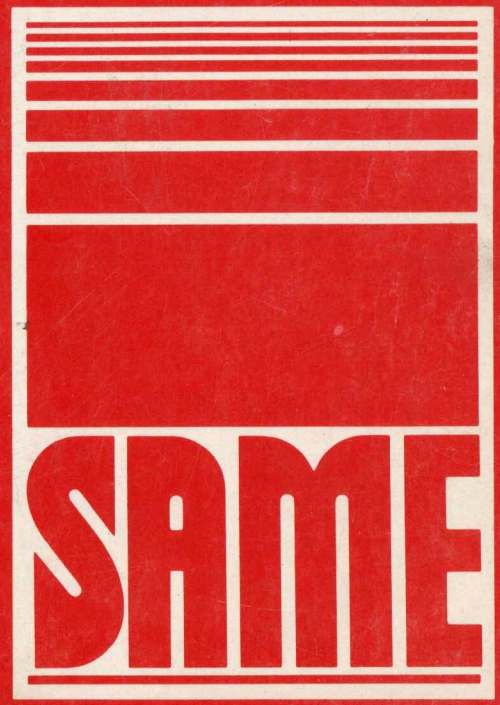
SAME TECHNOLOGY



SAME TECHNOLOGY

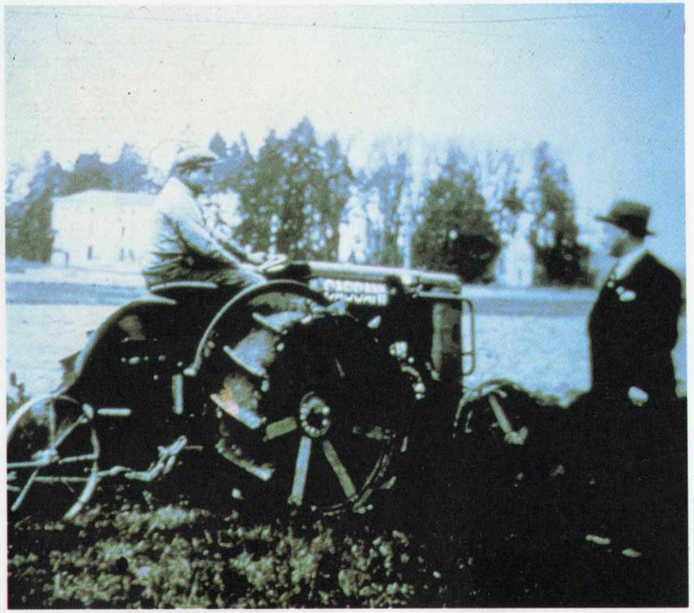
...THE SAME TRADITION...

Nowadays SAME is among the six leading manufacturers of agricultural tractors worldwide, a position it has achieved through the fifty years of specialized experience in which it played a leading role in the technical development of the tractor.
In **1927** Francesco Cassani, the founder of SAME, designed and built the first diesel-engined agricultural tractor in the world, the CASSANI 40 HP.

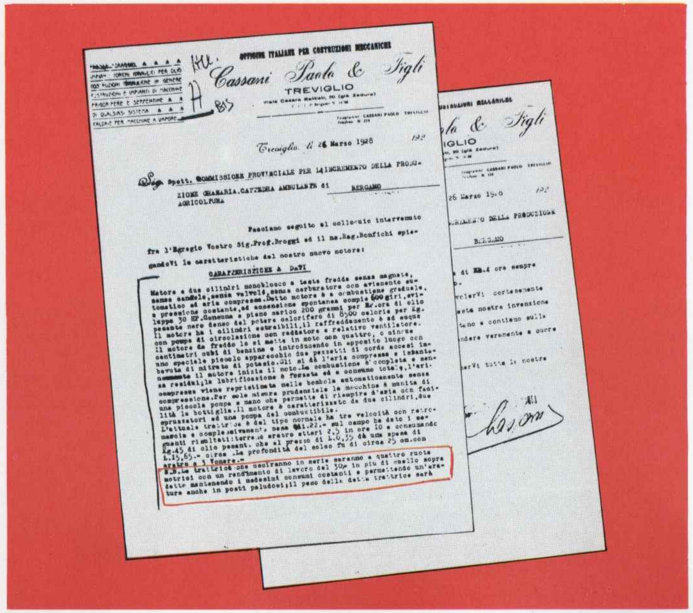
As early as **1928** he was considering the mass production of four-wheel-drive tractors, as can be seen in this letter from him to the Agricultural Inspectorate in Bergamo.

He subsequently began the industrial-scale production of injection components such as pumps, injectors, etc.
In **1935** he designed and produced highly sophisticated opposed-piston engines for use in aircraft.

Mr. Francesco Cassani personally supervising a demonstrating test.

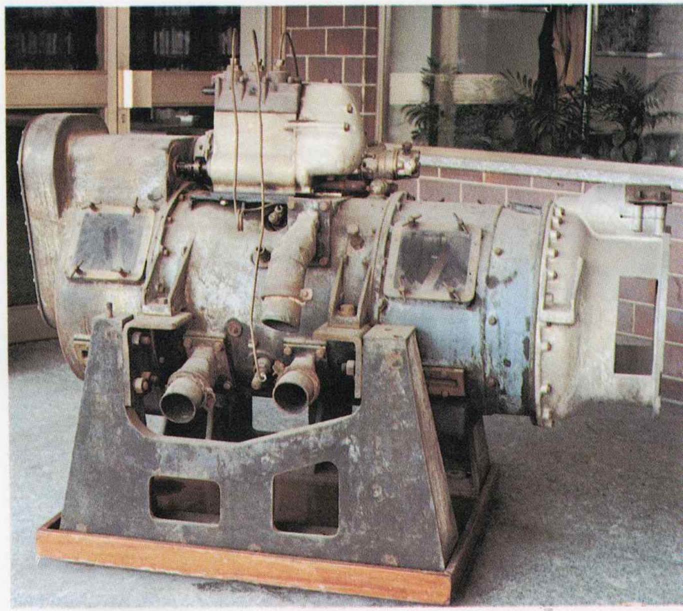


Autograph letter by Cassani brothers.



OFFICINE ITALIANE PER COSTRUZIONI MECCANICHE
Cassani Paolo & Figli
TREVIGLIO
Treviglio, li 26 Marzo 1928
Spett. COMMISSIONE PROVINCIALE PER L'INCREMENTO DELLA PRODUZIONE GRANARIA, CATTEDRA AMBULANTE di AGRICOLTURA
BERGAMO
Facciamo seguito al colloquio intervenuto fra l'Egregio Vostro Sig. Prof. Broggi ed il ns. Rag. Bonfichi spiegandoVi le caratteristiche del nostro nuovo motore:
CARATTERISTICHE A DATI

Diesel engine for the aircraft industry.



1948 - The start of industrial production.

1951 - The launching on an industrial scale of the Four-Wheel-Drive system, already thought of as an ideal as far back as 1928.
Today, production of the 4WD models accounts for more than 80% of SAME's total output.

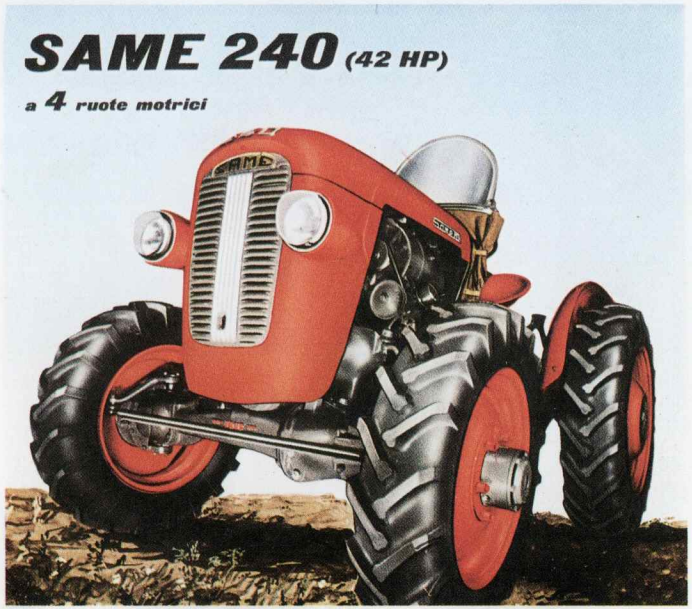
1958 - Introduction of the first Automatic Linkage Control Unit, an original SAME design, with sensing of the draught force on the lower lifting arms.

TODAY

Another original response to the problems of agricultural workers' health and safety: the series of driver's cabs produced by SAME not only meets international standards for safety and comfort, they also offer the operator a genuine alternative to the comfort of his own home during the long hours of the working day.

SAME D.A. 25 DT: the first SAME 4 wheel-driven tractor.

SAME 240: the first SAME tractor with the renowned Automatic Linkage Control Unit.



SAME GALAXY 170: the most powerful model of present SAME range.

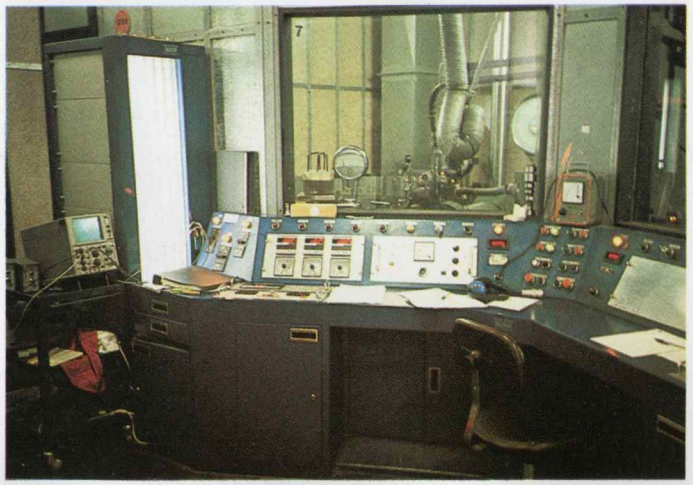
...THE SAME PHILOSOPHY...

Quite apart from the originality of its technical design, SAME differs from other manufacturers in concentrating all its efforts and all its resources solely and specifically on one product, **the agricultural tractor.** The major steps in the process of bringing out the product are:

1. STUDY OF AGRICULTURAL PROBLEMS
2. RESEARCH AND TRIALS
3. DESIGN
4. PRODUCTION
5. MARKETING

In the 50 years of its existence, SAME has always concentrated on building up its own technology rather than relying on external licences for the manufacture of particular components of its tractors. The success of this independent approach is confirmed by the fact that many SAME designed features have become an accepted reference even for other manufacturers:

- ▷ Original SAME engines
- ▷ Original SAME transmissions
- ▷ Original SAME driven front axles
- ▷ Original SAME Automatic Linkage Control Units
- ▷ Original SAME safety and comfort.



...THE SAME PRODUCT...

- **FIT FOR ANY CLIMATE**

  The air cooled engines allow SAME tractors to work without any problem even under the most critical environmental conditions: very hot and very cold climates.

- **FIT FOR ANY GROUND**

  SAME tractors **on sandy soils** show excellent «floating» qualities due to the large-sized tyres giving a lower specific pressure on the ground.
  SAME tractors **on heavy and wet soils** have an outstanding and constant adherence thanks to the more advanced center of gravity.

- **HIGH PERFORMING**

  Thanks to its world famous 4-WD system and the highly sensitive Automatic Linkage Control Unit, SAME tractors fully exploit the engine's power under all ground conditions ensuring constant grip and less slip.

- **ENERGY SAVING**

  Thanks to:

  — SAME air cooled engines.
  — SAME high performing mechanical transmissions.
  — SAME astonishing adherence to the ground.

...THE SAME RANGE...

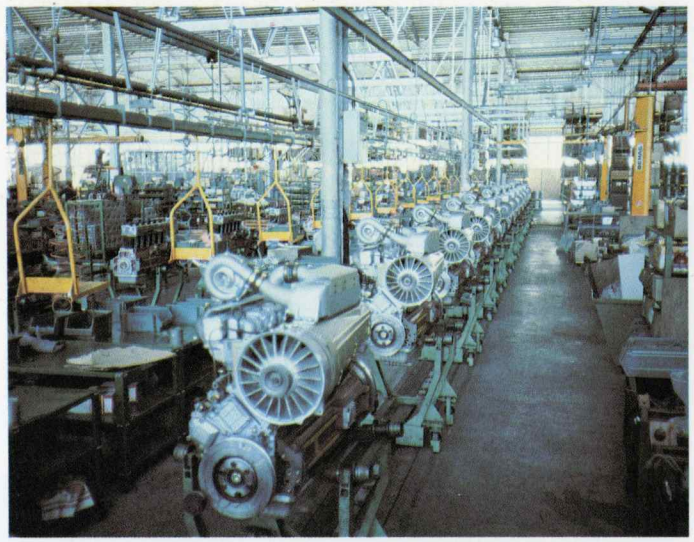
A COMPREHENSIVE TRACTOR RANGE MEETING THE WORLD'S AGRICULTURAL REQUIREMENTS

Nowadays, the SAME range offers the dealer impressive opportunities for success.

- **BROAD POWER SPAN FROM 30 TO 170 HP**
  Covering practically the entire power spread required by today's markets.
- **VERY COMPLETE**
  34 MODELS
  70 VERSIONS
- **TECHNOLOGICALLY ADVANCED**
  For a developing agricultural industry, seeking productivity and economy.
- **HIGHLY SPECIALIZED**
  From this point of view the SAME range is one of the most complete and best configured to meet fully the particular needs of specialized agricultural fields (fruit, vines, rice) or specific tasks (rapid transportation, heavy loads, building-site work, etc.).
- **CONVENIENT MODEL CATEGORIES**
  All the models in the range, apart from the smallest ones, are offered in two categories:
  — a more economical category for customers seeking high performance and excellent reliability;
  — an «EXPORT» category for the markets and customers requiring, in addition to performance and reliability, a high degree of sophistication and excellent comfort.

...TO MEET THE FARMER'S REQUIREMENTS ALL OVER THE WORLD...

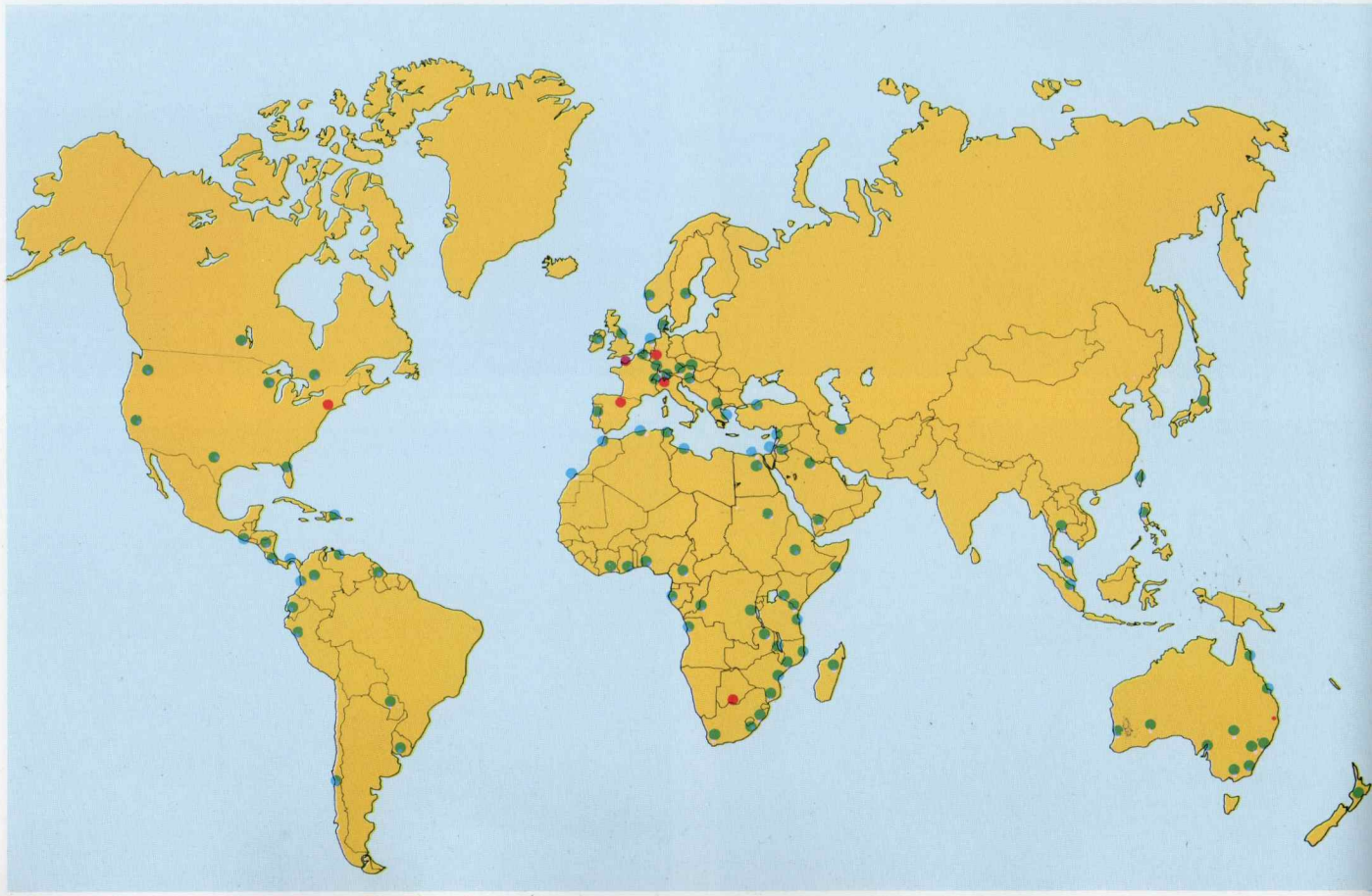
...SAME's PRODUCTION...



The SAME group has an annual production capacity of:
— over 40,000 tractors;
— over 50,000 engines.
Precision checking of the dimensions and structure of components is essential for a manufacturer such as SAME who seeks high-quality production.
Before being passed to the final production line, each sub-assembly undergoes rigorous operational testing.
Only when it has passed an extremely exacting final test is the tractor allowed to bear the pround name SAME.

OVER 200,000 TRACTORS IN 87 COUNTRIES WORLDWIDE.
Right from its first beginning, in addition to meeting the needs of the Italian market, SAME has always considered the overseas market as a testing ground for its own technology and as a source of new experience.
In 35 years of production, more than 200,000 tractors have been sold throughout the world. Today, SAME is the second-largest tractor manufacturer in Italy, and among the leading six worldwide.
50% or production is sold on the export market, through a sales network comprising over 250 distributors. In some markets, SAME operates directly through its own organization:

SAME FRANCE	(Paris)
SAME GERMANY	(Frankfurt)
SAME SPAIN	(Madrid)
SAME U.S.A.	(New York)
SAME SOUTH AFRICA	(Johannesburg)
SAME AUSTRALIA	(Sidney)
SAME U.K.	(Thirsk)



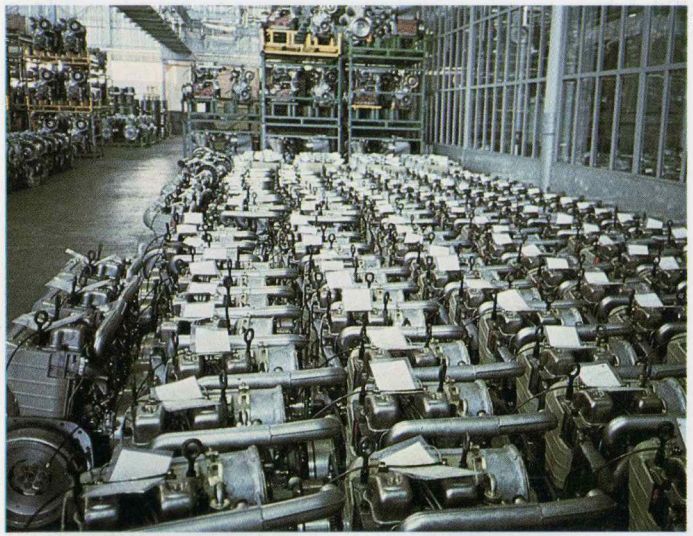
Aerial view of the Treviglio factory.

AIR-COOLED DIESEL ENGINES

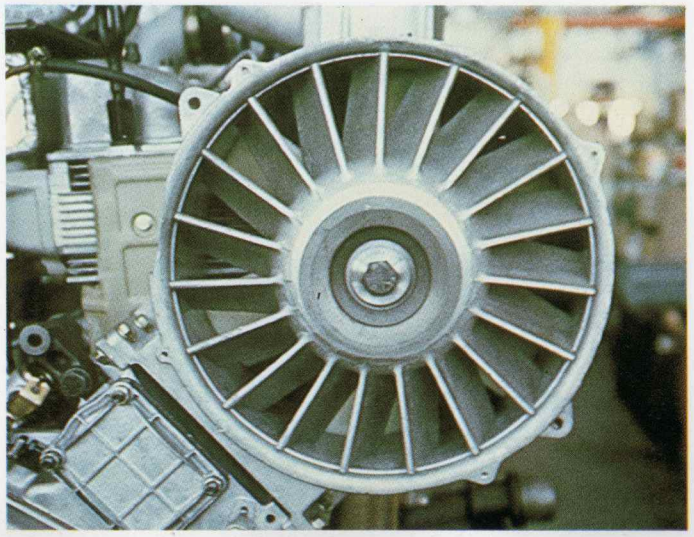
The engine is the heart of a tractor, and the SAME engines, specifically designed for agricultural use, have always been one of our strong points. Their design features have always acted as major reference points for other manufacturers as well.
Based on a process of analysis, research, field trials and totally original production, each of our engines is designed not simply as a unit in itself, but as an integral part of the tractor.

For all its engines, SAME has adopted:

▷ The DIESEL CYCLE (the first in the world for agricultural use),
thus continuing its own tradition which started in 1927.
The diesel engine is particularly suitable for agricultural applications, with their heavy load conditions, long operation periods, and consumption of fuel in direct proportion to the power produced.

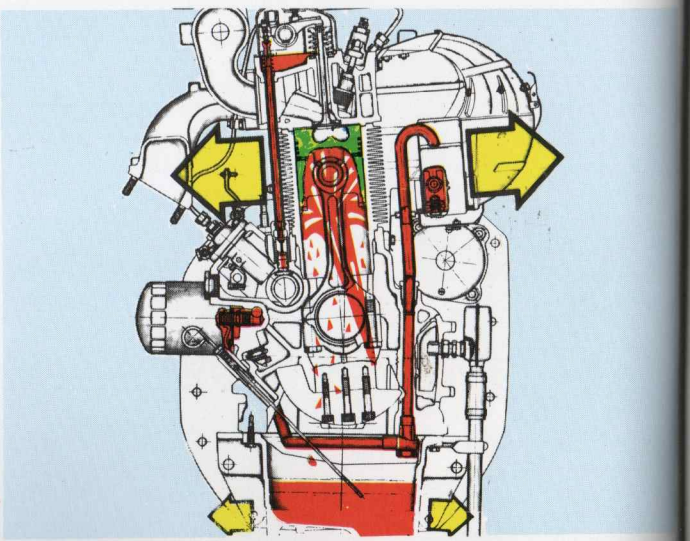


▷ AIR AND OIL COOLING
to increase the tractor's versatility all the year round and in all environmental conditions, and **to further reduce consumption.**
All the engines in the SAME range with outputs over 50 HP also incorporate an effective internal cooling system based on the lubricating oil.
The engine oil, after passing through an oil cooler, is sprayed on to each of the pistons, so as to provide direct cooling of its hot spots, which can be reached neither by air or cooling water. This gives higher engine output and longer engine life.
The 916.A series engines also make use of **mixed cylinder cooling,** the upper part being cooled by air, the lower part by oil passing through special ducts.



▷ STANDARDIZED COMPONENTS,
to simplify repairs, thus reducing downtime and repair costs, and simplifying the problem of keeping a stock of essential repair components.

▷ SIMPLIFIED MAINTENANCE
the use of air-cooling completely eliminates the problems and worries of water-cooling (boiling, freezing, corrosion, leaks, aging of rubber hoses, etc.) and requires only that the operator carry out extremely simple checks.

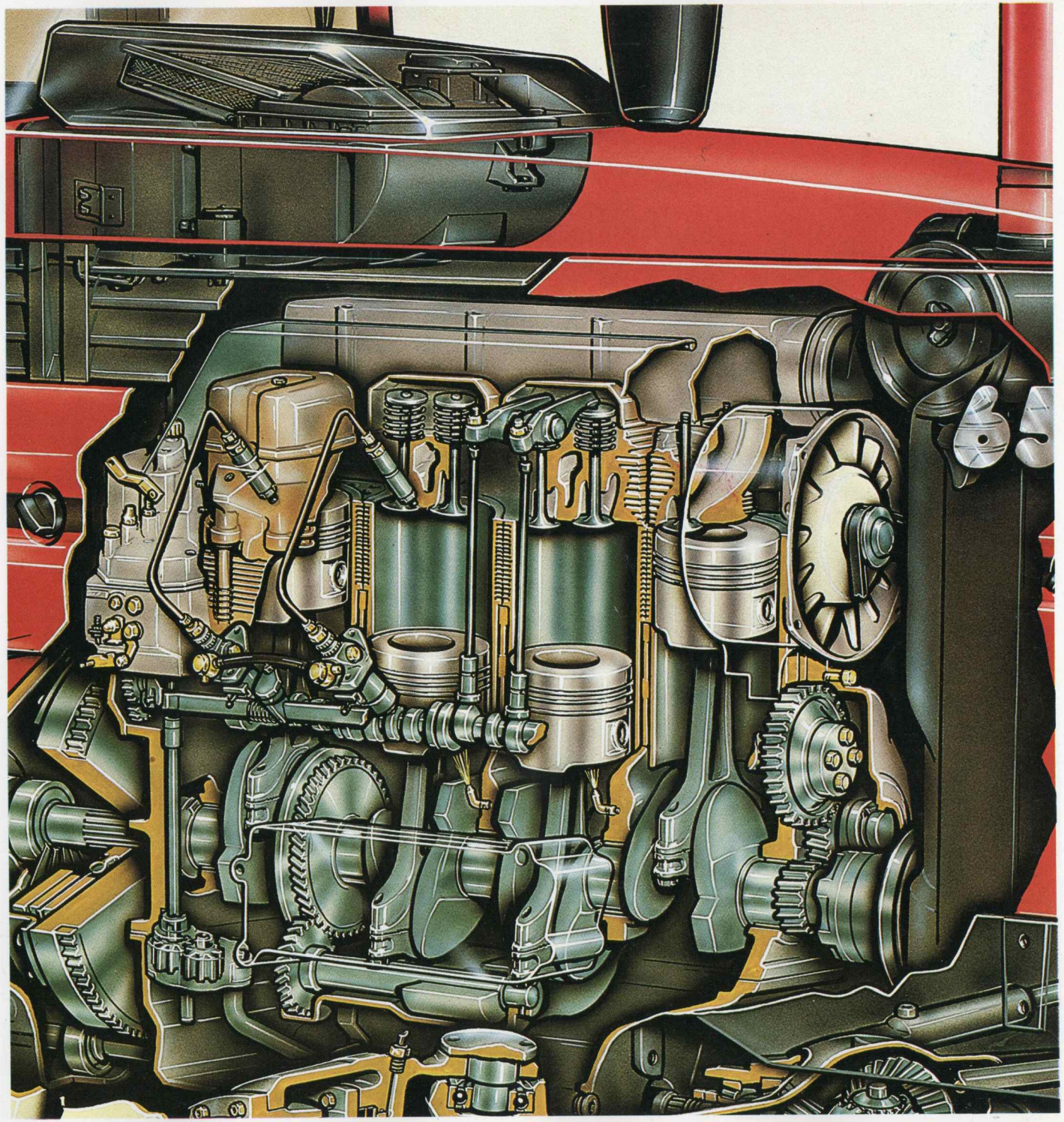


ENGINE RANGE

	HP DIN	Engine type	Specifications
Low range 35 ÷ 50 cv	35	982 L	1809 cm³ (98 × 120)
	45/50	983 L	2715 cm³ (98 × 120)
Medium range 50 ÷ 90 HP	55	1003 P	2827 cm³ (100 × 120)
	55	916.3 A	2750 cm³ (103 × 110)
	58/60	1053 P	3116 cm³ (105 × 120)
	65	916.4 A	3666 cm³ (103 × 110)
	68	1004 P	3770 cm³ (100 × 120)
	75/83	1054 P	4154 cm³ (105 × 120)
Medium-high range 90-150 HP	88	1054 PT	4154 cm³ (105 × 120)
	98	1055 P	5193 cm³ (105 × 120)
	105/110	1006 P	5655 cm³ (100 × 120)
	125	1056 P	6235 cm³ (105 × 120)
	145	1056 PS	6235 cm³ (105 × 120)
Top range over 160 HP	160/165	1056 PT (with inter-cooler)	6235 cm³ (105 × 120)

What does the farmer require from his engine?

1. HIGH POWER AT ALL ENGINE SPEEDS AND RAPID ACCELERATION AT LOW SPEEDS
2. HIGH OUTPUT AND OPERATING ECONOMY
3. IMMEDIATE STARTING AND RAPID AVAILABILITY OF THE POWER
4. HIGH DEGREE OF ADAPTABILITY TO ALL ENVIRONMENTAL CONDITIONS
5. LONG LIFE AND HIGH RELIABILITY
6. QUIET OPERATION, STURDINESS
7. SIMPLIFIED MAINTENANCE AND REPAIR

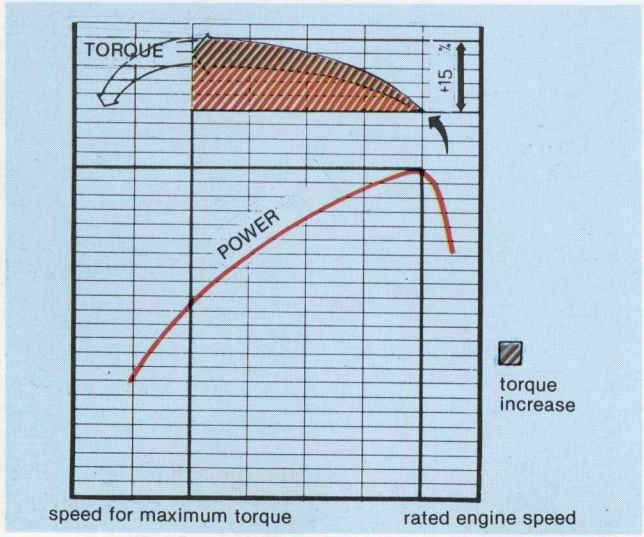


1. HIGH POWER AT ALL ENGINE SPEEDS AND RAPID ACCELERATION AT LOW SPEEDS

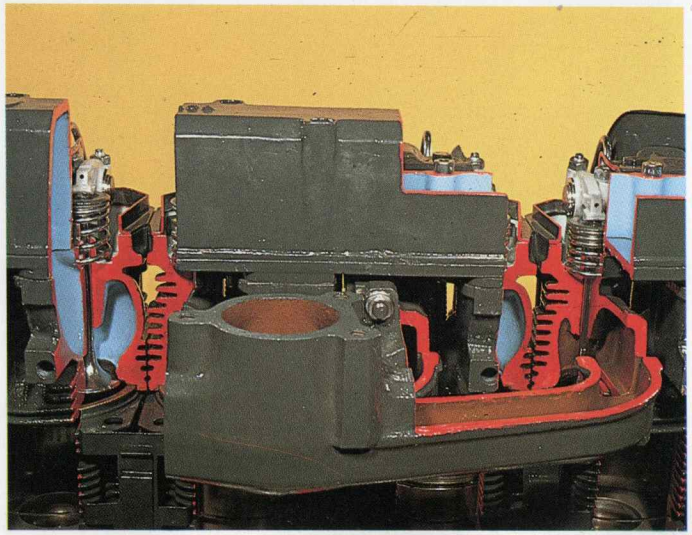
to make full use of the engine in all types of work under varying load conditions.
Outstanding engines with massive increase in torque and very low fuel consumption figures have been the result of precision design work on the air intakes, combustion chamber, valves, injection circuit and all the primary moving parts.

RAPID ACCELERATION, OR A LARGE RISE IN TORQUE, IS OBTAINED:

— by tuning the air intake so as to increase the delivery to each of the cylinders:
  ▷ large inlet manifolds;
  ▷ new inlet duct design, giving better mixing of the air with the diesel fuel, which results in lower consumption and reduced exhaust fumes;
  ▷ large-size dry air filters;
— the use of valve inserts in the cylinder heads, giving perfect seating and longer life;
— increasing the delivery of diesel fuel per cycle as engine speed drops under load, by means of a governor mounted on the injection pump control shaft.
This is an extremely important feature, allowing engine speed to remain constant under widely varying external loads.



Cylinder heads with high-turbulence inlet ducts.



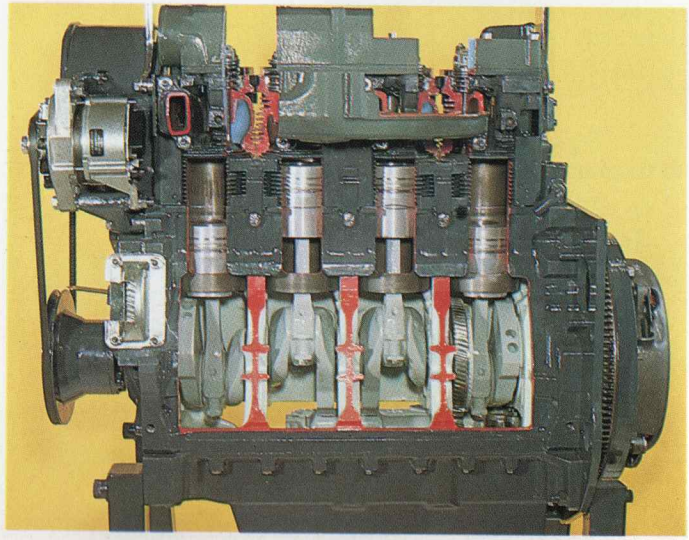
2. HIGH OUTPUT AND OPERATING ECONOMY

In other words conversion of a high percentage of thermal energy into useful mechanical energy. In concrete terms this means that the user is paying less for the power he obtains from his engine.

▷ **HIGH MECHANICAL OUTPUT**

Correct selection of operating specifications, perfect lubrication and a high degree of balancing of the major moving parts (pistons, connecting rods, crankshaft, flywheels) have all helped in minimizing power losses caused by friction in the moving parts.

Section of SAME 916.4 A 4-cylinder engine.



▷ HIGH THERMAL OUTPUT

Air-cooling allows the engine to operate at a mean cycle temperature higher than is possible with water-cooling. The French physicist CARNOT, one of the leading researchers into the engine cycle, showed that the higher the mean cycle temperature is, the higher the thermal output becomes.

The practical consequence is that in an air-cooled engine a higher percentage of the thermal energy developed by the combustion of the diesel fuel in converted into mechanical energy.

As a result, air-cooled engines give lower specific fuel consumption, the figures for the SAME engines being quite outstanding (160-175 grammes per HP per hour at maximum power).

Oil consumption is also kept particularly low, thanks to the provision of an oil-cooler, the use of a hypereutectic alloy for the pistons, special design of the piston rings and by a reduction in the clearance between the piston and the cylinder wall. This smaller clearance has been obtained by keeping the engine's internal temperature more constant, by means of direct cooling using the lubrication oil. Specific oil consumption of SAME engines generally varies between 0.3 and 0.5 grammes per HP per hour.

▷ HIGH INJECTION PERFORMANCE

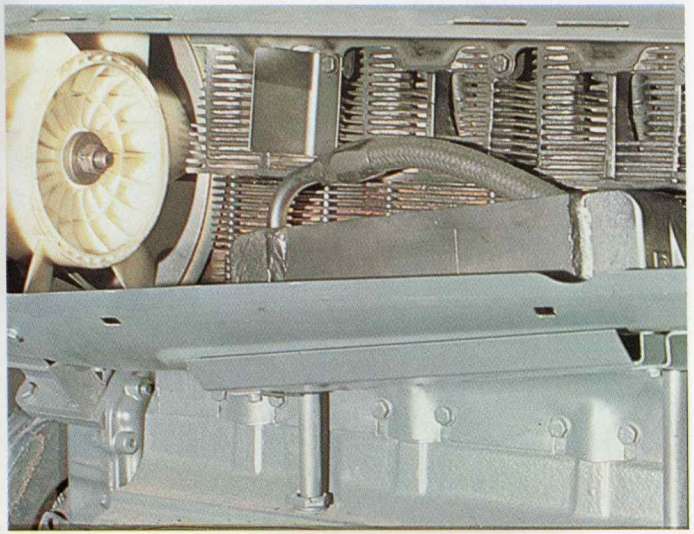
Obtained by:

immersed injection pumps driven directly off camshaft

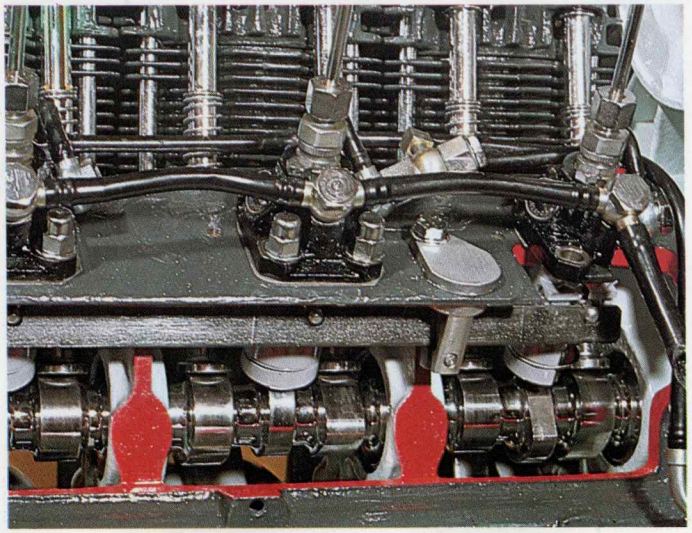
- higher injection speed at high engine speeds;
- considerable strength, since the pump is immersed in the crankcase;
- ease of timing.

The new 916.A series engines are fitted with separate pumps injecting to each individual cylinder. This has allowed further shortening of the pipes to the injectors, making them all the same length. This feature, together with a special valve to keep the pressure constant, eliminates injection irregularities, giving better fuel consumption.

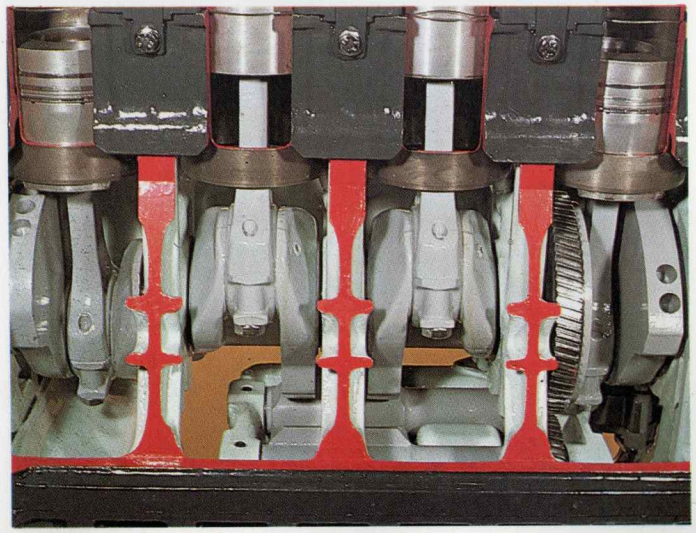
Engine oil-cooler.



Single-cylinder injection pumps used on the 916.A series engines.



Balance gears on the 4-cylinders engines.

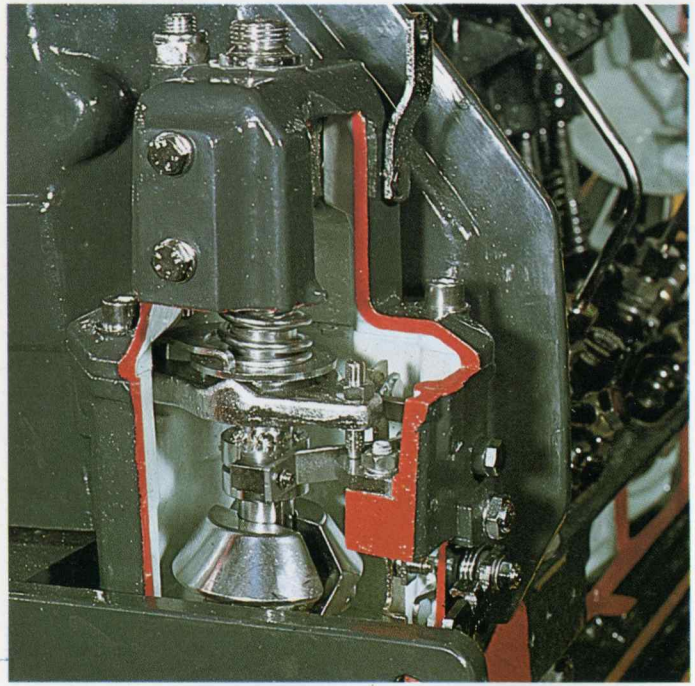


3. IMMEDIATE STARTING AND RAPID AVAILABILITY OF THE POWER,
even at very low ambient temperatures, so that the tractor can be put to work immediately.

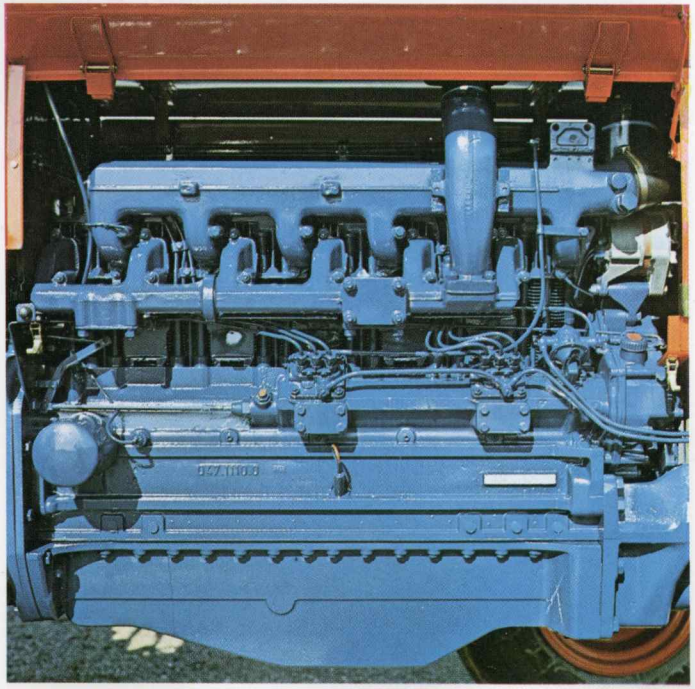
- ▷ Ensure high engine speed during the cold starting phase, high-capacity starters and batteries.
- ▷ Direct injection.
- ▷ Increase in injection pump delivery by means of an excess fuel device, for cold starting. In addition, injection is automatically retarted in engine cold conditions to give immediate starting.

For extremely severe climatic conditions (below —10°C/15°F), the engines are fitted with pre-heaters (glow plug positioned in the inlet manifold) and provision is made for the addition of an electric sump heater.

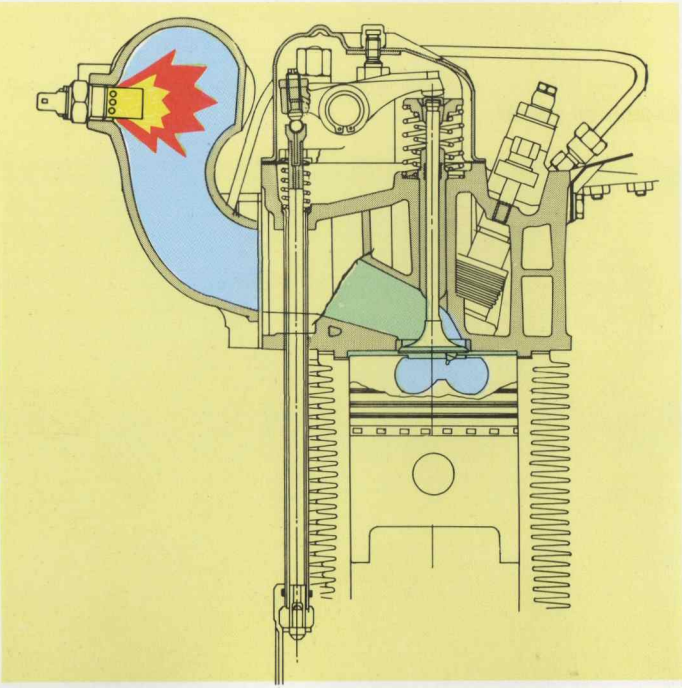
Vertical-shaft mechanical governor, an original SAME design, on the 916.A series engines.



Injection pumps for P series engines.



Glow plug.



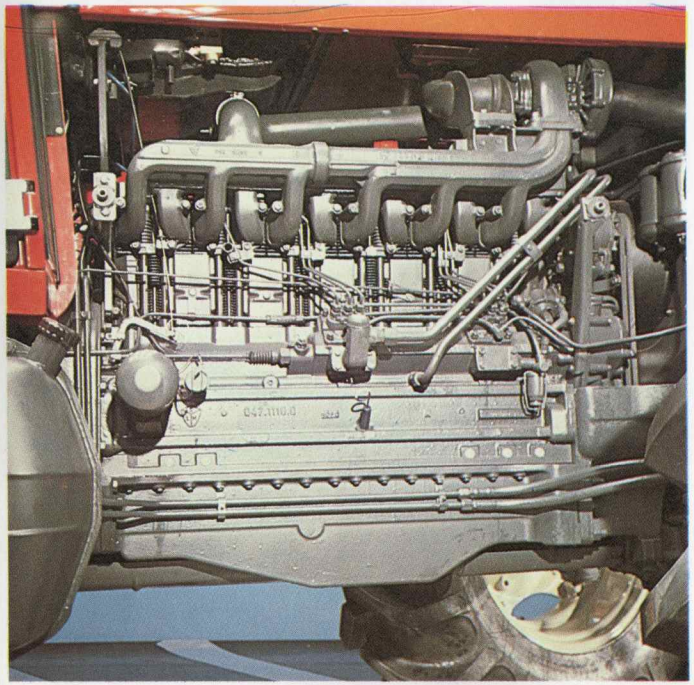
TURBOCHARGING

In order to obtain very high power levels without recourse to excessively large engines, SAME incorporates turbocharging, using an exhaust gas driven turbocharger. To ensure long life, the turbo unit is directly lubricated by cooled and filtered oil from the sump.
Driven by the engine exhaust gases, it injects compressed air into the cylinders thus increasing the quantity of air blown into the cylinders and making it possible to inject more diesel fuel, thus obtaining greater power outputs from a given engine displacement.

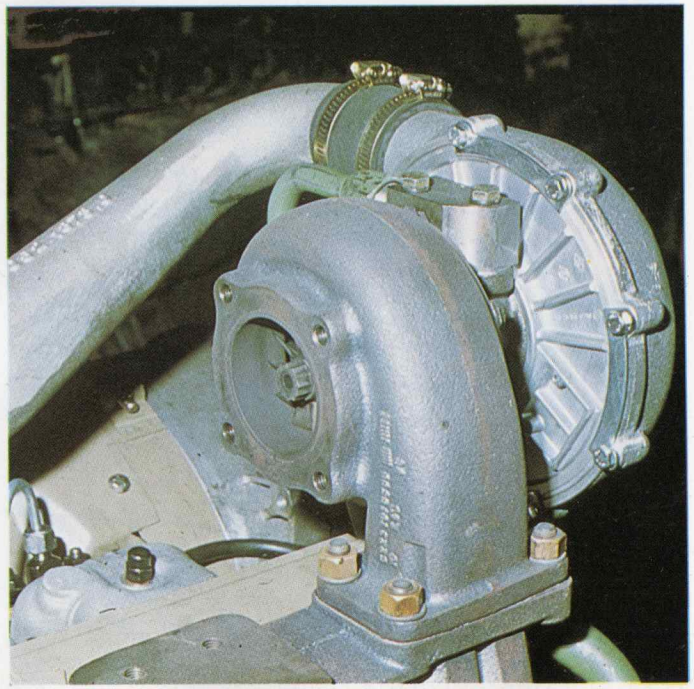
Turbocharging gives:
— lower specific fuel consumption than with the normally-aspirated engine, and thus lower costs per horsepower;
— constant engine output at varying altitudes;
— greater compactness than a normally-aspirated engine producing the same output;
— a more acceptable noise level.

Some engines are fitted with an air to air **intercooler,** positioned between the blower and the inlet manifold, which cools the air after compression by the turbine, giving the following advantages:
— higher power;
— reduced exhaust smoke and less pollution;
— reduced noise-levels and less wear.

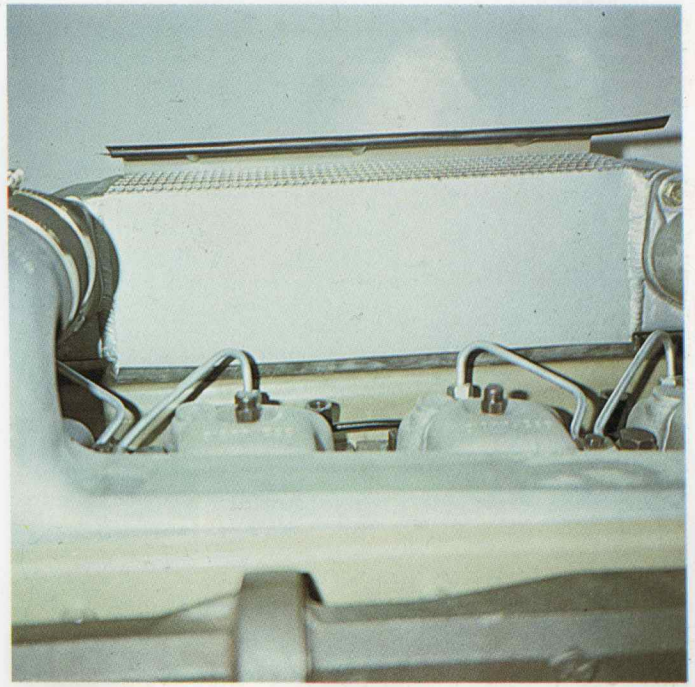
Turbocharged 6-cylinder engine.



Turbocharger.



Air to air intercooler.



4. HIGH DEGREE OF ADAPTABILITY TO ALL ENVIRONMENTAL CONDITIONS

This important feature of the SAME engines is due to the use of air-cooling, which allows them to be used even in extremely difficult ambient conditions (outside temperatures below —10°C/15°F or above 40°C/10/105°F), since air, unlike water, neither freezes nor boils.

It is very interesting to compare the traditional water-cooled engine with the engine directly cooled by air.

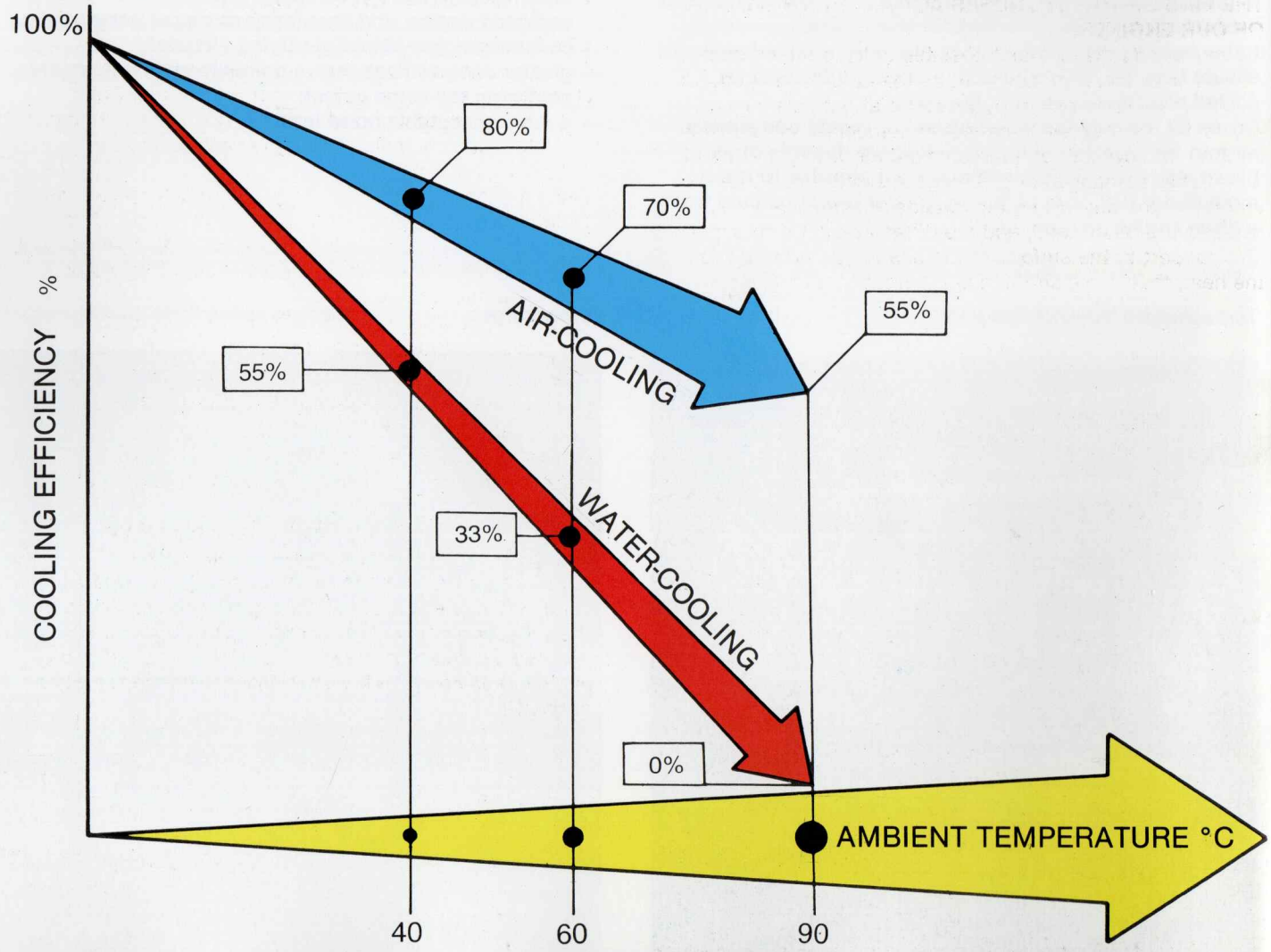
In both systems, of course, the ultimate coolant is the air, as in the water-cooled engine the only function of the water is to transfer the heat from the engine to the radiator.

However, both systems use the air as the coolant, acting on:

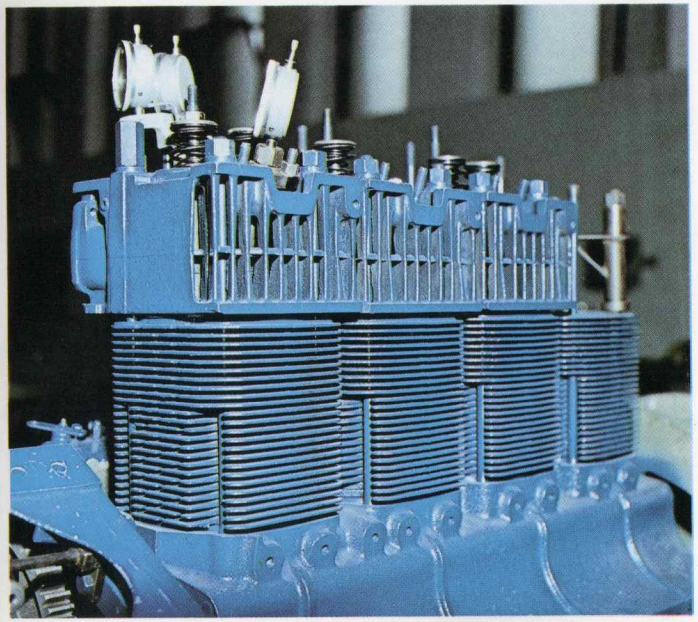
- ▷ **the ENGINE,** directly (air-cooled engine). Maximum temperature possible for cylinders and cylinder heads around 200°C (425°F);
- ▷ **the RADIATOR** (normal water-cooling) Maximum possible temperature around 90°C (195°F).

Starting from an ambient temperature of 0°C (32°F), as the ambient temperature increases the difference in temperature between the hot engine and the coolant, namely the air, which is a directly proportional measure of the cooling efficiency, drops less in percentage terms in the air-cooled engine than in the water-cooled one.

COOLING EFFICIENCY WITH CHANGING OF AMBIENT TEMPERATURE



THE FINS OF THE CYLINDERS ACT AS THE THERMOSTAT OF OUR ENGINES,
in other words they make it possible to keep the engine's operating temperature constant as the outside temperature varies. There is no risk of over-cooling at extremely low ambient temperatures, because the temperature difference between the cylinder and the ambient air is very great and the heat is exchanged only through a small part of the surface of the fins. When the outside temperature is very high, on the other hand, and the difference is much smaller, a major part of the surface of the fins is utilized to dispel the heat, thus avoiding the danger of overheating.



5. LONG LIFE AND HIGH RELIABILITY

LONG LIFE

One of the main causes of wear in an engine is the corrosive affect of the acids (mainly sulphuric) which form during combustion of diesel fuel and then condense on to the internal walls of the cylinders, during the engine's warm-up phase.
Since air-cooling allows the engine to reach operating temperature rapidly (the internal walls are hotter than 100°C/212°F in a few seconds), the dangers arising out of the formation of such acids are practically eliminated, giving increased engine life.
A further guarantee of engine life is given by **perfect lubrication** of all moving parts:

- large dry-type air filter, with integral pre-filter and automatic dust dump to ensure greater filtration efficiency (not lower than 99.95%);
- high-delivery lobe oil pump;
- over-dimensioned oil-cooler to keep the oil at its ideal lubricating temperature.

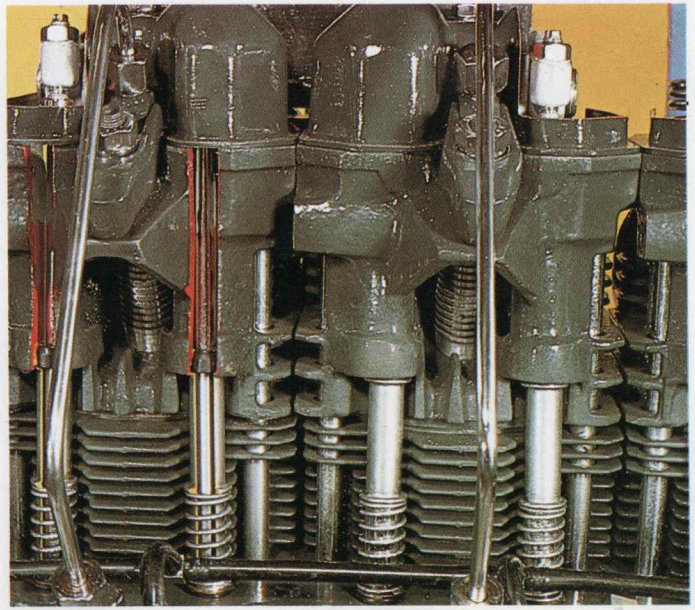
On the 916.A. series engines, lubrication is of the **«integral»** type, with provision for a thermostat. The lubricating oil to all parts of the engine (crankshaft, camshaft, rockers, etc.) runs along oilways machined in the cylinder block and the rocker shafts. Lubrication pipes as such are not used, either inside or outside the engine, thus completely eliminating the danger of leaks or breaks.

HIGH RELIABILITY

This important feature has been obtained:

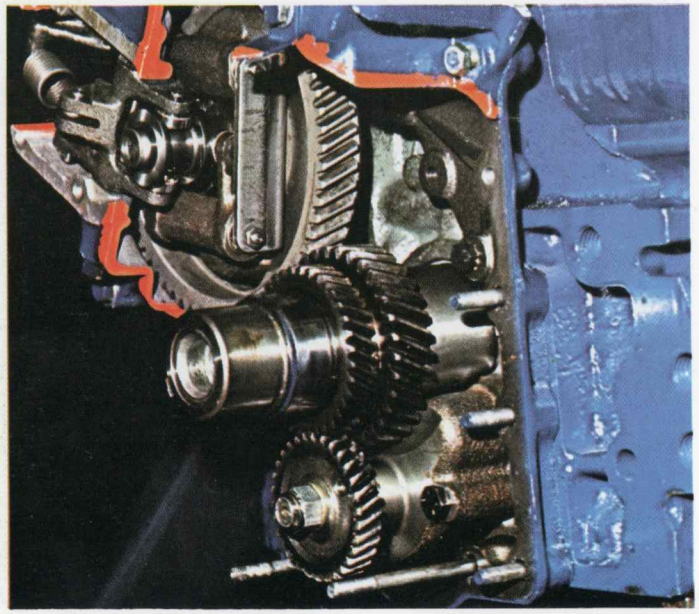
- by designing all the components of the engine to generous dimensions;
- by the use of top-quality materials;
- by scrupulous balancing of all the major moving components. Contra-rotating masses (balance gears) are incorporated in the 4-cylinder engines in order also to reduce second-order vibrations;
- by the use of hypereutectic alloy pistons and aluminium cylinder heads (on turbocharged engines) for more efficient heat dissipation, which reduces the degree of play caused by variations in temperature.

Integral cylinder head lubrication system.



6. STURDINESS AND QUIET OPERATION

— Helical-toothed timing gears;
— large sized cooling fans for slower rotation;
— fan assembly with rear stator (on the 916.A series engines) for a further reduction in noise and better distribution of cooling air along the cowling;
— special alloy pistons to reduce clearance;
— strengthening ribs on the engine block to reduce vibrations;
— lubrication of the cylinder heads via oilways machined in the rocker shafts, eliminating direct metal-to-metal contact between the various components.



7. SIMPLIFIED MAINTENANCE AND REPAIR

▷ **MODULAR CONSTRUCTION:** the SAME engines with more than one cylinder are the total of a number of single-cylinder engines. This particularly facilitates repairs, a large proportion of which can be carried out in the field. It also makes it possible to work separately on each module, changing only the one which is worn out.

▷ **STANDARDIZATION OF COMPONENTS:** more than **80%** of the components in the entire SAME range of engines are completely interchangeable. This considerably simplifies stock control, reduces inventory costs on spare parts and guarantees the tractor a long working life.

▷ **SIMPLE AND VERY ECONOMICAL MAINTENANCE:** the use of air-cooling completely eliminates the problems associated with water-cooling (boiling, freezing, corrosion, leaks, aging of rubber hoses, etc.) and merely requires that the operator carry out some very simple checks.

ACCESSIBILITY

The side panels can be easily removed, giving ready access to all the components of the engine needing maintenance. The oil filter, of a design used in cars, fits directly on the engine block.
Topping-up also is easy and quick.

EASY AND QUICK MAINTENANCE

The fins of the cylinder heads and cylinders need cleaning only at very long intervals, because the grill completely clears the cooling air of leaves, straw and any other foreign bodies which might otherwise obstruct the fins.

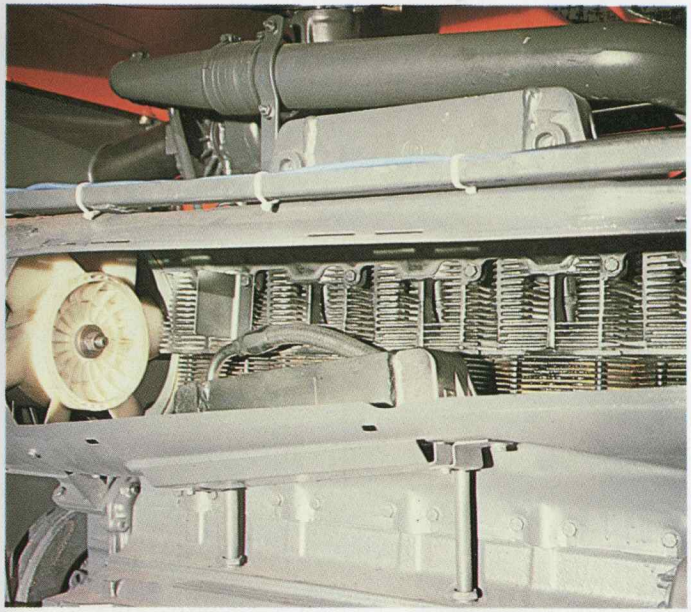
The inspection hatch on the air cowling and the rear baffles, which are readily removable, make this an easy and quick operation.

Thanks to these precautions, it has been found unnecessary to fit overheating warning devices to the engines.

The dry-type air filter is also well positioned for ease or removal.

A warning light, clearly visible on the dashboard, tells the operator when the filter is clogged.

The batteries are also readily accessible, for quick checking and topping-up.



CLUTCHES

The **clutches** are used to drive to the gearbox and to the P.T.O. the engine torque available at the flywheel.

What does the farmer need?

1. EASY AND SMOOTH OPERATION
2. HIGH PERFORMANCE AND LONG LIFE

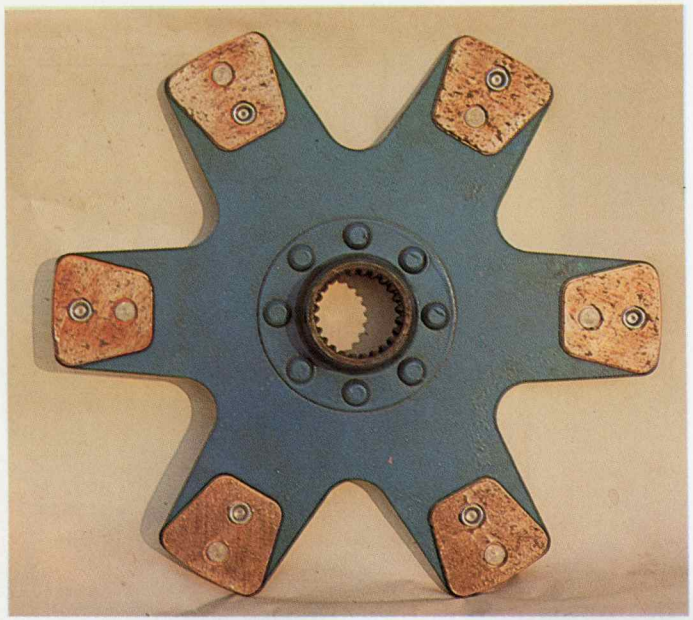
1. EASY AND SMOOTH OPERATION

The SAME design takes one of two different forms:

▷ **SEPARATE CLUTCHES, WITH SERVO-OPERATED P.T.O.**

— single dry plate for the gearbox

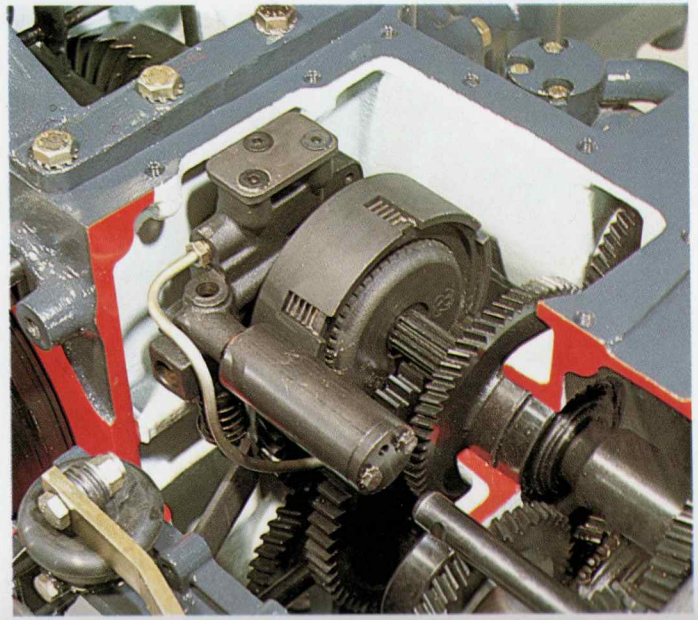
Sintered clutch plate.



— multi-plate oil-bath clutch **with hydraulic servo controls for the P.T.O.**

This is the best technical design currently available on the market, combining a high degree of reliability (avoiding wear, overheating and slip) with the advantage of completely independent operation of the transmission clutch, together with smooth and progressive take-up, which in turn gives better protection to the components of whatever equipment is being driven off the P.T.O. Nor is the operator required to exert any force at all. The higher cost of this design is fully offset by the advantages offered if the tractor is to be frequently used for P.T.O. work.

P.T.O. clutch with hydraulic servo controls.



▷ **DOUBLE CLUTCH WITH SEPARATE CONTROLS**

2 dry plates, operated by pedal for the transmission clutch and by a hand-lever for the P.T.O. This is a simple design, highly reliable and with the advantage of a greater economy.

The accurately designed linkages facilitate gentle and smooth engaging and disengaging, with a minimum of effort on the part of the operator.

On some models, the transmission clutch is hydrostatically operated, eliminating adjustment and giving long operation life.

2. HIGH PERFORMANCE AND LONG LIFE

To make full use of the power at the flywheel, without any clutch slip even under the hardest working conditions.

- **GENEROUS DIMENSIONS**
  The friction surfaces are large enough to give a long working life and to provide progressive and sure engagement even under heavy engine load conditions. For each power class (with increments virtually every 10 HP) SAME has specified a particular clutch plate diameter.
- **CORRECT CHOICE OF MATERIAL**
  — Friction surfaces in an organic asbestos-fibre-based material with metal insert to assist heat dispersion.
  — Sintered friction plates with a high coefficient of friction, optimum resistance to wear and excellent heat dispersal for the high-powered tractors.
- **PERFECT BALANCING**
  All clutch assemblies undergo dynamic balancing which completely eliminates vibration at any engine speed.

TRANSMISSIONS

The function of the **transmission** is to transfer the power of the engine:

— **to the wheels** (MOTIVE POWER), to transform it into tractive force;
— **to the power take-off** (WORKING POWER), to drive other implements.

THE GEARBOX

The gearbox allows the tractor to operate at different speeds, depending on the type of work to be performed.

The farmer needs:

- ▷ to be able to carry out all the types of work on his farm, from heavy jobs such as preparation of the ground to light tasks such as transportation, soil dressing, etc.;
- ▷ to have at his disposal a range of speeds guaranteeing maximum working output for any type of job;
- ▷ to be able to change gear easily and quickly;
- ▷ to be able to count on perfect efficiency and long operating life.

THE SAME GEARBOX ...IS MECHANICAL

Among the various designs available, this one is still «the most agricultural», in other words the most suited to use in agricultural operations, offering as it does the best reliability and the highest performance, and for all practical purposes requiring no maintenance.
On the higher-powered models intended for work imposing severe strains on the transmission, the gearbox oil passes through a special oil-cooler.

...IS EXTREMELY STURDY...

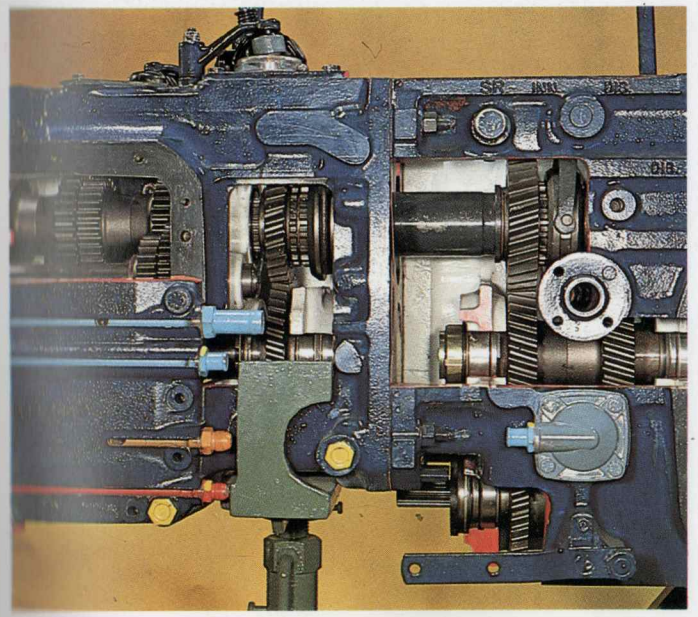
— Helical-toothed gears, transmission shafts, crown wheel and pinion, half-shafts — all in case-hardened and tempered alloy steel — are all generously proportioned to last throughout the life of the tractor, even under the most severe operating conditions.

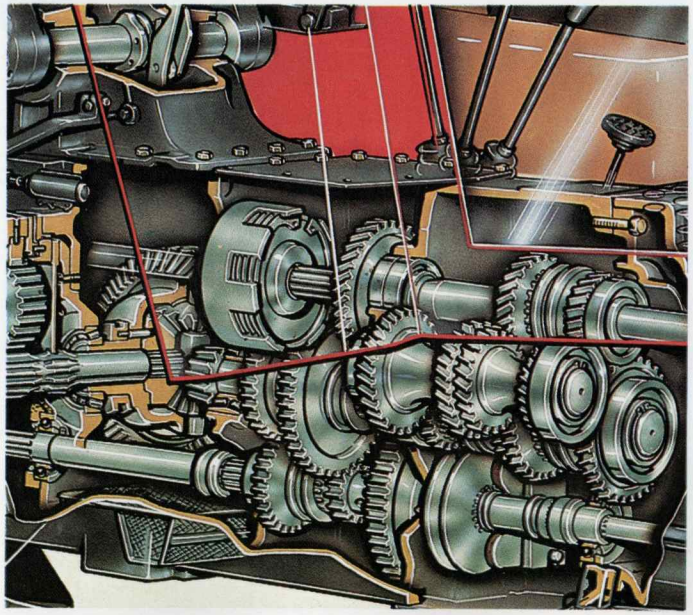
— The differential is fitted with a lock which can be engaged to provide equal tractive force to both rear wheels in the event that one of them slips. This lock disengages automatically as soon as working conditions return to normal.

— Most of the models are fitted with epicyclic final reduction units. The load is distributed on to three teeth (one to each planet), and on to a sun gear, in line with traditional design, which has the effect of increasing the working life of the bearings and the half-shafts.

...HAS A WIDE SPEED RANGE...

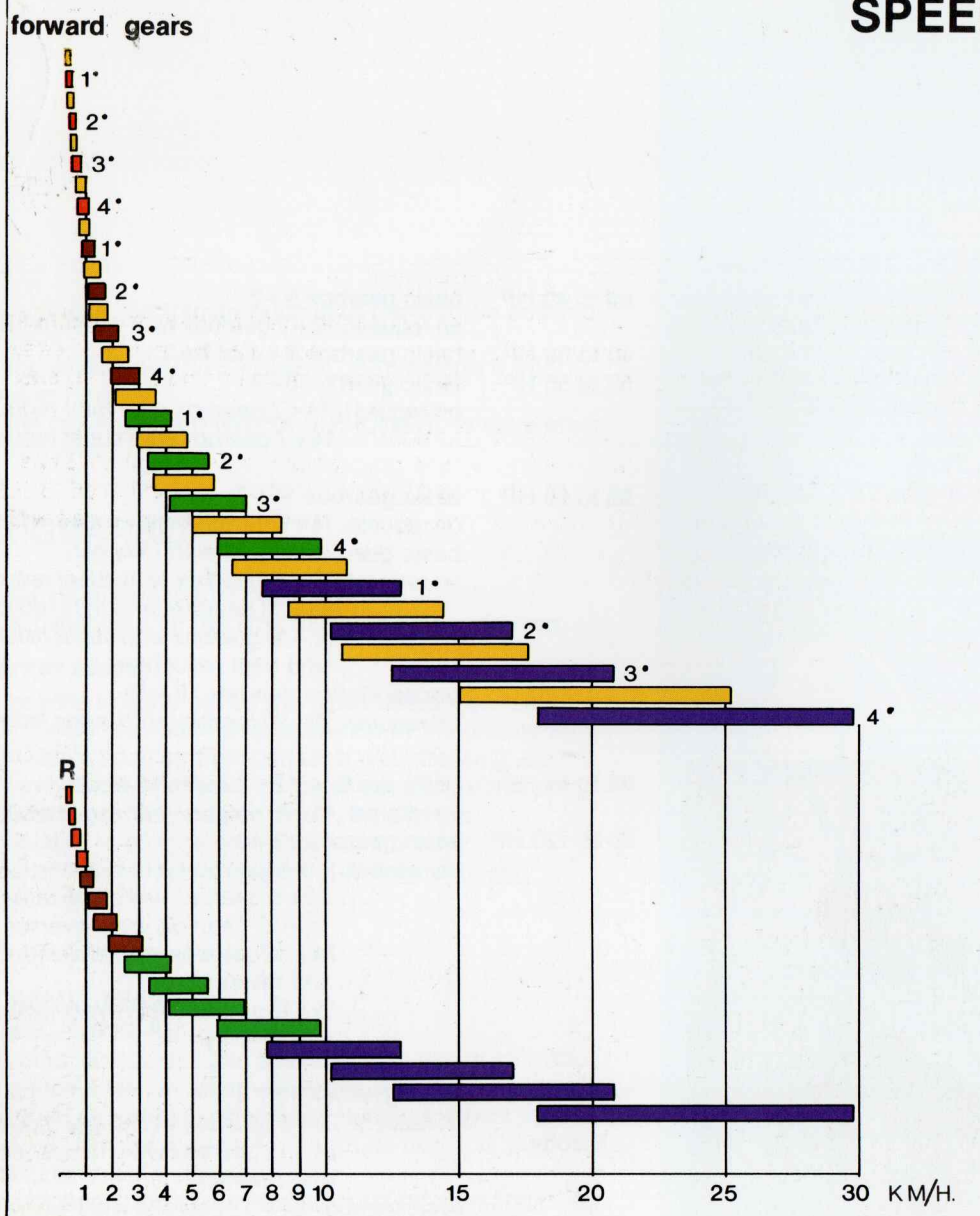
The SAME gearbox, designed in each case for a specific power output, has an adequate range of standard gears and numerous optional ones for use in special applications.





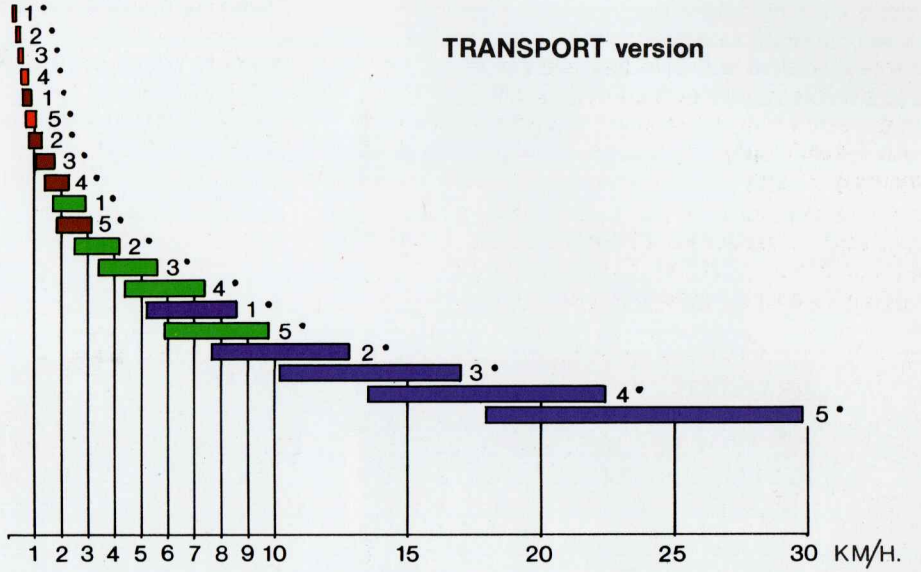
up to 40 HP	basic gearbox 6+2 on request, 12+2 gearbox with super reduction
40 to 50 HP	basic gearbox 8+4 or 9+3
50 to 55 HP	basic gearbox 8+4 on request, 14+7 gearbox with mini reduction 14+7 gearbox with super reduction
55 to 65 HP	basic gearbox 14+7 on request, 14+7 gearbox with super reduction basic gearbox 12+12 with reverser on request, 16+16 gearbox with super reduction 24+12 gearbox with mini reduction 32+16 gearbox with super reduction and mini reduction transportation gearbox 15+15 on request, 20+20 gearbox with super reduction
65 to 85 HP	basic gearbox 12+12 with reverser on request, 16+16 gearbox with super reduction
85 to 120 HP	basic gearbox 12+3 on request, 20+5 gearbox with super reduction 24+6 gearbox with mini reduction 12+12 gearbox with reverser 24+12 gearbox with mini reduction and reverser 16+12 gearbox with super reduction and reverser
120 to 145 HP	basic gearbox 12+3 on request, 20+5 gearbox with super reduction 24+12 gearbox with mini reduction and reverser basic gearbox 24+12 gearbox with mini reduction and reverser on request, 16+12 gearbox with super reduction and reverser
over 145 HP	basic gearbox 12+4 on request, 24+8 gearbox with super reduction

MEDIUM RANGE SPEED GRAPH



forward and reverse gears

TRANSPORT version



MINI-REDUCED SPEEDS

SUPER-REDUCED

SLOW

NORMAL

FAST

...SUITS ALL TYPES OF WORK

The correct «speed range» is available for each type of application, using a box with 3, 4 or 5 gears depending on the model.

▷ **SUPER-REDUCED GEARS**
For special P.T.O. work requiring extremely low speeds but high engine speeds (ditching, transplanting, harvesting, etc.) the lower gears can be augmented by a set of creep gears giving a speed range between 0.35 and 1.5 km/h (0.21 ÷ 0.93 mph).

▷ **MINI-REDUCED GEARS**
Available on some models at the top of the range it doubles the speeds, reduces the intervals between the gears and thus enables full use to be made of the tractor's power in special agricultural applications.

▷ **REVERSER GEAR**
To speed up the empty returns when working on slopes and to make more convenient and rapid the tractor's various trips around the farm when loading and storing crops, silage-making, cleaning, distributing fodder, levelling, etc.

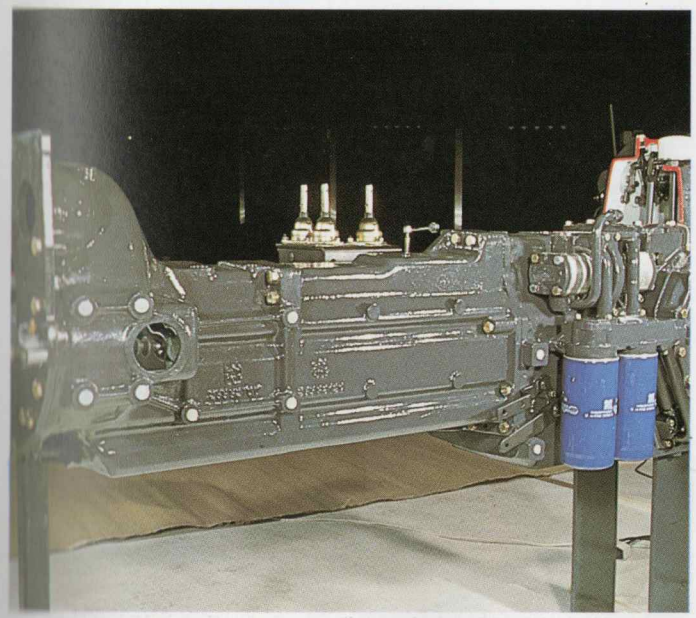
▷ **MAXIMUM SPEED 30 KM/H (18.6 m.p.h)**
Standard on all models above 50 HP, to meet the needs for long trips and quick transportation. On the 4-WD version of some models a speed of 40 km/h (24.9 m.p.h.) is available on request.

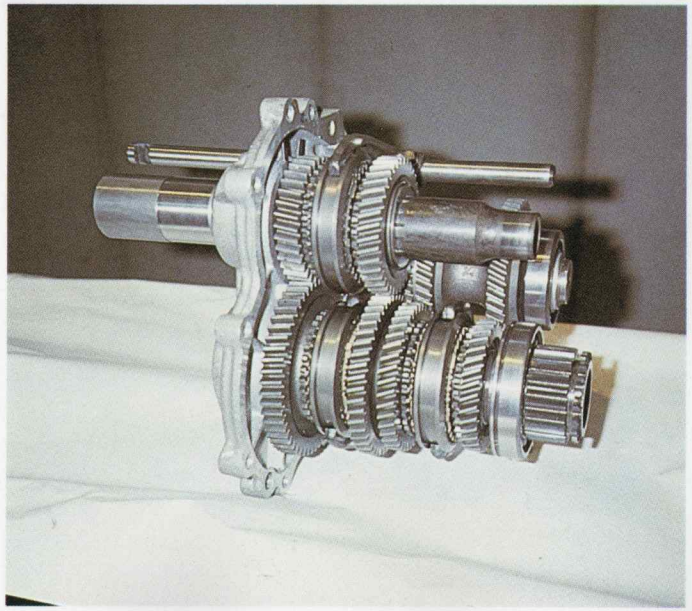
...IT'S EASY TO USE

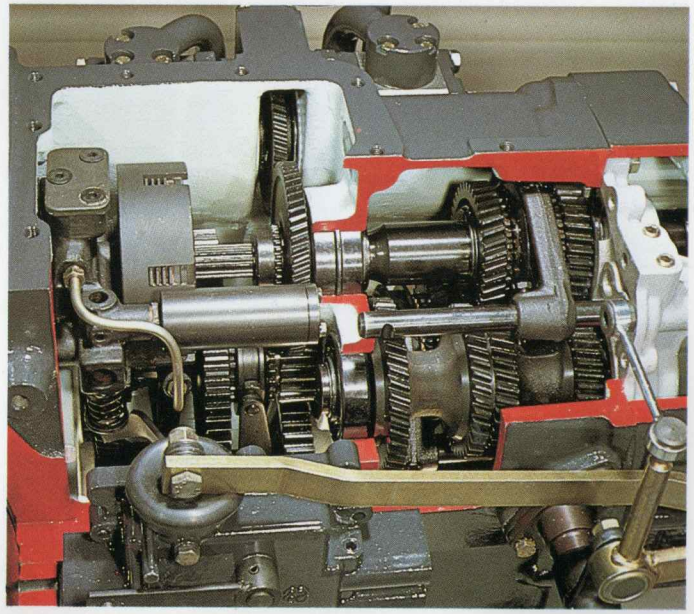
SYNCHROMESH GEARBOX on all models above 50 HP, for increased operator comfort and to allow rapid and easy gearchanging, particularly when travelling on the roads.

...IT'S SAFE TO USE

In line with its particular concern for safety, SAME has equipped its models with an isolator switch linked to the gear-lever, preventing the engine from being started with a gear engaged.



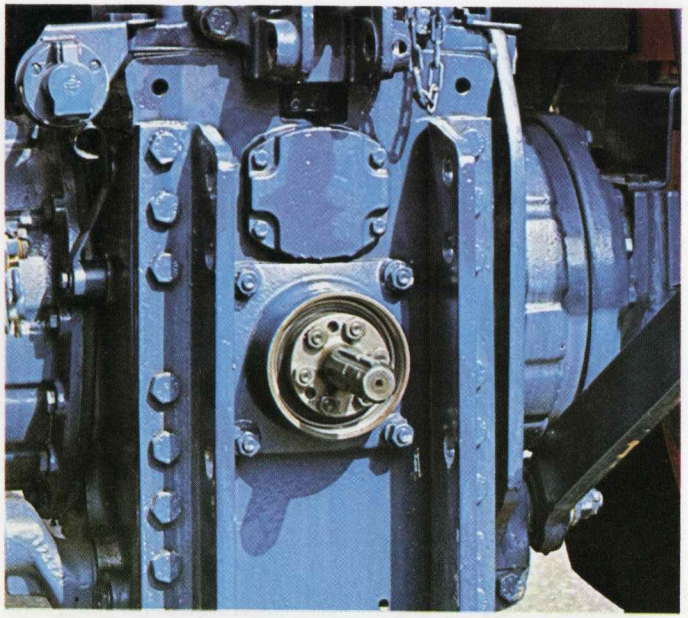




THE POWER TAKE-OFF

The function of this assembly is extremely important, because during a good portion of its working hours the tractor makes use of the P.T.O. to drive external machinery such as grinders, cutters, rotary harrows, spreaders, pumps or balers.
The types of P.T.O. generally used today are:

- **P.T.O. SYNCHRONIZED WITH ENGINE SPEED:** the P.T.O.'s speed of rotation is proportional to engine speed.
  — 540 rpm for equipment absorbing low or medium power levels;
  — 1000 rpm for equipment absorbing high power levels.



- **P.T.O. SYNCHRONIZERD WITH THE REAR WHEELS:** for each metre of travel the P.T.O. completes a given number of revolutions, regardless of the gear selected. This mode is common when pulling equipment with driven axles. On some models, the independent shaft of this type P.T.O. allows both power take-offs to be used simultaneously.

What does the farmer need?

▷ a P.T.O. suitable to the type of work the tractor will be doing;
▷ full exploitation of the power of the engine;
▷ easy link-up with the implements.

The SAME P.T.O.

...IS SUITABLE FOR THE TYPE OF WORK THE TRACTOR WILL BE DOING...

- **up to 50 HP**
  540 rpm P.T.O.
  syncronized P.T.O.
- **50 to 60 HP**
  540 rpm P.T.O.
  1000 rpm P.T.O. (on request)
  syncronized P.T.O.
- **55 to 65 HP**
  540 rpm P.T.O.
  1000 rpm P.T.O.
  synchronized P.T.O. (on request)
- **60 to 110 HP**
  540 rpm P.T.O.
  1000 rpm P.T.O.
  synchronized P.T.O. (on request)
- **above 110 HP**
  540 rpm P.T.O.
  1000 rpm P.T.O.

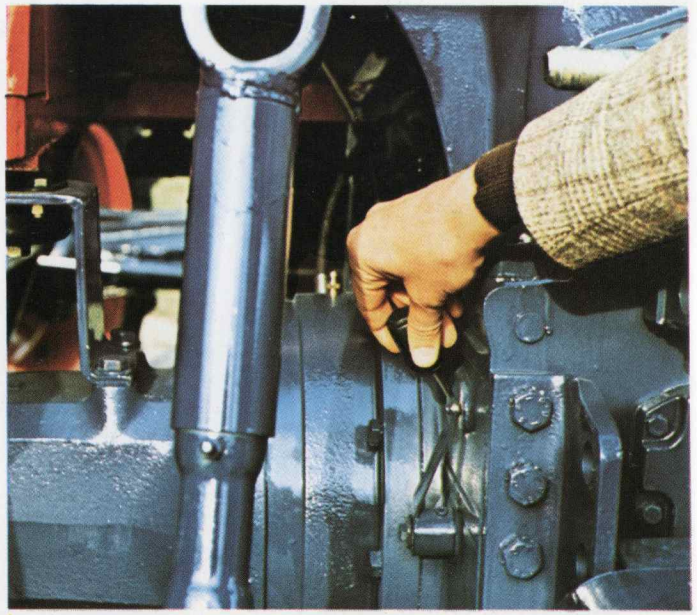
...OFFERS HIGH WORKING OUTPUT

The standard speeds of 540 or 1000 revolutions are obtained with the engine running within 85-90% of maximum power. This allows the operator to make the best use of the power of the engine and gives him a considerable reserve of torque.

...CAN BE LINKED UP EASILY

- On all models the output shaft turns freely once the clutch is disengaged.
- The models equipped with a speed selector lever (540 or 1000 rpm) also have a neutral position.

In either case, linking up to the implement's shaft is extremely easy.



THE BRAKES

The function of the brakes is to guarantee complete safety for the tractor in use and at the same time to improve its manoeuvrability by reducing the turning circle. Both of these features are particularly important nowadays, because tractors are often used for transportation and for pulling trailers, sometimes in mountainous areas.

What does the farmer require?

▷ HIGH EFFICIENCY AND LONG LIFE
▷ EASY AND SMOOTH OPERATION

HIGH EFFICIENCY AND LONG LIFE WITH OIL-BATH DISC BRAKES

The discs are fitted on the rear half-shafts, just before of the final reduction units. Their generous size and the specifications of the materials used guarantee:

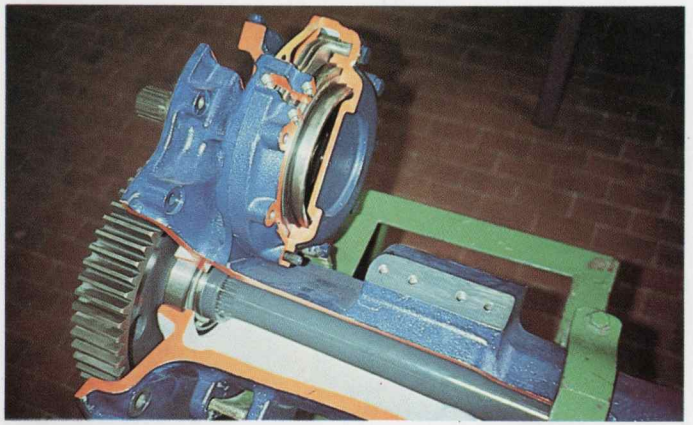
- ▷ **sure stopping** power;
- ▷ **long life,** since even when acting on fast-rotating shafts they require only low braking torques;
- ▷ **perfect protection** against mud and dirt;
- ▷ **no maintenance;**
- ▷ **no wear or overheating.**

On some models the oil-bath disc brakes are fitted with oil-cooling to eliminate completely any risk of overheating, even under the hardest working conditions.

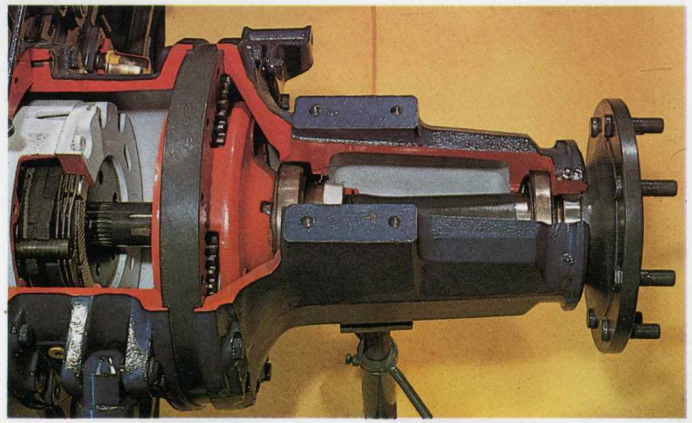
The parking brake is operated by a separate hand lever and ensures that the tractor is held stationary even on steep slopes. In accordance with EEC standards for models up to 50 HP, it acts on the service brakes.

To give greater safety and in the interests of conformity with the strictest worldwide, on the models from 55 to 145 HP, the parking brake (oil-bath multiple discs brake) is completely independent of the service brakes.

Oil-bath disc brakes with oil-cooling.



On the high-powered models, the cooling oil itself passes through an oil-cooler.



EASY AND SMOOTH OPERATION

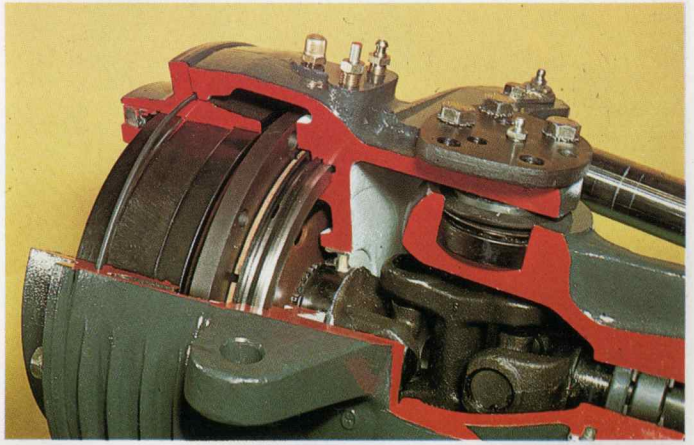
On all models which can be used to tow trailers on the road (medium and high range) two types of braking system are available, with type approval in accordance with the regulations of the various countries:

- ▷ **hydraulic braking,** making use of oil under pressure in the servo-unit steering circuit;
- ▷ **combined hydraulic and air braking,** using a compressor mounted directly on the timing case.

On the models of more than 55 HP, the brakes are operated hydrostatically rather than mechanically, making them lighter to use. In this system, the function of levers and rods is fulfilled by oil under pressure, thus eliminating virtually all play and therefore any need for adjustment.

Quick, easy and safe braking is also helped by the use of pedals of the suspended type, which are fitted with an anti- slip surface and located well clear of any other controls which might interfere with braking.

Oil-bath disc brakes on front wheels (on a 4WD tractor).




SAME hercules 160
SAME
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FOUR-WHEEL-DRIVE

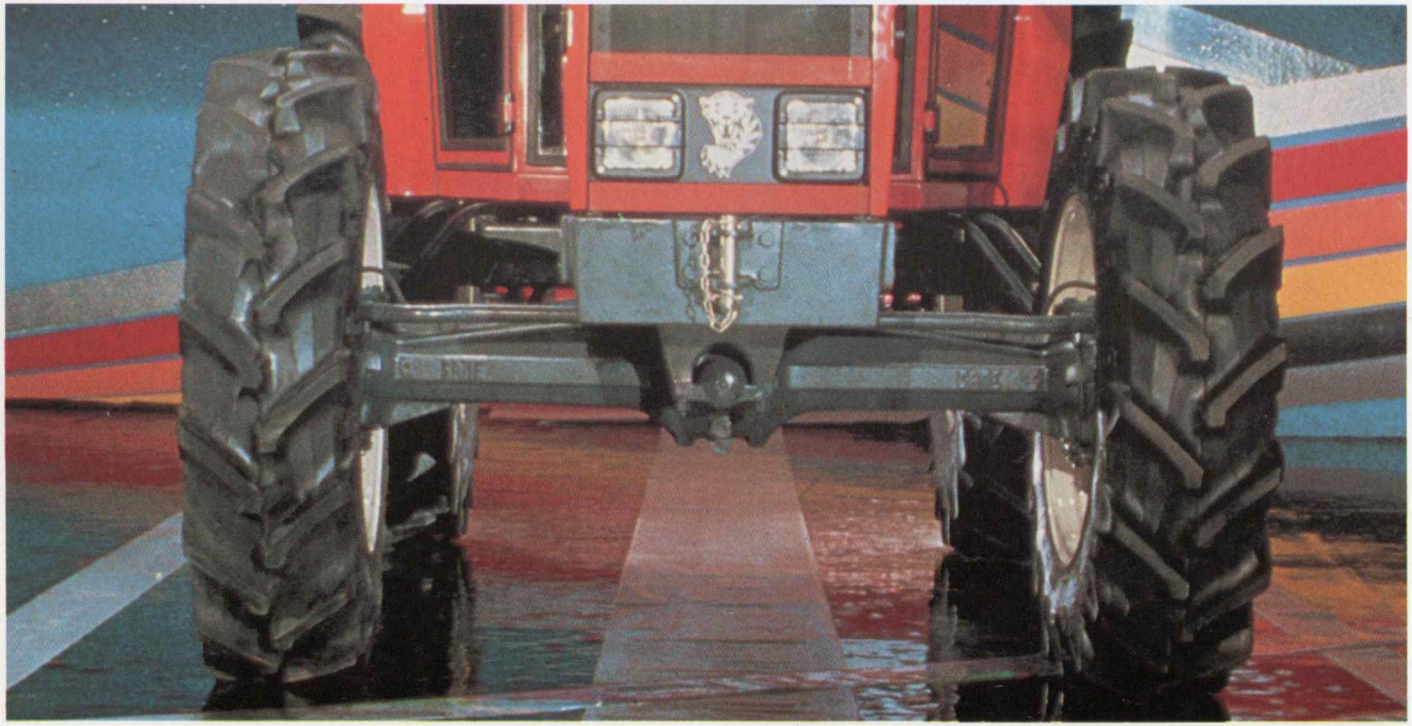
FOUR-WHEEL-DRIVE

Together with the air-cooled engine, the four-wheel-drive makes up one of the key features of SAME's rich tradition. The function of a driven front axle, in strictly technical terms, is on the one hand to improve the performance of the tractor under normal working conditions, by ensuring better adherence to the ground and less slip, and on the other to allow the use of a wheeled tractor in extreme working conditions: clay soils, wet, sandy or extremely sticky ground, and steep slopes. Ing. Cassani foresaw these requirements for agricultur as far back as 1928, and since then SAME has led the field worldwide in the development of the concept of all-wheel drive for a modern tractor.

The most significant achievements in this area are:
— an advanced technical design which is increasingly copied wherever agricultural tractors are built;
— original SAME manufacture for the entire model range;
— guaranteed reliability under all conditions;
— high performance;
— wide operational versatility

AN ADVANCED TECHNICAL DESIGN

▷ The P.T.O. is taken directly from the gearbox, low in the centre of the tractor, ensuring right from the design stage that the power is correctly distributed between the components driving the front and the rear axles.



▷ The transmission shaft to the front axle has no universal joints, is located centrally and well above the level of the ground, and is protected by a metal casing.
▷ The motive power is transmitted from the half-shafts to the wheels by means of constant velocity joints, guaranteeing regular rotation of the wheels even at low speeds, improved working life, complete safety of utilization and a small turning radius.
▷ Large high-ratio epicyclic final drive units fitted in the wheel hubs allow the transmission shaft, the crown wheel and pinion, the differential and the half-shafts all to rotate at high speeds, transmitting low torques and thereby avoiding the dangers of overload or breakage.
▷ High-quality oil and dirt seals.
▷ No slip or safety devices between the gearbox and the front axle. If any such feature were fitted, it could negate the contribution of the front driven axle at critical moments (rapid descents, exceptional loads, etc.).

ORIGINAL SAME MANUFACTURE FOR THE WHOLE RANGE

Not only the design, but also the construction of all the components of the wide range of front axles is carried out directly by SAME in its own factories, following and reinforcing a proud tradition.
Over the whole range and all the versions in production, any SAME tractor can also be a «SAME Four-Wheel-Drive Tractor».

GUARANTEED RELIABILITY UNDER ALL CONDITIONS

This is a direct consequence of the sound design principles adopted:
▷ use of materials rigorously tested over long periods and under the most varied conditions;
▷ machining and assembly by highly specialized craftsmen;
▷ epicyclic final drive units capable of withstanding the heaviest stresses;

▷ design, experience and tradition «all from the house of SAME».

DIFFERENTIAL LOCK

To give constant and complete adherence under all conditions, for:

▷ high productivity;
▷ reduced tyre wear;
▷ less ground compaction;
▷ reduced fuel consumption.

The SAME design takes one of 2 different forms:

1. **Automatic locking of the differential (NO SPIN system).** This is a mechanism which keeps the front wheels always engaged, automatically releasing the outside wheel during steering and then locking up again automatically once the tractor is straight.
2) **Mechanical locking of the differential.** Can be engaged at the same time as the rear lock, coming rapidly into action if one wheel starts to slip in relation to the other, resulting in sudden loss of grip.

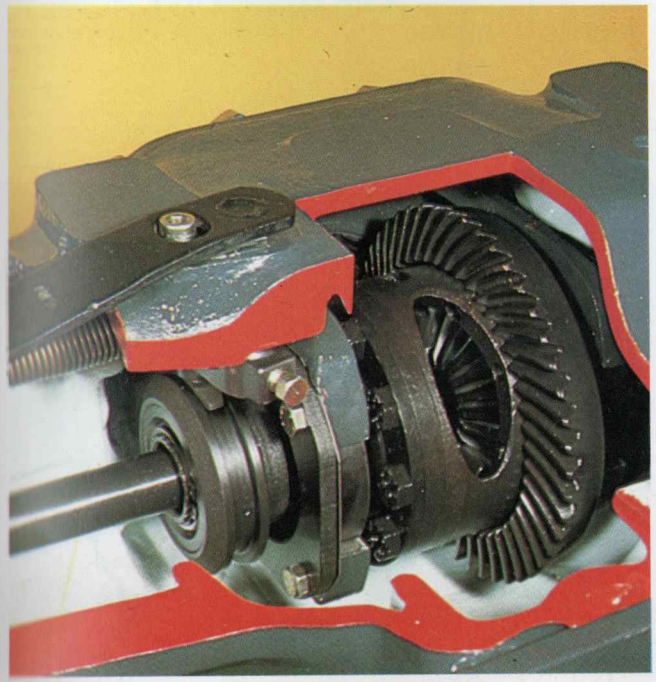
ALL-WHEEL BRAKING

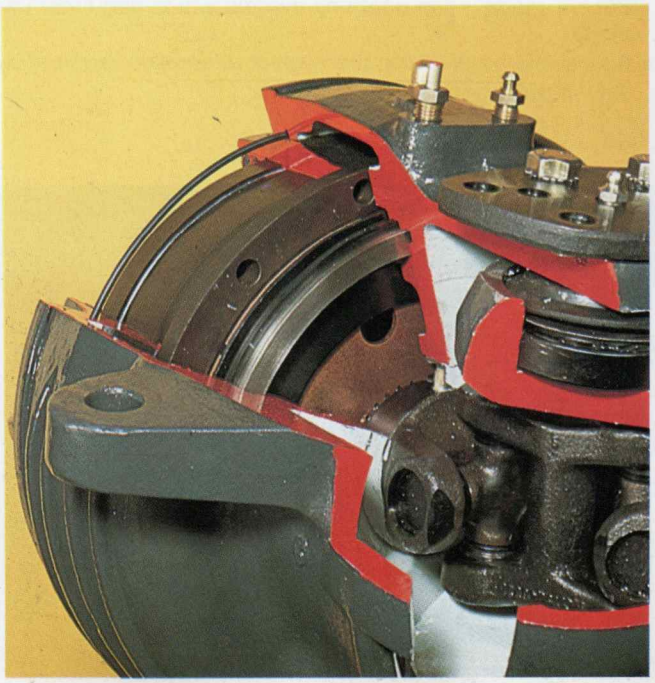
Some models can be fitted on request with all-wheel braking, using oil-bath disc brakes on the front wheel hubs, operating simultaneously with the rear brakes.
It is therefore possible to use the front brakes independently, braking either the right or the left wheels.

All-wheel braking gives the following advantages:

- more powerful braking;
- greater security when pulling trailers;
- 50° steering angle.

Large-sized epicyclic final drive unit.





HIGH PERFORMANCE

It is, of course, impossible to express the performance of an agricultural tractor in figures, the more so if it is a four-wheel-drive. The performance of the tractor changes, in fact, as the working conditions change, and the influence of the front driven axle becomes greater as the conditions deteriorate.

It is possible, however, on the basis of an extensive study of the agricultural sector, to assure that the average increase in performance will be of the order of 30% in medium to good conditions, which means that conditions can be tackled where a two-wheel-drive version would fail: marshy ground, sand, mountains, etc.

Large-sized front tyres. By comparison with the best of the competition, SAME fits larger front tyres with a given size of rear tyre, thus attaining the following advantages:

— large ground clearance, comparable with that of the 2-WD version of the same power;
— greater effective weight at the front;
— greater surface in contact with the ground, giving less slip and less tyre wear;
— lower specific pressure on the ground, resulting in less compaction.

WIDE VERSATILITY AND 50° STEERING

▷ Extensive oscillation of the axle, to give high adaptability to all types of ground.
▷ High ground clearance, for particular soil preparation tasks (deep ploughing) and so that the tractor can work in earthing-up, weeding and harvesting operations without damaging the crops.
▷ Excellent steering, saving time in tight spaces. The 55 to 170 HP model span contains models which can steer up to 50°.
▷ Adjustable track giving the correct dimension required by the various agricultural operations.

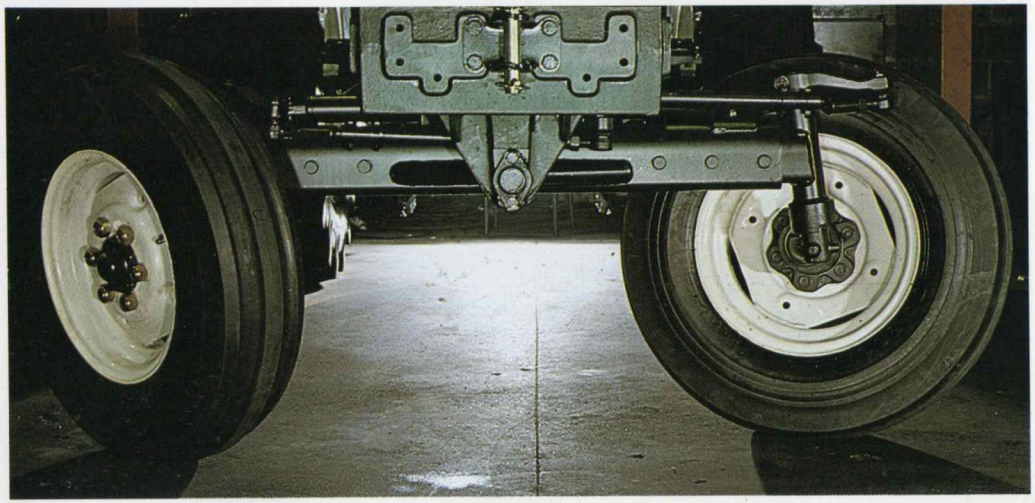
TWO-WHEEL-DRIVE

Strength

Naturally, the greater strength required of a 4-WD tractor will also be found, in the case of the SAME range, in the 2-WD versions. All the SAME tractors are designed as 4-WD units, a proportion of them being changed to 2-wheel-drive tractors by replacing the driven front axle with a stout beam axle.

MANOEUVRABILITY

- **72° steering**
  Many of the SAME two-wheel-drive models have a steering angle of as much as 72°, making for easy and rapid manoeuvering even in very tight spaces.
- **High ground clearance and adjustable track,** for ease of working in row crops.

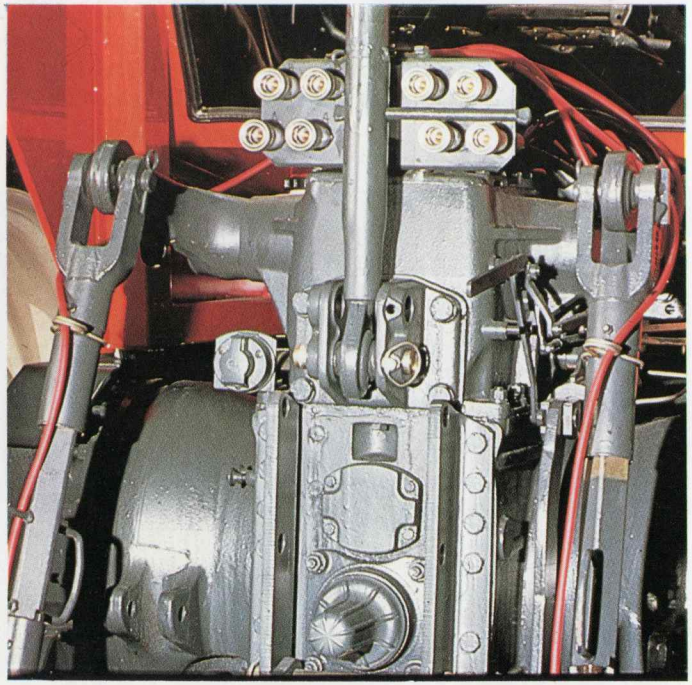


AUTOMATIC LINKAGE CONTROL UNIT

With the **AUTOMATIC LINKAGE CONTROL UNIT,** which has traditionally been one of SAME's strong points, the tractor becomes an «intelligent» operating unit, in other words one capable of carrying out operations and checks which in the past had to be under the control of the operator, and doing so automatically and in response to variations in working conditions.

...ITS FUNCTIONS

- **Position control**
  Allows the implement to be carried and held at any height, whether in the ground or out of it, according to the position of the control lever (yellow).



- **Draught control**
  Allows the tractive force of the tractor to be kept virtually constant, and is commonly used with all mounted implements which have to work in the soil at a particular depth (ploughs, harrows, rippers, cultivators, etc.).
  The control lever (yellow) is used to lower the implement into the ground. An automatic device controlled by the depth control lever (green) then comes into play to keep the draught force applied to the implement almost constant, regulating it in response to changes in the resistance exerted by the soil.

- **Combined position and draught control («MIX»)**
  On many models, this original type of control gives increased work output in soils of very variable consistency, since it allows selection of the best possible combination of the two control modes described above.

- **Floating control**
  Use in the floating mode completely releases the lower lifting arms, allowing them to move freely. This mode in frequently used when working with implements which have to follow the line of the ground (ridging ploughs, seed-drills, mowing machines, and so on).

...ITS SPECIFICATIONS

- **Control of the force on the lifting arms (an original SAME system)**
  The automatic device monitoring the draught force is linked directly to the lower lifting arms, instead of to the top link as on the traditional design.

- **Easy and light in use**
  The control levers, of different colours for easy of identification, are conveniently situated, within easy reach of the driver.

ADVANTAGES

- ▷ **Very rapid action:** there is an extremely short time-lag between any variation in the load on the implement and the change in its working depth, thanks to the elimination of any play in the linkage between the lifting arms and the sensor.
- ▷ **High sensitivity:** detecting even slight variations in load.

- **Economical operation**
  An original pressure modulation system ensures that any delivery of hydraulic oil surplus to requirements is dumped not at the circuit's maximum pressure, but at working pressure.

This gives a significant saving in power, and eliminates any danger of kick-back in the circuit.

- **Control of the rate of drop of the implement**
  The circuit is fitted with a hydraulic damper (Valvematic) which keeps the implement's rate of drop constant, avoiding any abrupt and harmful impact with the ground.

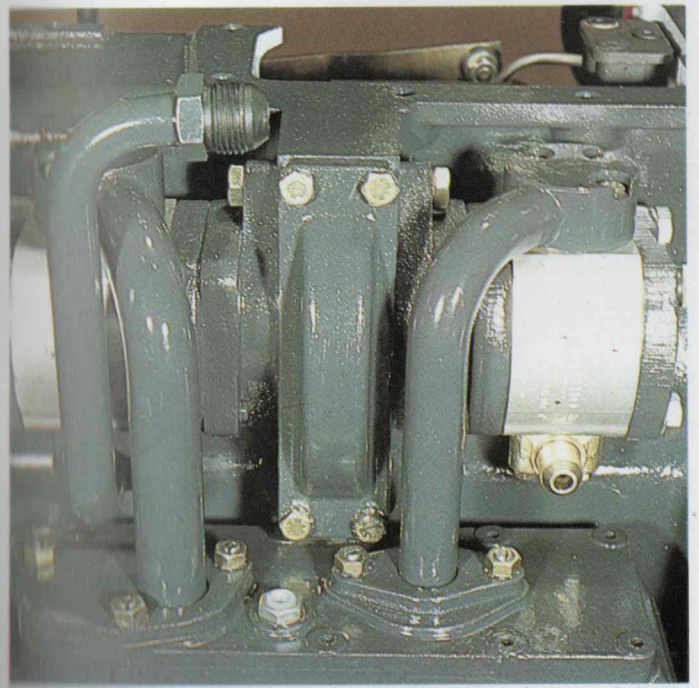
- **Safety valve**
  A non-return valve on the lowering circuit prevents the implement from dropping when the engine is turned off.

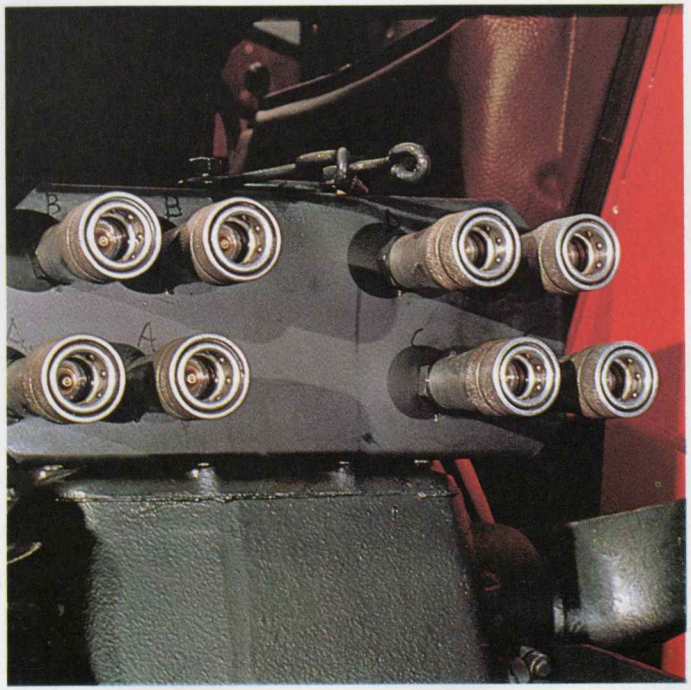
- **High lifting capacity**
  On all models, exceeds the figures recommended in the ISO standards.

- **A hydraulic power source**
  The hydraulic lifting circuit has been designed so that the tractor can also be used as a source of hydraulic power, to drive hydraulic motors and hydraulically-controlled implements. For this purpose, a very powerful pump is fitted, with a delivery (30 to 64 litres/min — 6.6 ÷ 14.1 Imp. Gals/7.9 ÷ 16.9 US Gals — depending on the model) well in excess of the most common requirements.

- **Auxiliary hydraulic outlets**
  Single or double-acting rams can be operated from any of 3, 4, 6 or 8 hydraulic outlets, each incorporating a safety valve.
  Rapid-coupling connectors (1/2") can be supplied on request, for connection to hydraulic remote-control piping.

- **Three-point linkage**
  This is of stout dimensions, and is fitted with telescopic stabilizers, extendible ends, and adjustable top links, providing easy and correct hitching of any type of implement. For even greater convenience, an automatic three-point linkage can be supplied, allowing the operator to hitch up implements while still seated in the driving seat.





COMFORT
SAFETY
HEALTH

Recent years have seen a major improvement in working conditions in the agricultural sector, both economically and qualitatively. Operators have become more demanding as to their comfort, and these demands have been incorporated into a number of international standards. This means that the agricultural operator now works in environments which are not only more comfortable but safer as well.

The SAME response to this situation takes two different forms:

- **«ECONOMIC» level of comfort,** providing the degree of comfort which is strictly essential to the operator's wellbeing. This standard is generally fitted on those tractors which, while maintaining all the operating characteristics dictated by modern agriculture, have been designed with a view to lower costs and are aimed at certain specific markets.

- **«ADVANCED» level of comfort,** including all the innovations capable of ensuring the maximum level of comfort and convenience and in consequence the maximum output of work.
  It has been very adequately demonstrated that an operator who is comfortable is also more alert, less likely to have accidents, and more productive.

WHAT DOES SAME OFFER TO GIVE COMPLETE COMFORT?

1. **FLAT-FLOOR DESIGN:** The floor is completely flat, suspended on silent-blocks, spacious, completely insulated from the rest of the tractor and covered with a non-slip rubber matting. Available on all models over 50 HP.
2. **DASHBOARD:** the comprehensive and easy to read instruments allow the operator to monitor constantly whether the tractor is operating as it should.
3. **CONTROLS:** easily identified by colour and shape, the controls are located so that the operator can find them almost instinctively, without any sacrifice in convenience. The pedals are of the suspended type, so that the floor is completely clear of anything which might hamper the driver's freedom of movement.
4. **HYDROSTATIC STEERING:** light, precise and safe. Many models are fitted with a «reactive» hydrostatic system with twin rams, which centres the steering automatically after it has been turned.
5. **DRIVER'S SEAT:** designed on anatomical principles, with raising armrests, it can be adjusted in four different ways:
   — sensitivity, to match the springing of the seat to the driver's weight;
   — fore and aft, to fit the position to the driver's height;
   — seat height;
   — inclination of the back.

CAB

- **An original SAME design.**
  Designed by SAME to form a unit with the rest of the tractor, it is built to guarantee the driver's complete safety and provide an ideal working temperature under all climatic conditions. An original SAME design, it is type-approved as a safety cab to meet all international standards on safety and sound-proofing.

- **Insulated from the tractor** and suspended on four stout dampers.

- **Minimum noise level.**
  A low level of noise is the best way to eliminate driver stress. This removes any risk of hearing damage, and results in a more alert and more productive operator. Four generous-sized rubber supports are fitted to minimize lateral and vertical shocks and vibration. Materials with excellent sound-absorbing characteristics are used in the cladding to absorb any remaining noise and vibration.
  In addition, the cab is separated from the engine compartment by means of a thick insulating bulkhead, designed to ensure that the noise and heat from the engine do not find their way into the cab.

- **Easy and safe access.**
  It is quick and easy to get into and out of the driver's seat. The steps are of a useful size and at the correct angle, and do not foul the ground even when ploughing deep. The handles are located in natural positions.

- **Spacious, with visibility on all sides.**
  The usable internal volume is easily adequate for any size of driver, and the working areas are directly in view, thanks to the large glass areas. Two large mirrors on the outside of the cab make it easy to watch trailed or mounted implements.

- **Forced ventilation.**
  Recirculating air is filtered to eliminate dust, and is blown through adjustable vents into the cab by a three-speed fan.
- **Efficient and economical heating.**
  A powerful heater guarantees a comfortable temperature inside the cab even when the temperature outside is below zero. The temperature is thermostatically controlled.
- **Fresh air even in very hot climates.**
  The air conditioning system maintains the air inside the cab at a level close to the optimum for the human body, making the cab a pleasant refuge in the hottest hours of the summer.
- **Pressurization.**
  The perfect fit of the doors, side windows and rear hatch, and the protective boots over the various control levers, seal the cab completely against dust and dirt, giving a pressure level inside the cab of 3-4 mm H_2O, which is the maximum allowed by law to avoid causing respiratory discomfort in the driver.
- **Natural ventilation.**
  Openings on all sides to give natural ventilation and to avoid irradiation effects when standing in the sun.
- **Interior features.**
  Light and restful colours to give a pleasant working environment, a large pocket for documents and a comfortable passenger seat.
  The root has a slot for a radio, interior lights and a digital clock.

SERVICES

SAME does not forget its products once they have left the factory, but follows them with care and attention throughout their working life, to guarantee constant technical back up and resultant maximum performance, even after many years of work.
With this in mind, SAME has set up an efficient «direct line» to the needs and desires of all its markets, comprising the following Departments:

• Technical Assistance

Highly qualified SAME technicians are always at the service of the user, not only to solve his technical problems but also to offer useful advice on the correct way to utilize our tractors. A complex network of technical assistance centres in Italy and abroad makes it possible to reach even the most distant customers within a very short time.

• Mechanic Training School

To onsure that the personnel of the assistance centres are always technically up to date, every year SAME organizes a series of specialized courses at the Treviglio Headquarters, attended by technicians from all over the world.

• Technical Documentation

The work of this Department is to provide SAME's customers and representatives — sales agents, technicians, etc. — with all the technical information they need for complete familiarity with the product, correct utilization by the farmer and qualified assistance from the technicians in the technical centres:

- ▷ **Workshop manuals**
- ▷ **Parts lists,** either:
  - — on paper
  - — on microfiche
- ▷ **Operation and maintenance handbooks** for each tractor
- ▷ **Technical information bulletins** on specific problems or modifications
- ▷ **Specialized technical memoranda**
- ▷ **Workshop equipment catalogues**

All these publications are available in Italian, French, Engligh, German and Spanish.

• Spares

An extremely comprehensive Spare Parts Department, stocking over 8 million items, is able to supply spares for our tractors even if they are over 15 years old. Computerized equipment is used for instant monitoring of stock levels, inwards and outwards movements, and so on. Order-processing is also computerized, under the SAME Data Processing Centre, guaranteeing accurate and speedy stock handling. Numerous parts centres throughout Italy and abroad can meet even unexpected requirements with very little delay.

• Publicity

The Publicity Department is responsible for the image of the SAME product, and uses many different media (brochures, articles, the «4RM» newsletter, audio-visuals, daily and specialized press, trade fairs, promotional gifts) to provide this information and to give potential users information on the tractors' specific characteristics.
One very busy section is Public Relations, responsible for factory visits, for SAME always follows an open-door policy.


SAME tiger 100


SAME

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