engineered products need a marketing strategy.

Right up to the present century innovative products came on the market as a result of tinkering by gifted amateur inventors often with minimal equipment, little finance and a negative attitude from established companies. Since the turn of the century however breakthroughs have come from the research teams design workshops and laboratories of bigger international companies. Vast sums have been committed to corporate Research and Development and product development following research programmes involving thousands of scientists and technicians. In many instances the consumer market has gained new products as spin-offs from unrelated research - Calalythic Convertor - from a study of chemicals, and natural gases. The annual reports of almost all multinationals give a lot of coverage to investment in product development. Their research and development teams work on products preparing to capture tommrow's



markets.

For Example.

Stihl trendsetters in chainsaw design not only manufacture chainsaws and other devices in the homeland, but carry out all the design, development market and financial management for world wide markets. It is evident that Stihl believed in a good working environment, good working relations in the interest of the company and all other employees and last but not least a good marketing strategy since day one. Half of the employees at the

domestic plants have been with Stihl for more than 5 years and 20% for more than 10 years.

The parent plant started in 1947 - 200 employees. They produced 90 saws a month in 1947. The first Stihl consumer service opened in 1948. Today there are 400 service centres and more than 6000 dealers in Germany alone.

"In 1971 the 2000th employee started work and 1.5 millionth Stihl - a Stihl 020AV - came off the assembly line". (Stihl 1990 Catalogue)

At that stage they had a yearly out put of 340,000 chainsaws.

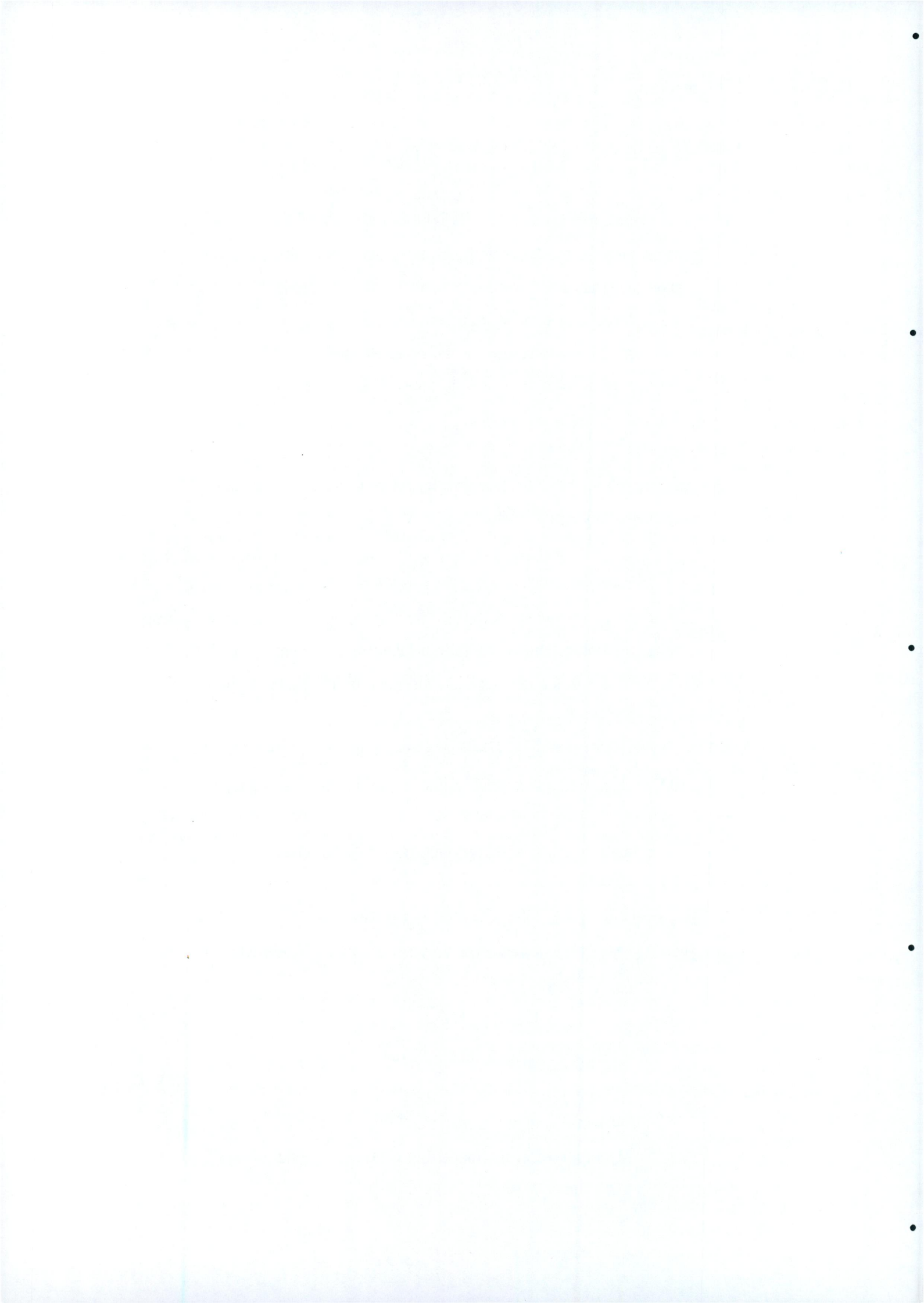
"In this chainsaw era - Stihls annual report 1990."

1990 Stihls Groups workforce numbered 5,710. Which was 303 more than in 1989 - 5397.

Of this total 3,593 were employed at the parent plant.

1,946 employed at the manufacturing and marketing subsidiaries.

171 employed at the marketing centre in Dieburg.



The parent company thus accounted for 62.9% of the total workforce, the subsidiaries abroad 34.1% and the Dieburg marketing centre 3%.

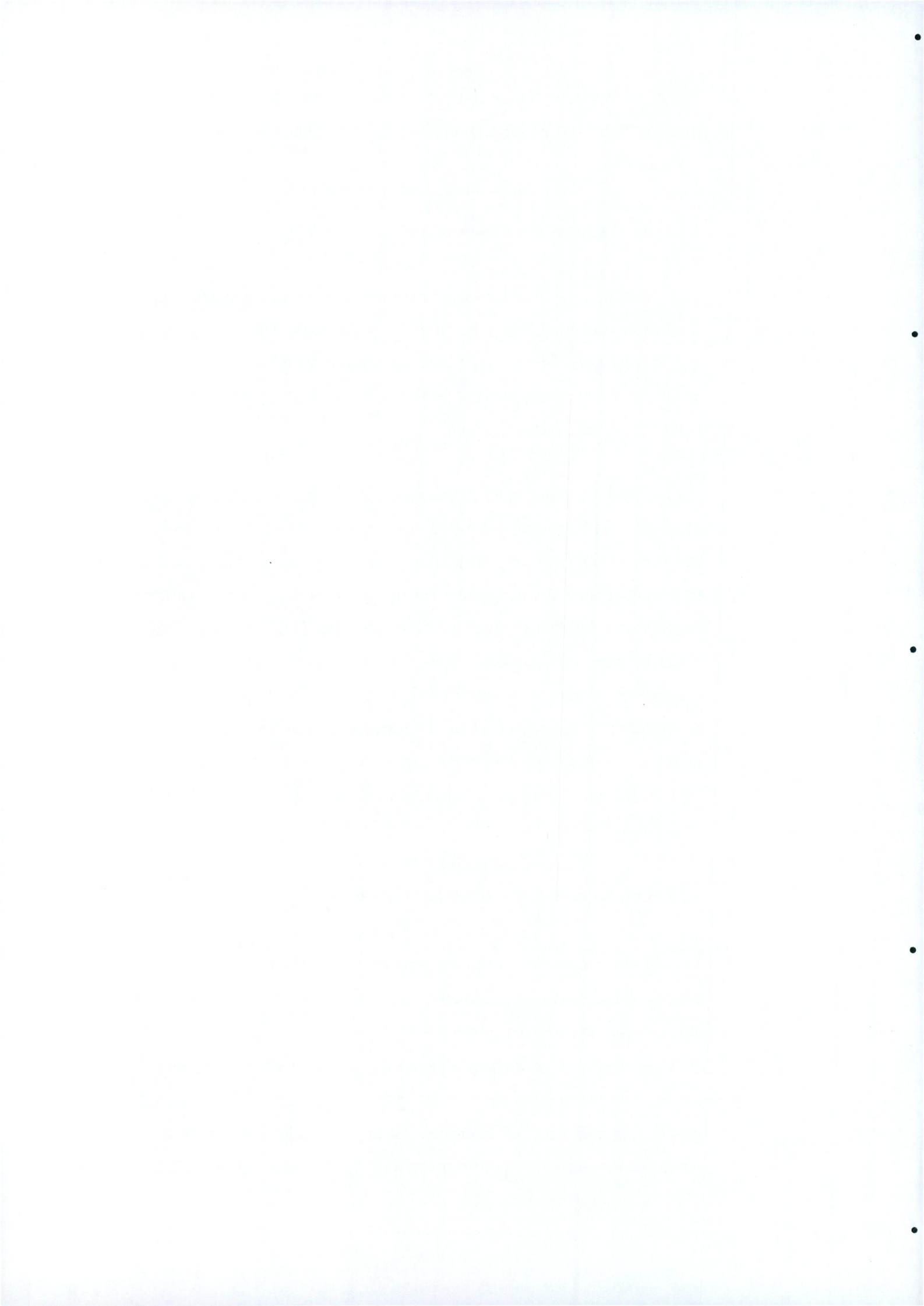
4.3.1 To Promote The Chainsaw In The Right Way

The last quarter of this the twentieth century is experiencing such a leap forward in marketing, research and design technology, that developments and improvements in chainsaws have been dramatic and intriguing. Some of the major improvements have been the speed of cutting and in the reduction of weight and vibration.

Chainsaws have long ceased to be utilised solely by the forestry industry. They are used by people generally. Although power tools and chainsaws have made many jobs very much easier the sheer power of these machines make them potentially dangerous. Safety standards have been increasing in recent years. Modern chainsaws designed and fitted with safety features are a vast improvement on older models. Safety complying with government standards is a factor worth considering when purchasing any new machine. Sometimes the presence of extra safety features add to the cost of the machine, but this is not always the case. Irrespective of what safety features are fitted to a power tool if used carelessly it will always be hazardous.

4.3.2 Consumer Safety: Selling Safe Power.

The chainsaw and other power tools have the potential to cause harm if used incorrectly. Almost all injuries from any power tool are the result of misuse. The first and most essential safety product one provides to the customer is "that" knowledge. When selling a chainsaw to the average person its better to sell a result or end product - something like blocks of firewood, pruned trees or a do-it-yourself job. It would be incorrect to stress that the power equipment or chainsaw is dangerous. If one considers



the chainsaw dangerous and sells it they incur some of the liability for the harm it might cause. Stressing safety not danger is a better sales promoter - before, during and after the sale - constant stress should be put on the safe use of the chainsaw. Once consumers generally are aware and understand the safe use of the chainsaw, they are much more appreciative of the safety equipment.

4.3.3 Promoting Safety Apparel And Protection Devices

Another important aspect in the design of the chainsaw in this decade is the concern for safety as demonstrated by a host of features in chainsaw magazines and brochures. Everything from the chain brake to the narrow saw body and plastic coated handles have been designed, changed and updated with the Consumer in mind. There is a whole range of protective clothing on the market. Everything from safety boots with steel toe caps, hard hats, safety helmets earmuffs, browguard and visor. The protective clothing comes in a selection of wet and cold weather gear. Respiratory protection, eye and head gear are also available, some if not all the chainsaw retail outlets promote the sale and use of these safety products (Oregon Literature) Liffey Distributors Ltd.



Chainsaws are potentially dangerous, Professionals appreciate this and readily use safety equipment. Apparel and protection devices are optional accessories for chainsaws and other power tools and to the customer (especially the non professional user they are merely unnecessary and expensive "extras").

4.3.4 Safety Awareness Videos

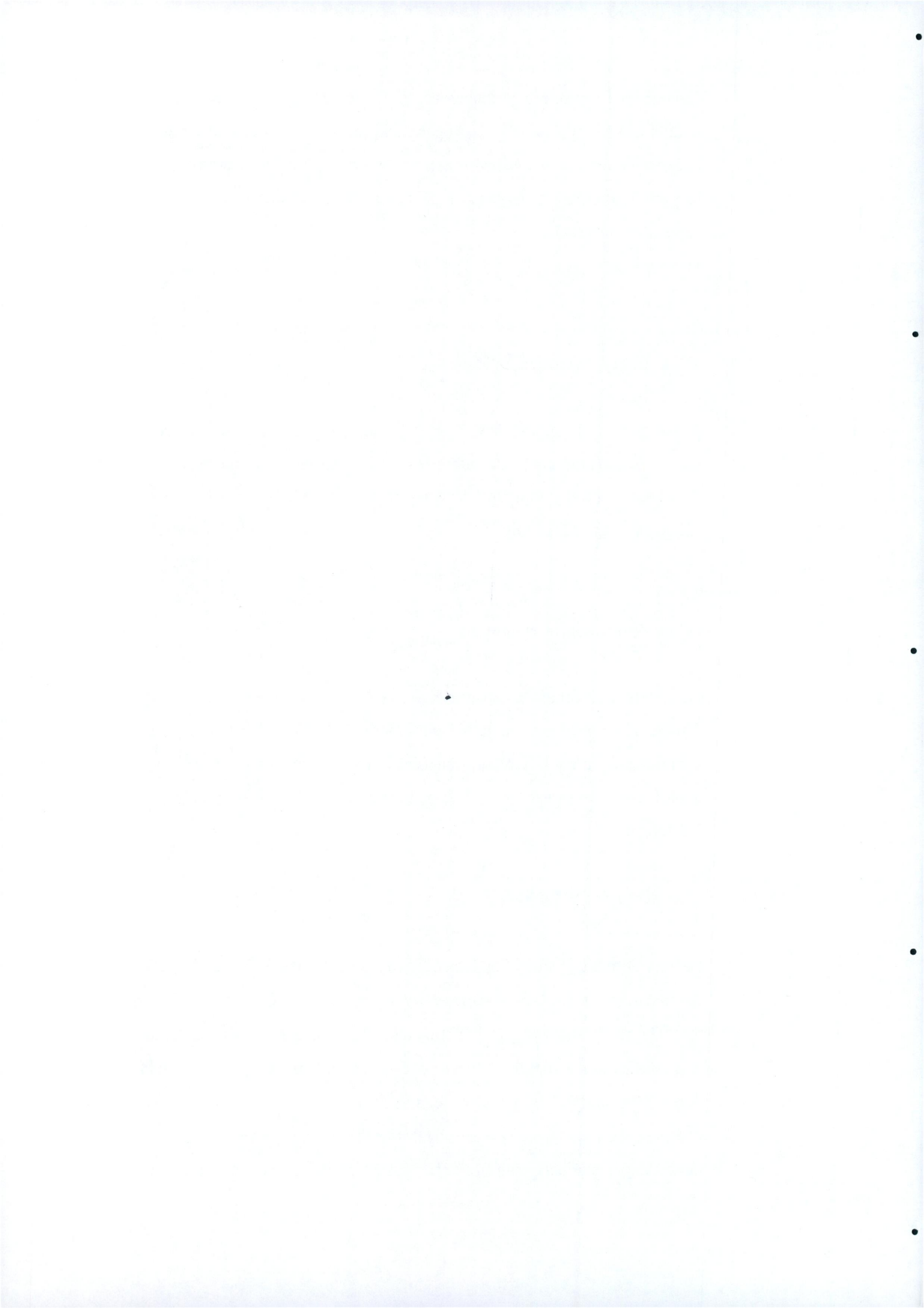
Argus, a Norfolk English based video production company has produced consumer oriented chainsaw safety instruction videos. The information in the videos conform with British Safety regulations SC10 and AS20 (Chainsaw Age Mag, July '89).

Safety Awareness Literature

Husqvarnas brochure "Husqvarna Forestry Technique for Organised Thinning" gives advice on easier and more efficient working in the forestry department. Safety advice is emphasized in the discussion of injury avoiding working methods and equipment and accessories (Husqvarna Literature)

Chainsaw Injuries Low

Results of a major study conducted by the occupational Safety and Health Administration of the U.S government were released to : Chainsaw Age July 89. The study analyzed 141 fatalities resulting from on the job accidents and injuries in the logging industry over a six year period ending in 1984. Among the studys findings were relative frequencies of the major causes of death, of the four major causes (which together accounted for 94 percent of the fatalities studied), cuts from chainsaws was by far the least frequent



accounting for 2% of deaths: More frequent were falling trees 64%, unsafe operation of large equipment 17% and rolling or moving logs 11% (Chainsaw Age July '89 Page 28).

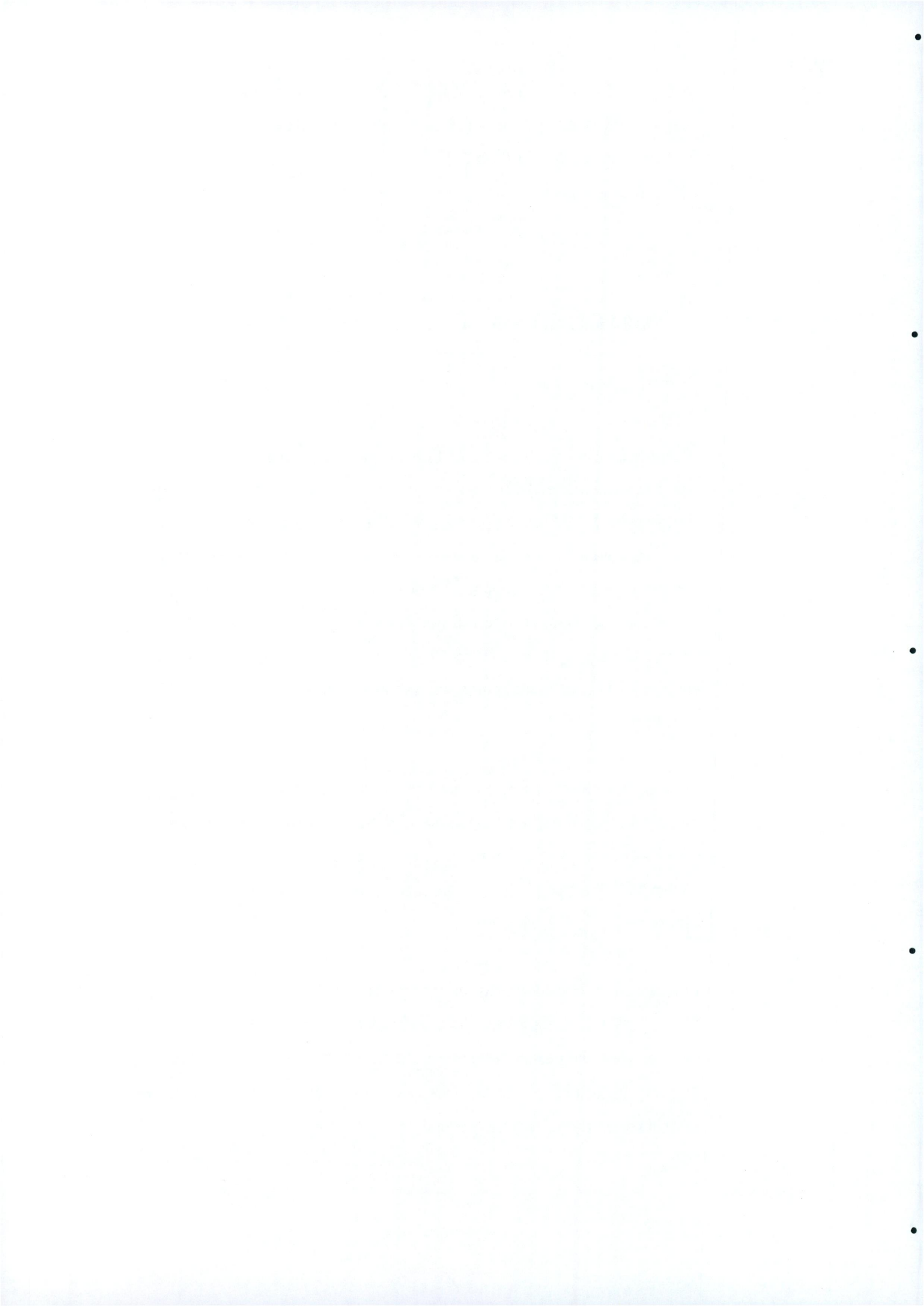
4.4 Environmental Protection And Energy Saving Materials

Environmental and Conservation

"Conservation means wise use of the Earth and its resources." (Chain Saw Age Magazine, Dec 1992). Most of the world's leading manufacturers of cutting systems for the forest industry are strong advocates of programmes that preserve and protect large areas of the Earth's forests. Some of these companies encourage and support global reforestation programmes designed to enhance and keep commercial tree crops a vital future resource. The Oregon Cutting System Division Blount Inc., Portland, Oregon, USA, view environmental tree planting programmes as essential, not only in the US but worldwide.

Oregon, American Cutting System new environmental tree planting programs as essential not only in the U.S. but worldwide "Fact is, those who buy Oregon products in the U.S. get a free tree, or tree seeds to plant". "After cutting a tree planting a tree makes good sense" (Chainsaw Age Magazine Dec 1990, Page 60).

Environmental considerations and energy saving already important issues for industry are going to become more important. From an environmental point of view the design decision to use aluminum die casting in chainsaw manufacture results in vast amounts of energy to be used initially, but these can subsequently be recycled several times.



Plastic components on the other hand do not require larger amounts of energy in production, but in case of chainsaws are not recycled as they are mainly "thermosets".

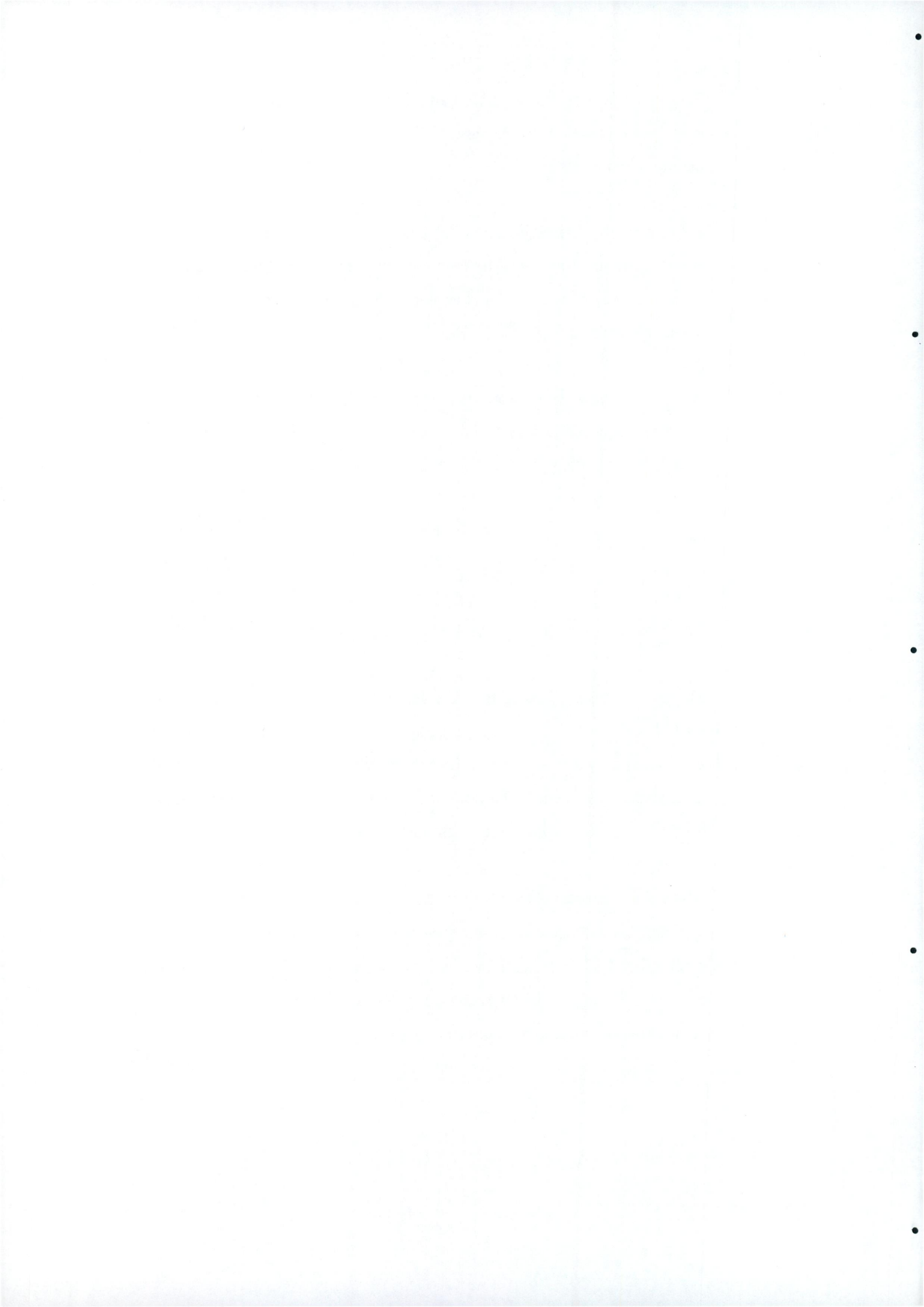
Up to recently chain lubrication has been neither very economic nor environmentally friendly. The new ematic system in chainsaws claims to make the most of economy and ecology. Its believed to reduce oil consumption by up to 50%.

Husqvarna's new two-stroke oils combustion characteristics ensure that while performance is maximised, smoke emissions are kept to a minimum. This is an important factor for the chainsaw user.

4.5 The Chainsaw Design And The Environment.

The usage rate is declining to some degree. This may only be a phase related to the rising public concern for the environment. This may be offset in the future by a return to the coppice managed plantations. This system is used primarily to benefit the flora and fauna and the constant harvesting of timber could be considered a by product.

Some chainsaw manufactures in recent years have adopted an environmental approach ranging from cadmium free products to unleaded fuel, vegetable chain oil and in some cases even a catalytic convertor, producing with the consumer in mind. The consumers decision to purchase a more environmentally friendly chainsaw is easier.

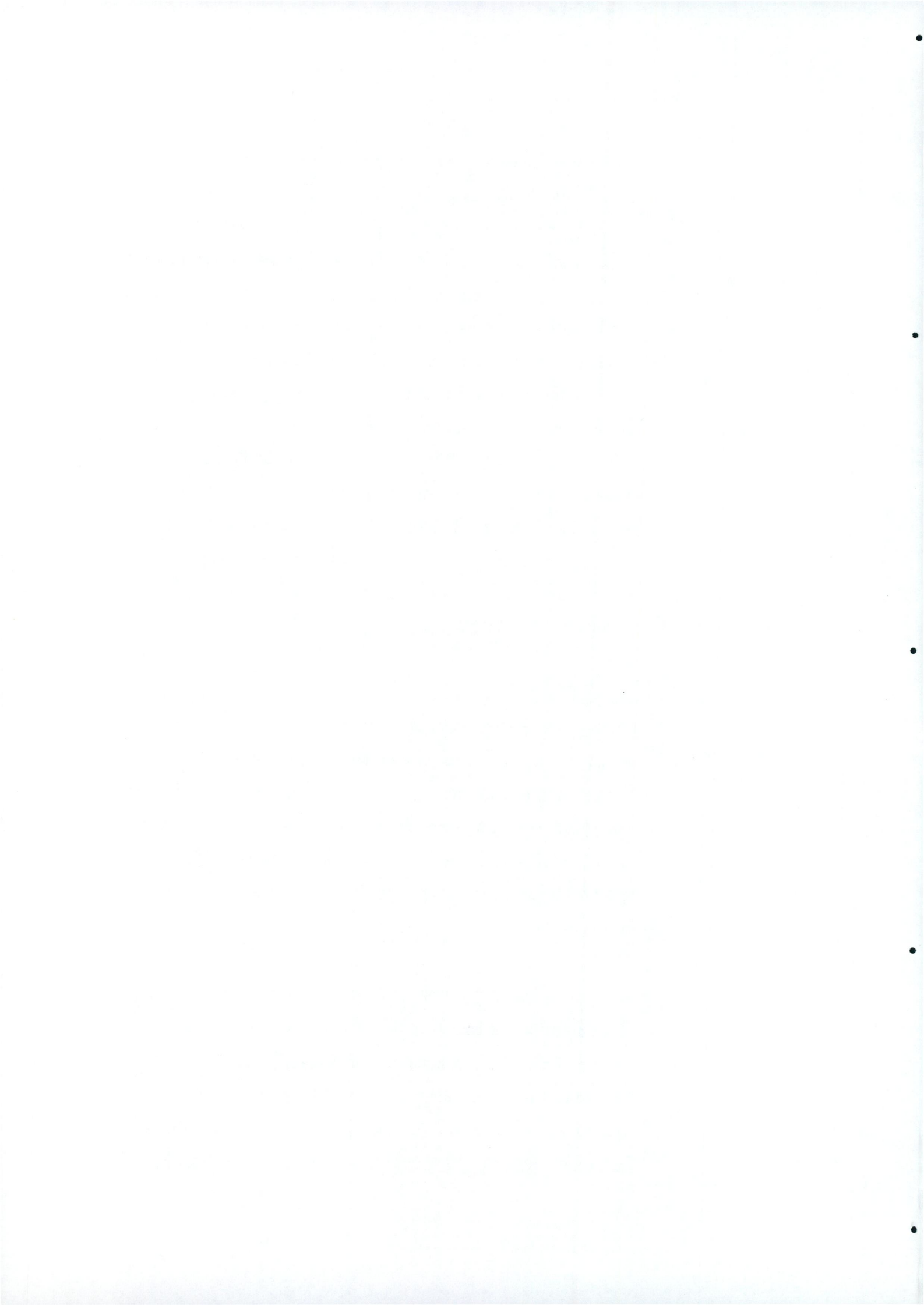


Conclusion

The chainsaw, being a highly engineered product owes its existence to innovative breakthrough in technology, not least aluminium alloys. There are definitely reservations about safety, due to the nature of its function. This aspect of the chainsaw has escaped even the progress of technology. The addition of any extra safety features could lead to a sacrifice of efficiency and function, and maybe also the cutting chain. The word chainsaw has become synonymous with wood-cutting. The consumer recognises this relationship between the word and its capabilities, therefore any change that would claim to be as effective and not incorporating a chain or the word chainsaw would have to overcome peoples' visual and mental expectations. This theory also applies to the colour of the chainsaw. Chainsaws have adopted a trait of applying bright colours and using these colours as an aspect of product identification, and also a warning to consumers and users to be careful. Colour stresses safety first.

Being good, safe and efficient is primarily what should concern the design of chainsaws. Visual appearance is important, and used correctly can be an extremely positive force in marketing a product. Safety, efficiency, and the environment have become the marketing techniques adopted as a substitute for endearing styling lost as a result of the chainsaws totally functional form, that holds precedence over non-functional niceties.

The encompassing of psychological ergonomics owing to the layout of the constituent elements of the chainsaw is completely accidental, and are borne of its functional requirements. The chainsaw has evolved and inevitably adopted a form that mirrors its working parameters. The chainsaw is a highly engineered product and as such should primarily be functional and efficient, therefore any

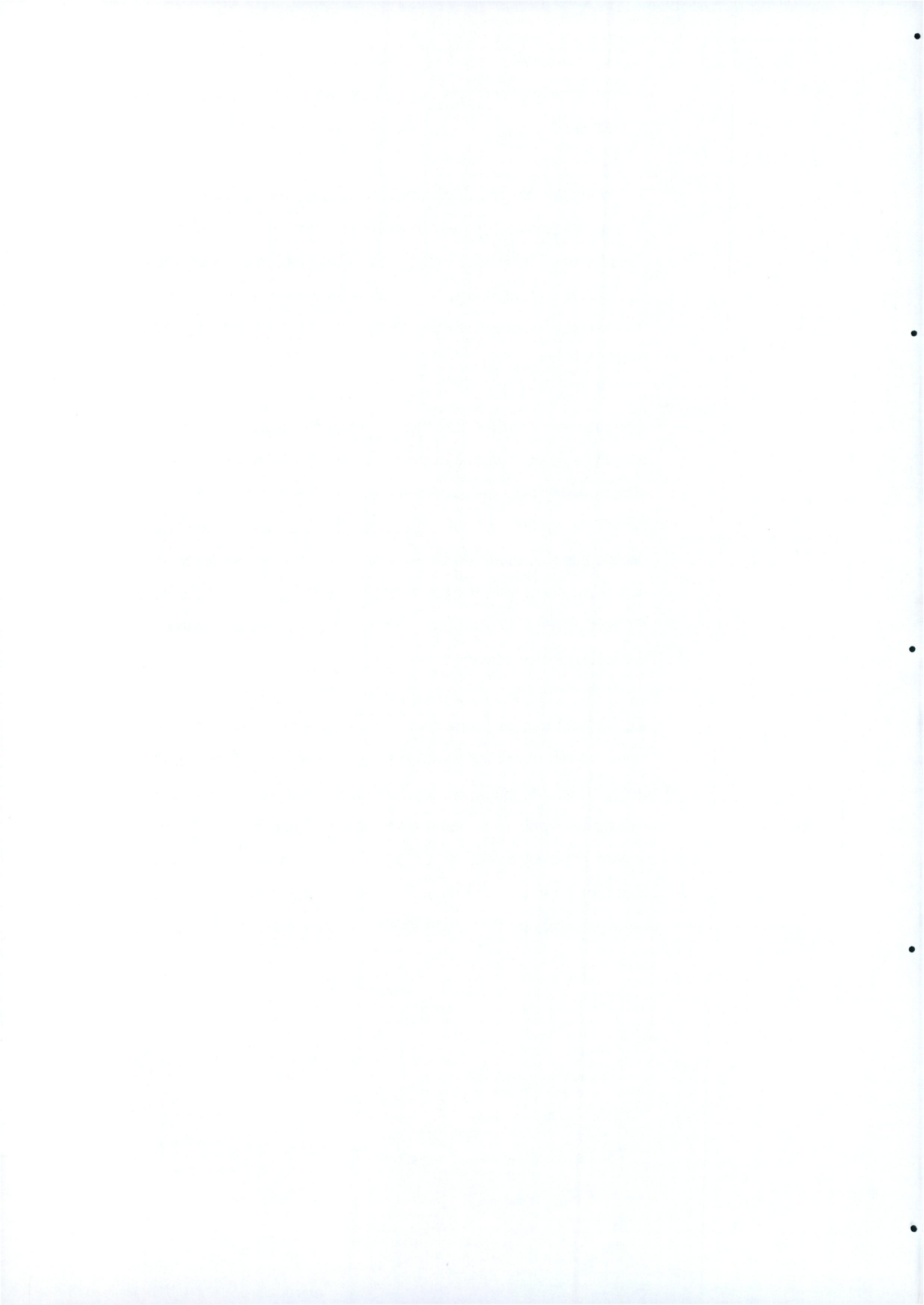


manufacturer that sacrifices function for over indulgent styling, do so at their peril.

The chainsaw has remained a product of the nineties due to the formulated psychology used by chainsaw manufacturers. Chainsaw manufacturers have used issues such as reforestation, development research, and green issues, to appeal to the awareness and increasingly important issues which influence a buyer of any product in the nineties.

The chainsaw industry has reached the growth maturity stage and may even be entering the decaying stage. There are many reasons why this may have occurred, e.g. the casual user who forms a large part of the market and who has purchased a chainsaw in the last decade has a machine which will serve his or her needs for years to come, but changes in market strategy may help to expand the market for specialised versions of the chainsaw e.g. lightweights suitable for the ladies or tree surgery.

It is evident that chainsaw manufacturers and chainsaw designers have a moral obligation to abide by and incorporate all the important issues which the consumer considers to be important. The chainsaw industry is worth \$2.8 billion a year and will remain so if the effort already made by manufacturers and designers to meet our visual, conceptual and moral prejudices remains at the standard achieved, or unless a substitute for wood, which is central to our civilisation, is found.



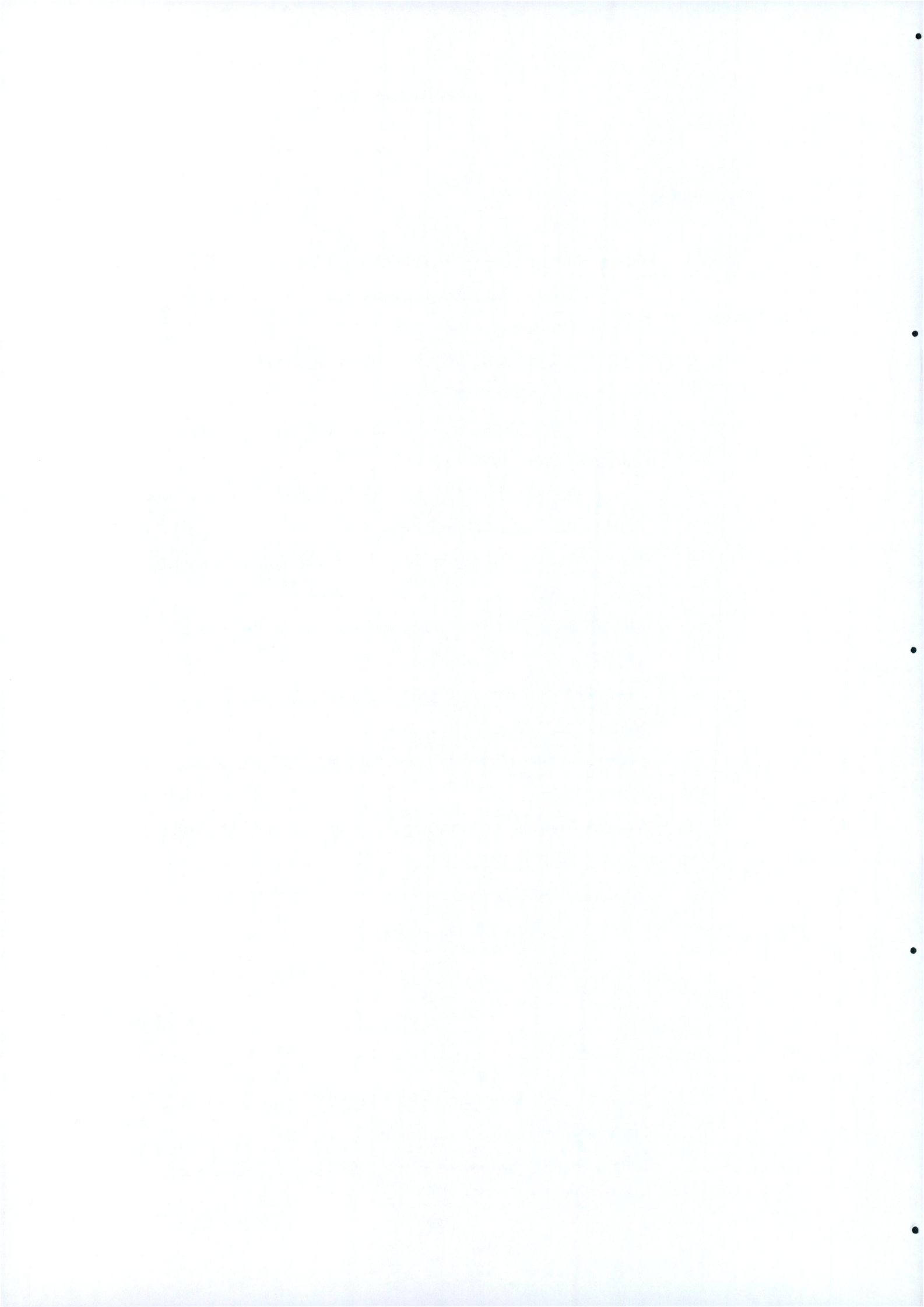
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Interviews

Mr. Frank Jones

I had an interview with Mr. Frank Jones on Saturday, 15th January 1994. We discussed the historical background of the chain-saw, the evolution and change in design of the chain-saw, through to the first one-man chain-saw.

