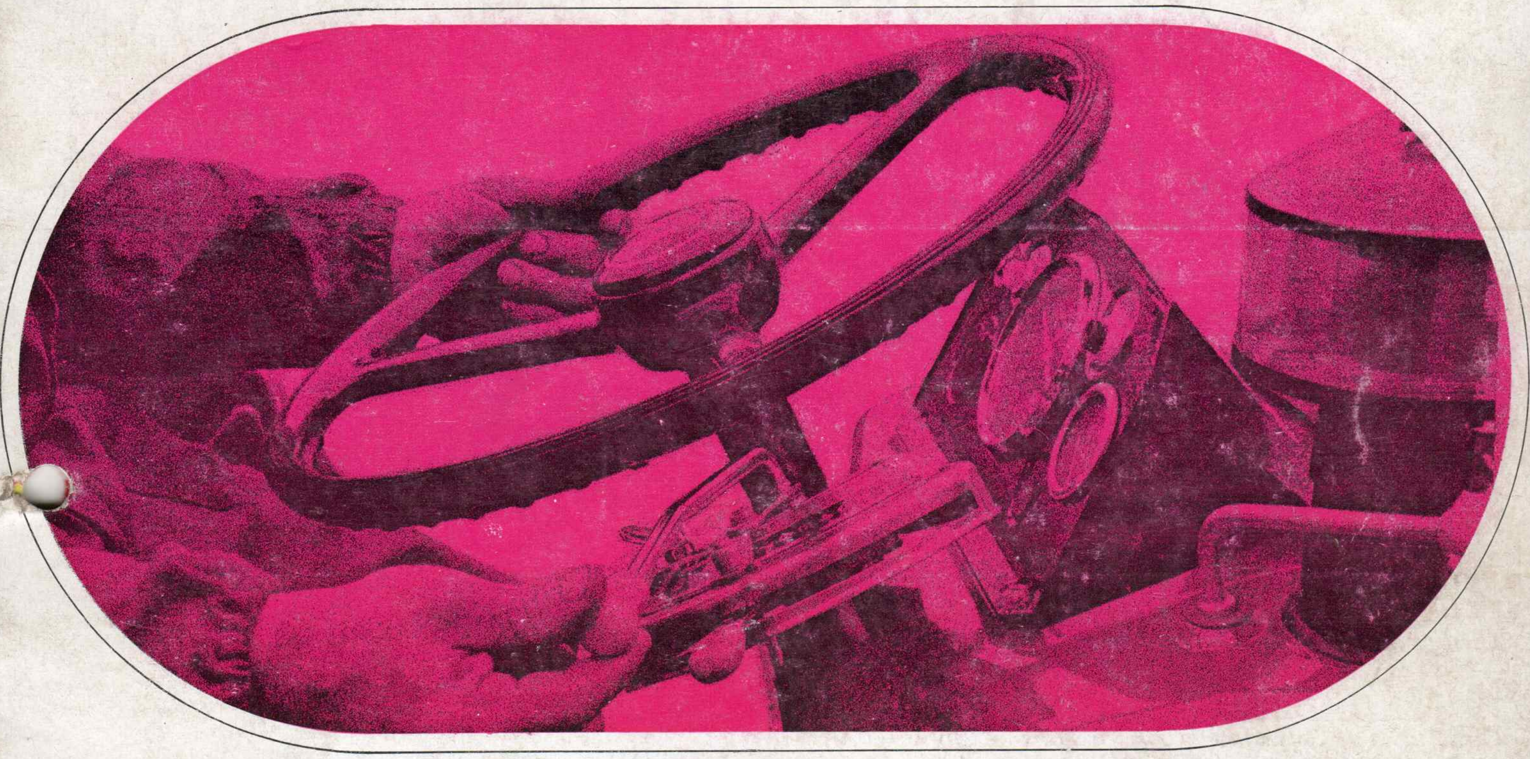
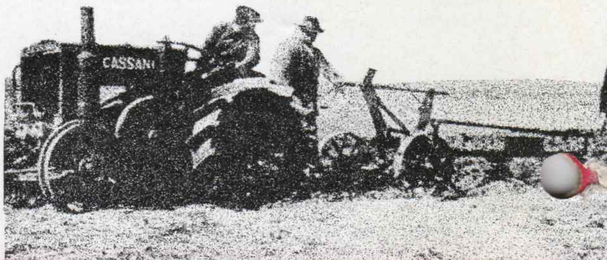
SAME automatic linkage control unit





The Cassani 40 HP tractor towing a plough. This glorious tractor was created by the brothers Francesco and Giovanni Cassani « who while still very young, in 1927, were the first in the world to apply the Diesel engine to the agricultural tractor, which application then spread, uncontested, throughout the field of agricultural motorization ».
« The first United States tractor featuring the Diesel engine was a Caterpillar appearing in 1931 ».

from « I Pionieri Italiani della Meccanizzazione Agricola » by Nerlo Nerli in « Agricoltura e civiltà delle Macchine », published by the Ente Autonomo per la Fiera di Verona, 1967.

Neither at the time of the start of agricultural mechanization nor thereafter did the link-up between tractor and implement constitute a serious practical problem, since it sufficed to attach to the rear towing member the same implement that was used with animals — either exactly as it was or with very slight modifications. However, with technical progress and growing economic necessity the need was felt to adapt cultivating machines to the new means of mechanical traction, in particular by reinforcing their structure and increasing their dimensions so as to be able to exploit the increased powers to the full.
It was the plough that perhaps underwent the biggest transformation: it was modified considerably in the frame, its working members were made larger, it was equipped with adjustment and control devices operable by the tractor driver. Nevertheless, despite the various improvements, and like all the other cultivating implements, the plough remained a trailed implement,

the development of the tractor-implement link-up

with all the defects peculiar to this category: only slight mechanical efficiency as a result of the fact that the friction of the cultivating implement in operation nearly always touches the earth with the whole weight of the implement; difficult handling on account of the length of the tractor-implement complex; laborious or even impossible reverse movements either because of the structure of the implements or because of the flexibility of the tractive means; marked tendency of the tractor to pitch during abnormal efforts, caused by weight-transfer from front to rear wheels; almost general necessity for an extra worker to look after the implement, in addition to the tractor driver.

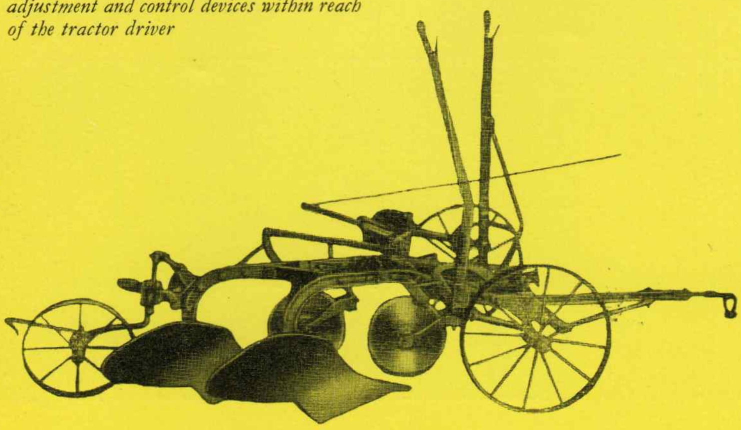
Although not prohibitive, these defects could occasionally become serious. Thus they received the careful study of technicians, inventors and constructors, who adopted various means for removing them. Thus, for example, in about 1909, a German inventor built a tractor which included on a single fixed chassis the driving means and the implement (plough), which new complex was named motor-plough. The new machine had considerable mobility, was stable, but from the economic point of view not very satisfactory and consequently went the way of a great number of other creations which came to nothing. But it should be recalled that in the motor plough there is application of the concept of a close union between tractive machine and implement, a concept which gradually developed through a large number of studies and practical experiments until the creation of the present-day hydraulic lifters.

classification of implements in relation to the linkage system

The large family of agricultural equipment, implements constructed to perform the various operations called for by agronomical technique, subdivide as regards link-up to the drive vehicle (agricultural tractor) into three broad categories:

trailed implements

Trailed plough equipped with adjustment and control devices within reach of the tractor driver



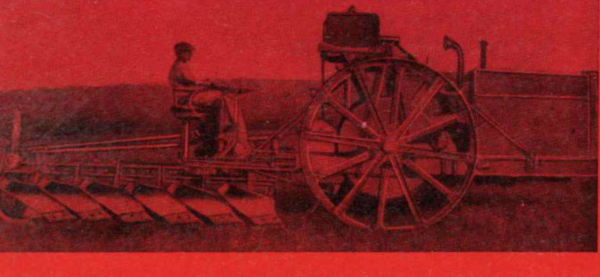
The trailed implements are linked to the tractive means without any of their weight bearing on the latter. The link-up is thus single, flexible (hawsers or chains) or rigid (draw bars).

semi - carried implements

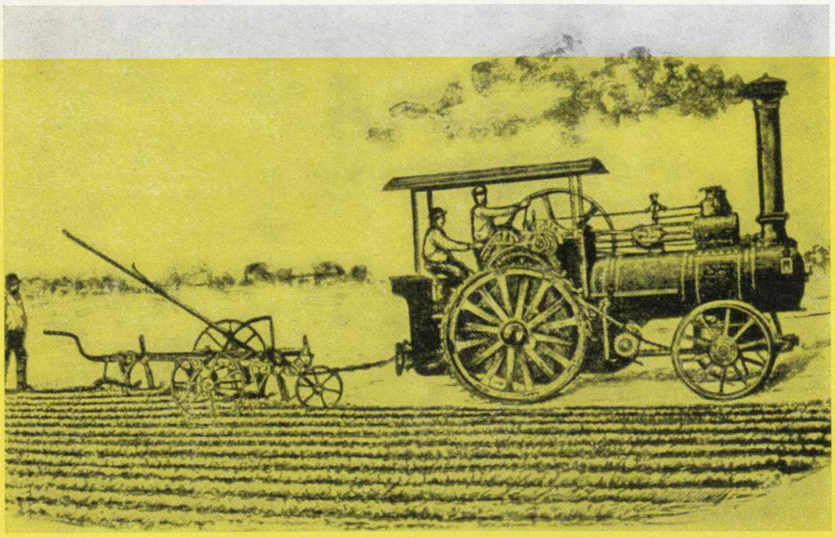
Those implements are semi-carried which when in service or during transportation bring part of their weight to bear on the tractive means.

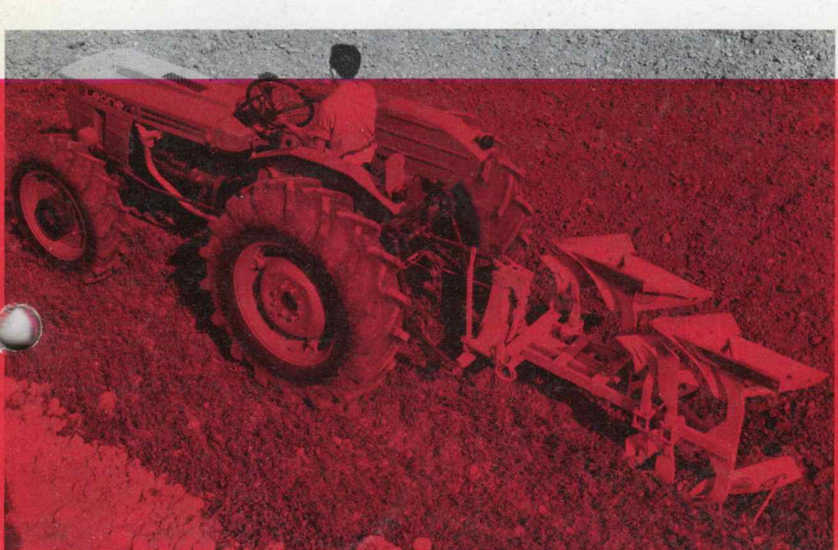
carried implements

Motor plough uniting on a single fixed chassis the driving means and the implement



These are the implements joined with one, two or more rigid and articulated rods to the tractive vehicle, with which they form a single body.

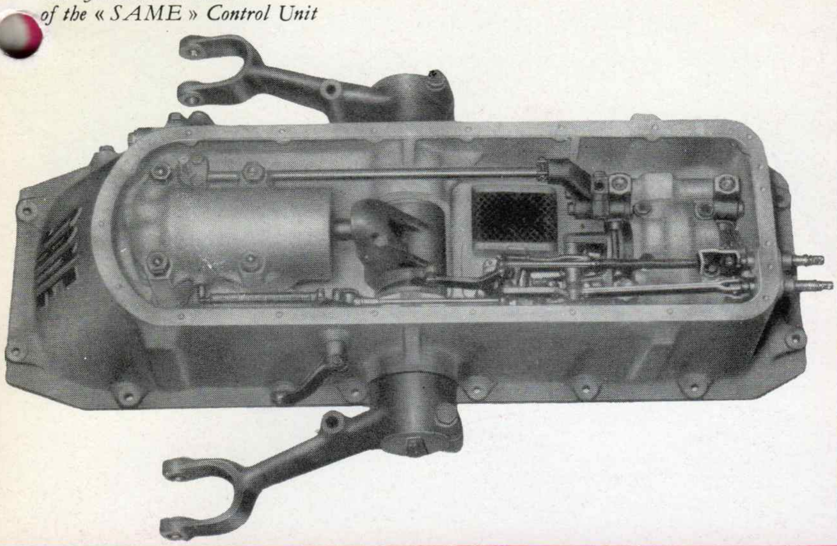




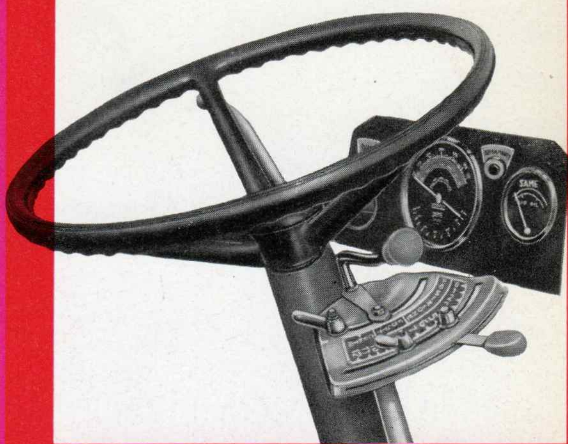
Automation and the SAME tractor with Automatic Control Unit

With the aim of bringing the agricultural world to a higher economic and social level and of reducing the physical fatigue of the farm worker to the greatest possible extent, thus allowing him conditions of life closer to those of every other type of worker, technicians and planners long studied the best way for automatizing culture operations by means of a system fully available to man and controllable with the greatest ease, so as to achieve higher performance with the implements used.

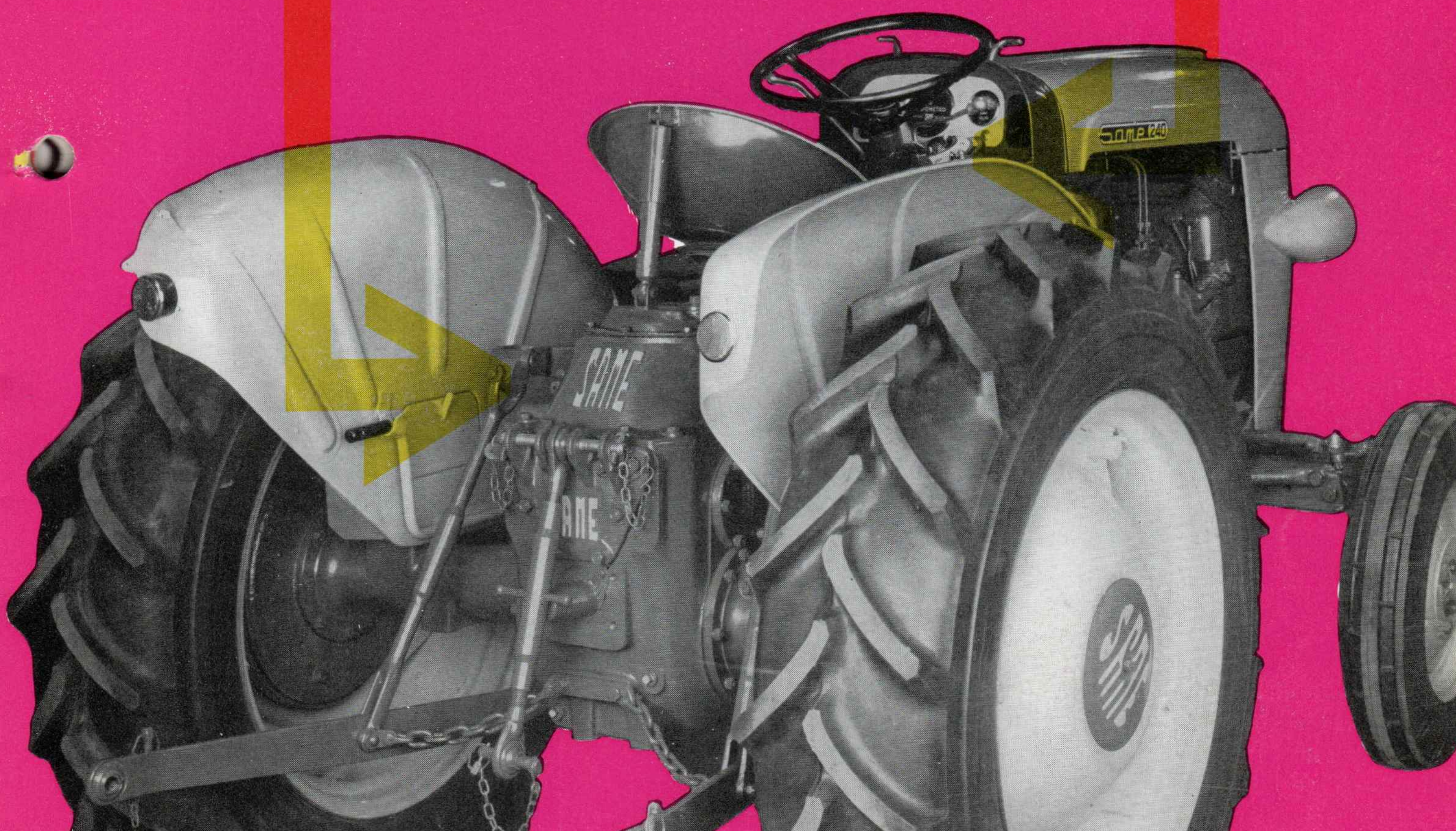
Accordingly, the SAME Company started the "automation" series, which entails putting one machine at the service of another machine, whereby to utilize the entire work potential of the tractor-implement complex, entrusting to human intelligence only the control of the various culture operations. The SAME tractor equipped with the Automatic Control Unit, and marking the commencement of the "automation" series, is thus defined "intelligent".



The hydraulic mechanism of the « SAME » Control Unit

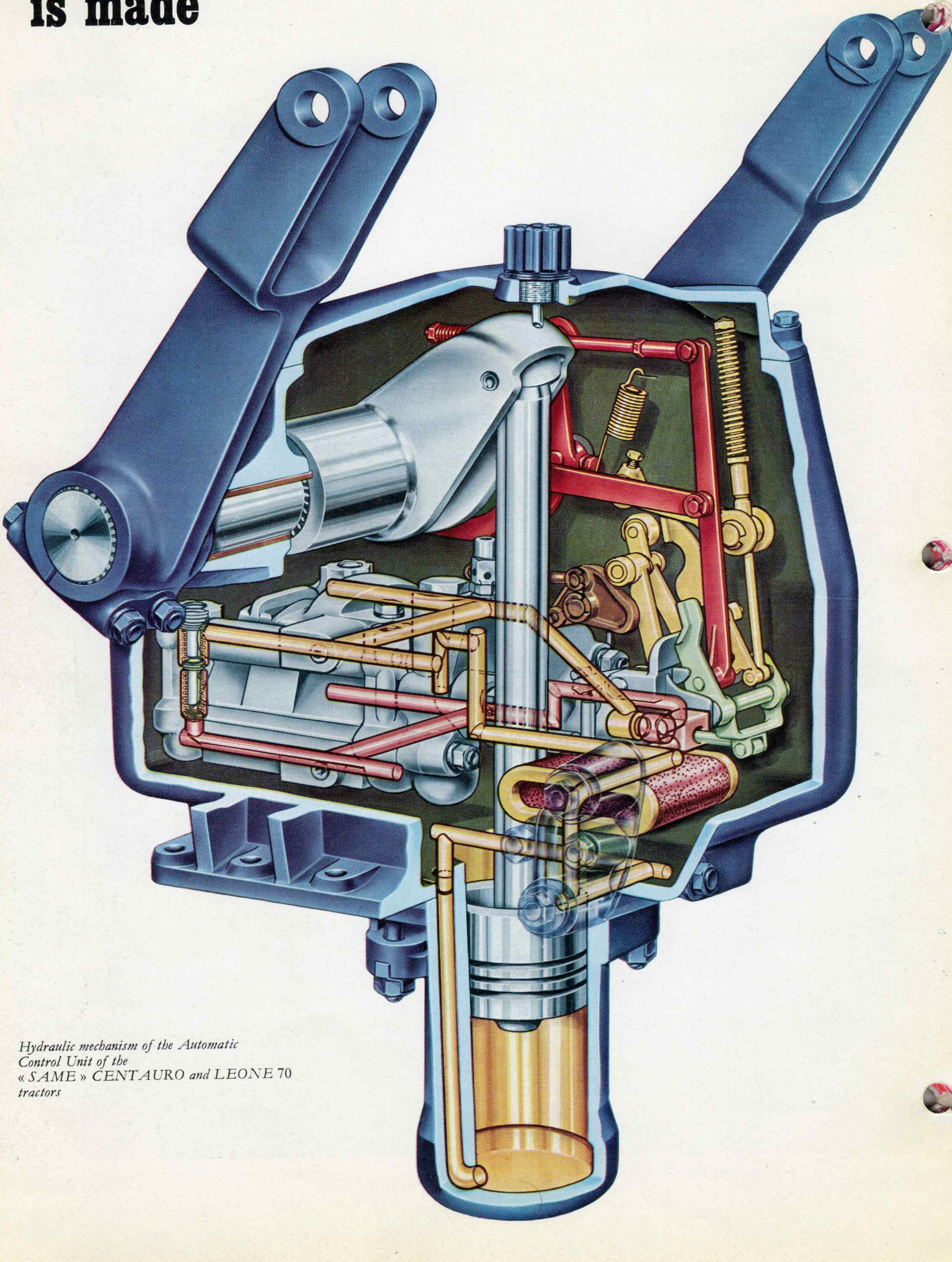


The control panel of the « SAME » Automatic Control Unit positioned under the steering wheel



The « SAME » 240 Tractor, the first with Automatic Control Unit

how the **SAME** Automatic Control Unit is made



Hydraulic mechanism of the Automatic Control Unit of the « SAME » CENTAURO and LEONE 70 tractors

The « SAME » Automatic Control Unit is positioned at the extreme rear part of the « SAME » tractors now in production, and consists of two distinct complexes:

the three-point hitch

the hydraulic apparatus

which are harmoniously and reciprocally connected so as to interact in the performance of the following functions:

1
raising and lowering of the implement

2
position control

3
draught control

4
implement drop speed control

5
rapid implement sinking

6
force control with trailed implements

The following practical advantages are achieved:

1
perfect technical execution of agricultural operations

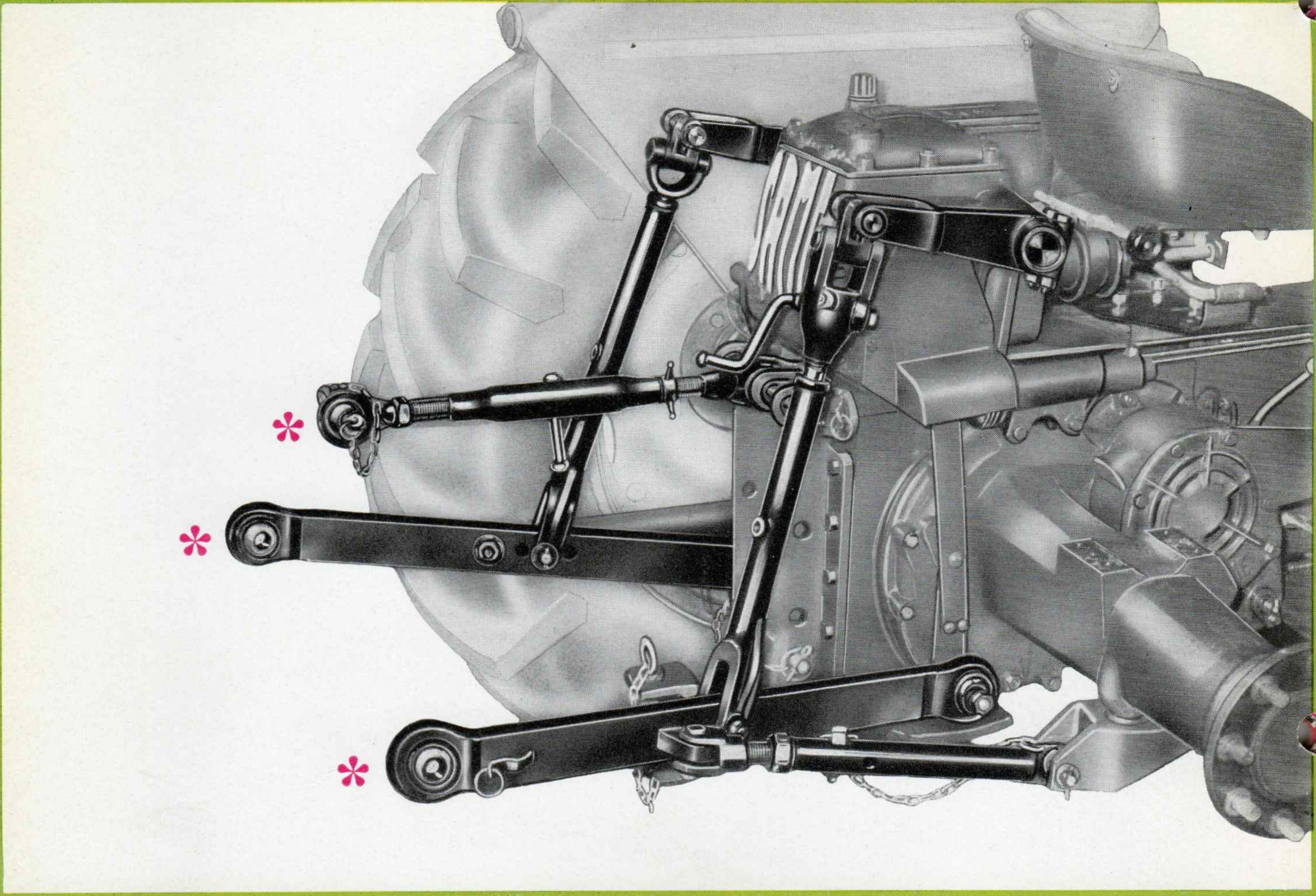
2
optimum exploitation of tractor power

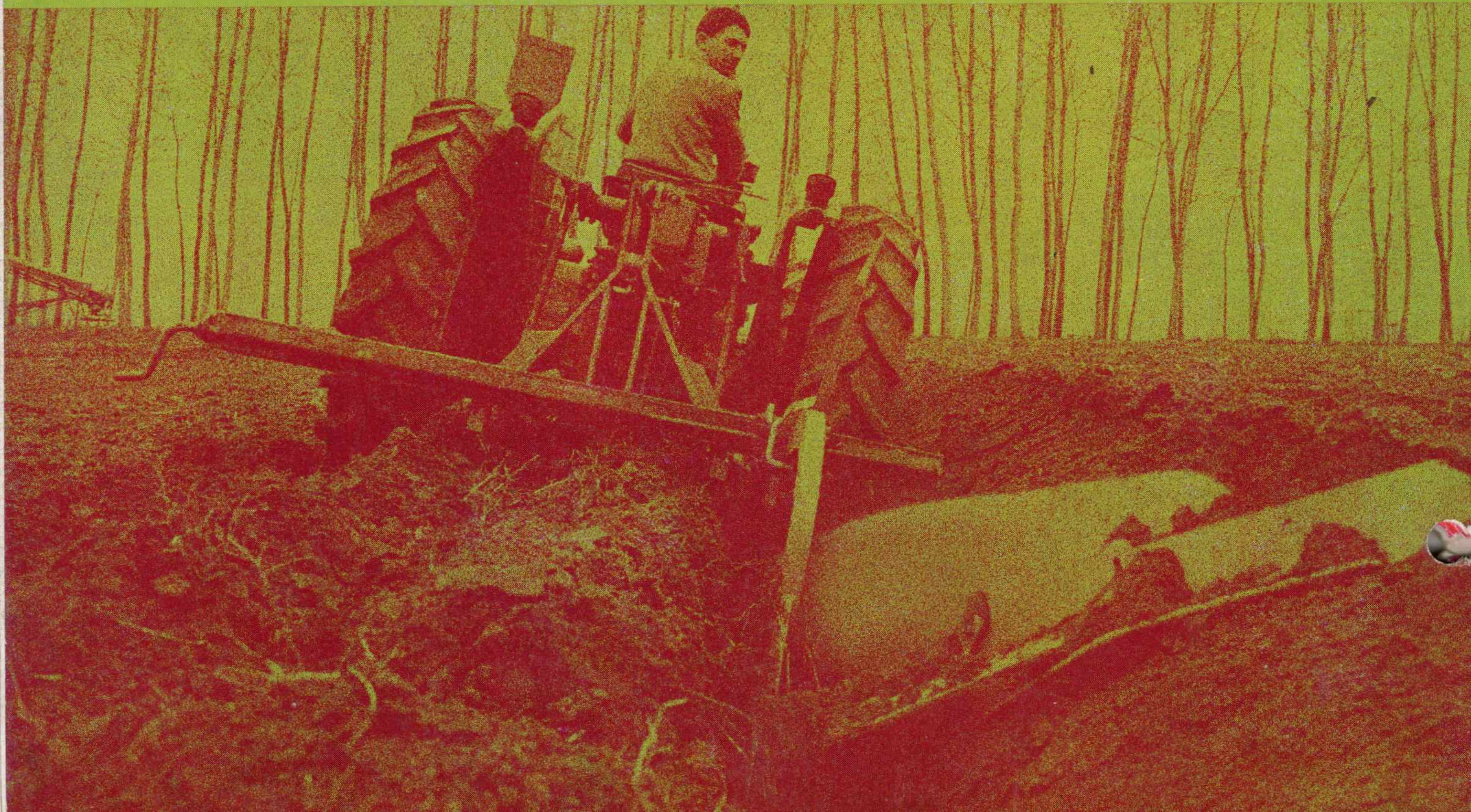
3
increase in mechanical efficiency

4
high degree of alleviation of tractor driver's fatigue

5
notable labour saving

SAME three-point hitch





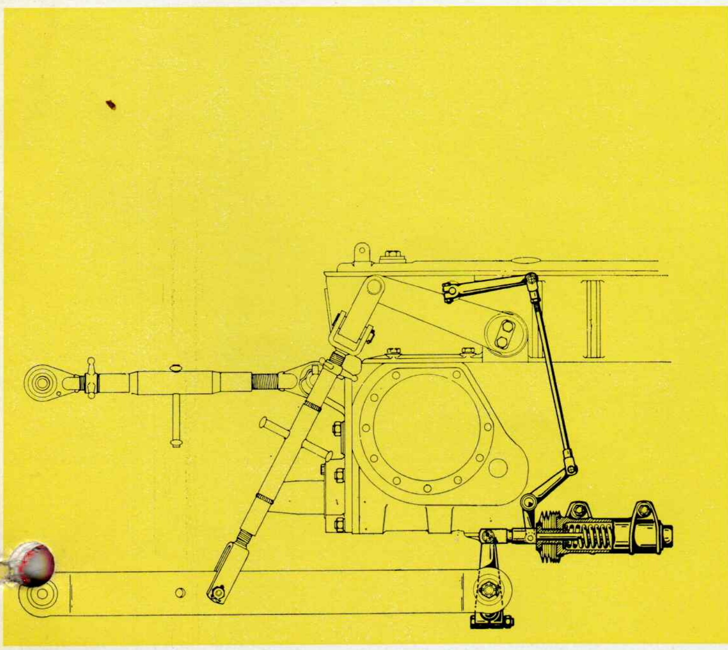
The « SAME » three-point hitch is designed and embodied according to category 1 and category 2 of international standardization regulations. Comprised under category 1 are the three-point hitches of the tractors SAMETTO V, ITALIA 35, ATLANTA 45, both 2 and 4 wheel drive; comprised under category 2 are the three-point hitches of the CENTAURO, LEONE 70 and ARIETE tractors. We think it opportune to recall that the hole diameters of the spherical joints are, for the category 1, $^{3}/_{4}''$ (19 mm) for the upper hitch-point and $^{7}/_{8}''$ (22.1 mm) for the two lower hitch-points while in the category 2 they are 1'' (25.4 mm) for the upper hitch-point and $1^{1}/_{8}''$ (28.4 mm) for the two lower hitch-points. The two connection links between the lower coupling levers and the external arms of the hydraulic mechanism are also of standardized execution. The right-hand of the two links is of variable length.

A characteristic peculiar to the « SAME » Automatic Control Unit is however the mobile coupling to the body of the tractor of the front spherical joints of the lower raising levers. During work, the latter are pulled backwards, but their movement is opposed by the springs in the working parts; the greater the effort, the greater compression these springs receive.

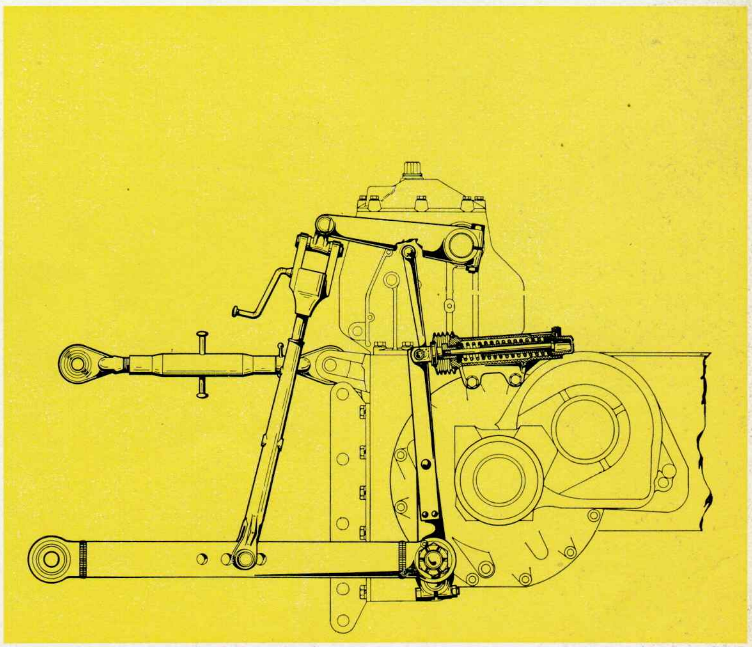
The consequent displacement of the coupling point of the said levers is transmitted to the valve of the distributor and utilized for the automatic regulation of the intensity of effort and thus, indirectly, of work depth. Since the automatic control is effected by means of the use of the two levers, it follows that:

the action of the towing efforts is direct, and so independent of the reciprocal distances between the three hitch points; the automatic adjustment of effort can also be obtained in the absence of the upper hitch-point, i.e. with a two-point hitch;

the regulation of work-depth can also be obtained with trailed implements, provided they are coupled to the lower levers, while their control jacks are hydraulically connected to the delivery circuit of the pump.

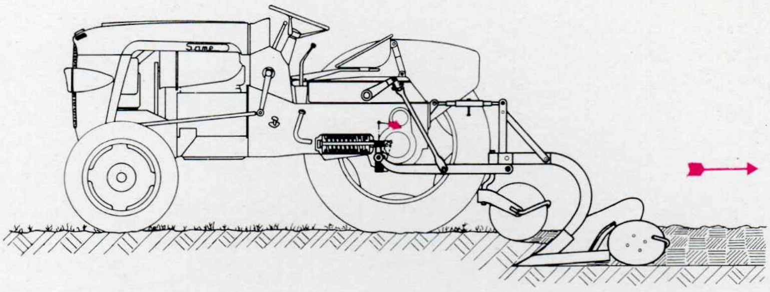


The external force regulation members of the Automatic Control Units of the SAMETTO V, ITALIA 35, ATLANTA V 45 and ARIETE tractors

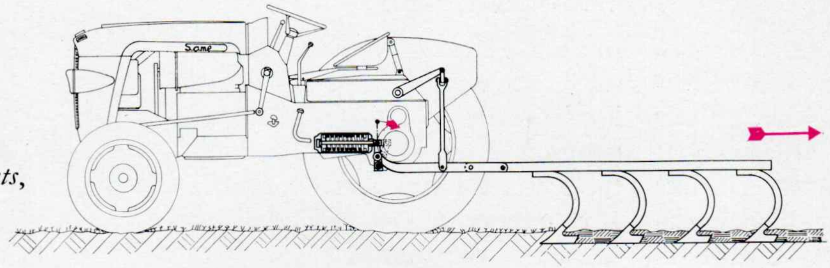


The external force regulation members of the Automatic Control of the « SAME » CENTAURO and LEONE 70 tractors

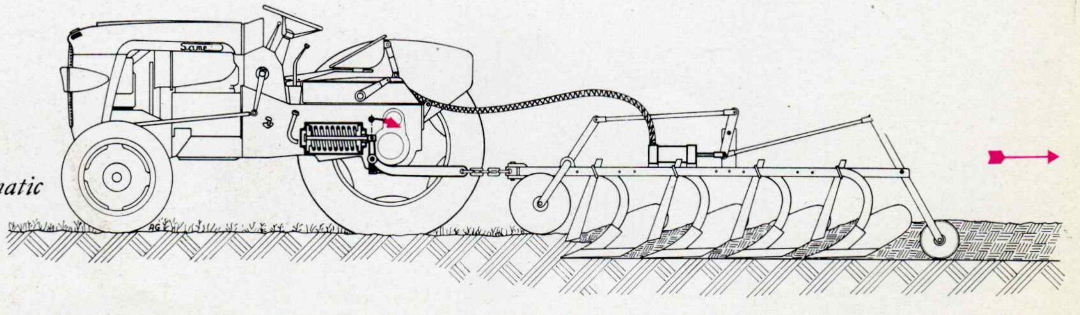
« SAME » « automation series »
tractors with three-point hitch in which the action of the force for automatic regulation of work depth is direct, and so independent of the position of the third point

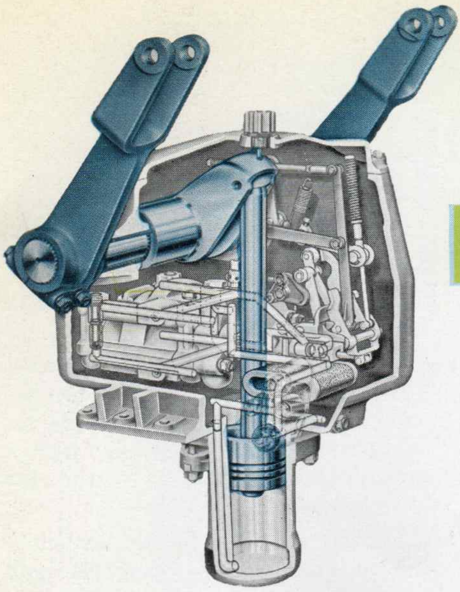


« SAME » « automation series »
tractor with implement hitched only onto the two lower points, which in any case act on the work-depth regulation members



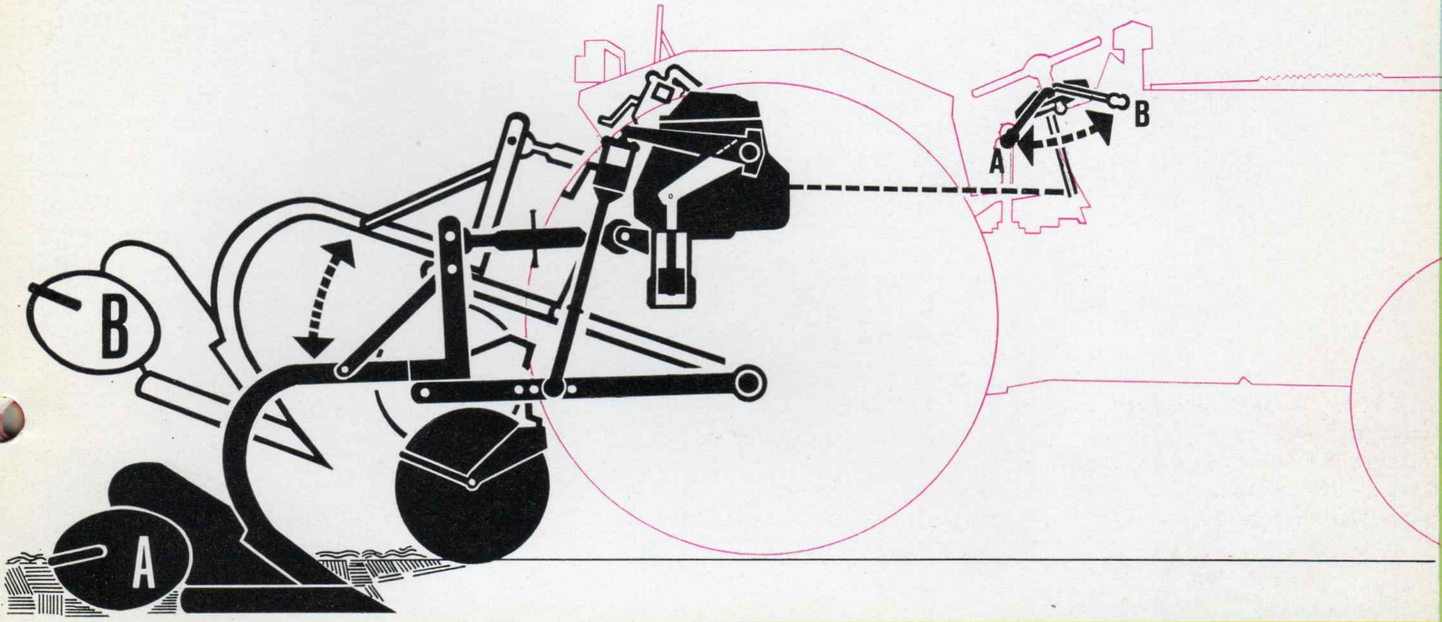
« SAME » « automation series »
tractor with trailed implement hydraulically connected to the Automatic Control Unit which acts on the jacks of the implement for work-depth regulation

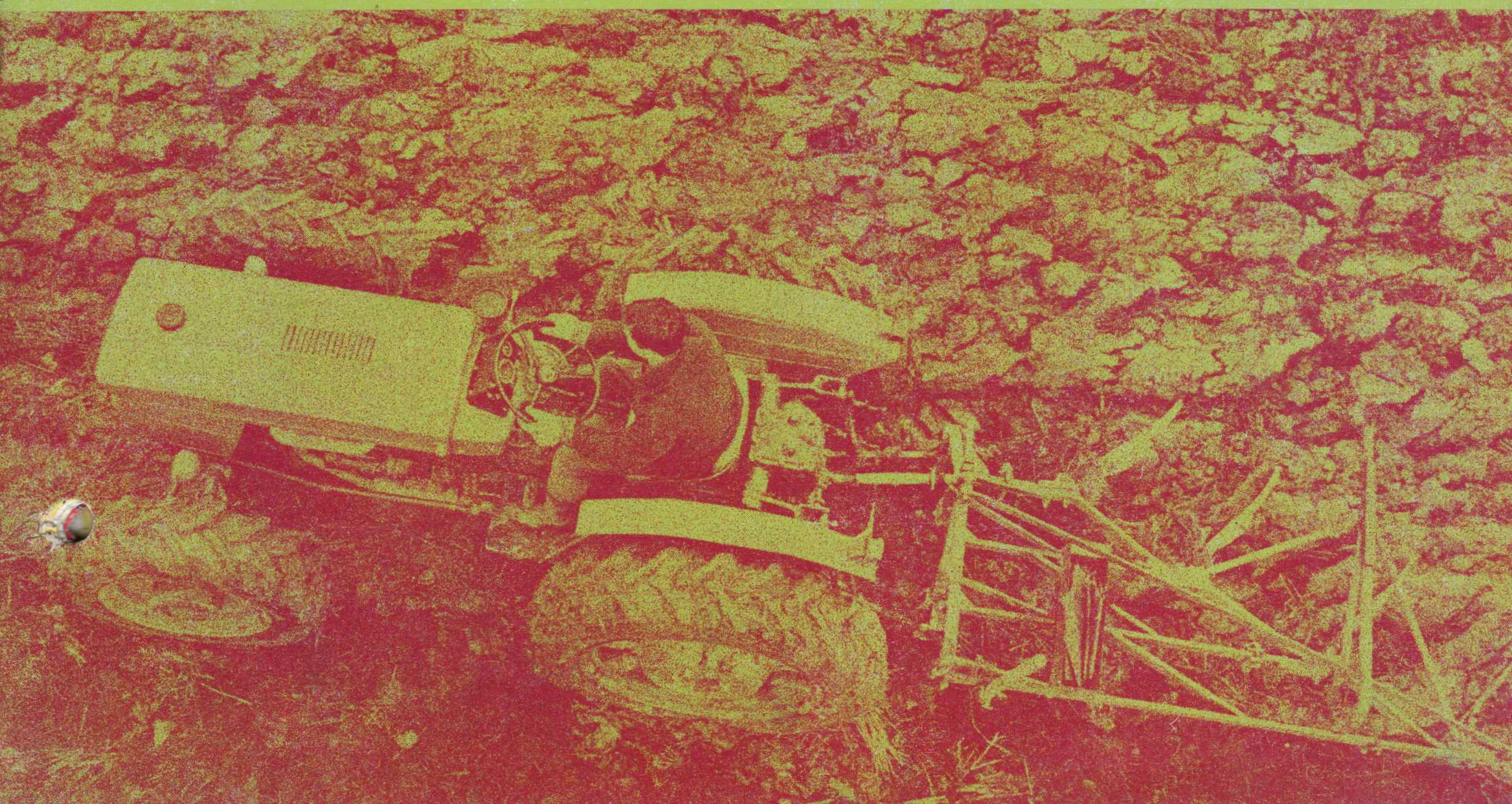


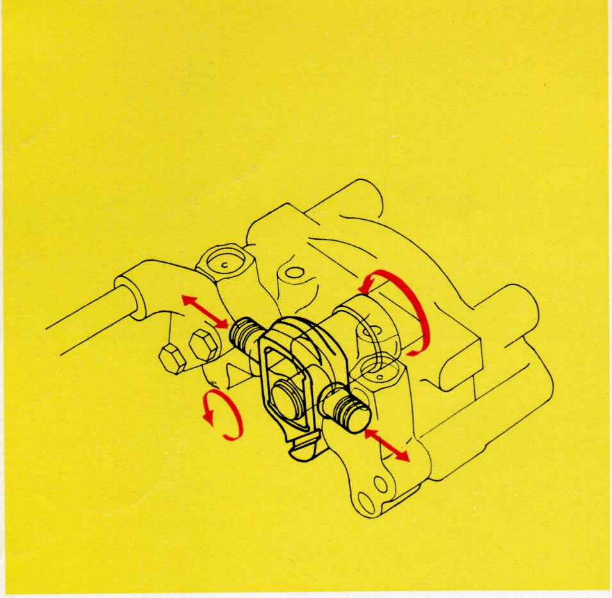


the hydraulic mechanism

The transmission of mechanical energy for the raising of the implement







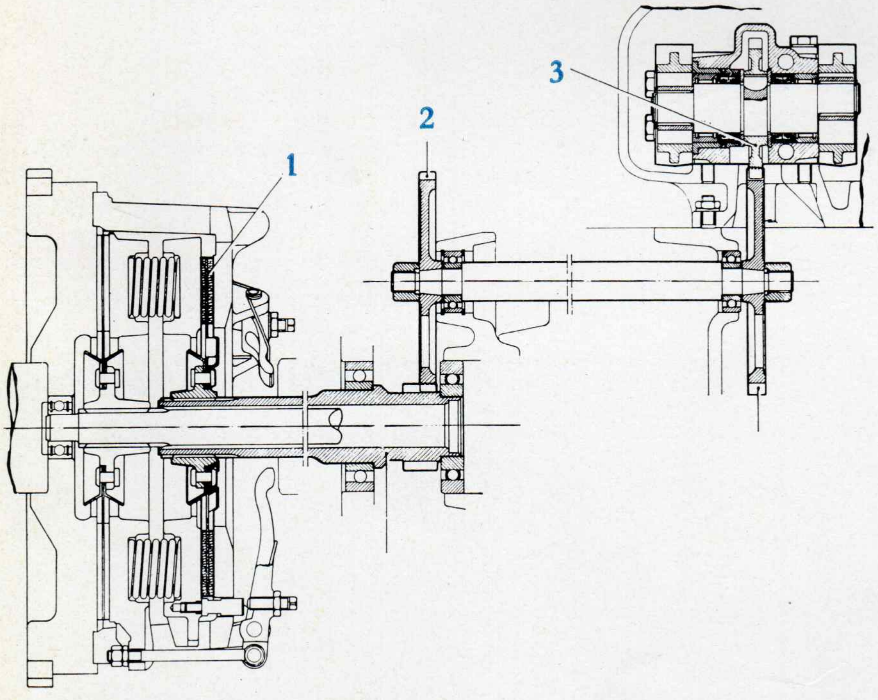
The mechanical operation of the pump

The hydraulic mechanism provides the mechanical energy necessary for the raising of the implement.

This energy is given by the engine of the tractor connected to the pump and is transmitted by the oil under pressure to the hydraulic jack mechanically connected to the lower hitch levers.

The pump is a 4-element suction-force pump. The hydraulic jack is single acting.

The hydraulic circuit, that is to say the complex of oil-ducts, is in two distinct sections; one is a low pressure suction section and the other a high pressure delivery section. Both sections link up with the distributor, which is provided with a distributing valve which can take up three positions corresponding to three functions:



The transmission of engine movement to the pump
1 *secondary clutch plate*
2 *first pair of gears*
3 *second pair of gears*

1

raising (*raising position*)

2

lowering (*lowering position*)

3

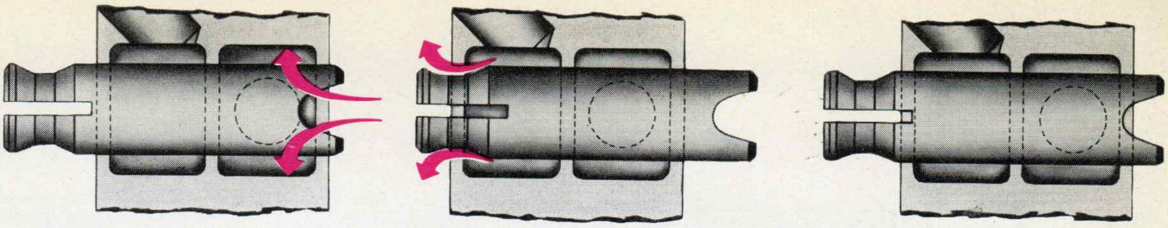
halt both of raising and lowering (*neutral position*).

Raising occurs after closing of the delivery port (connected to the high-pressure delivery section), and opening of the suction port (connected to the low-pressure section).

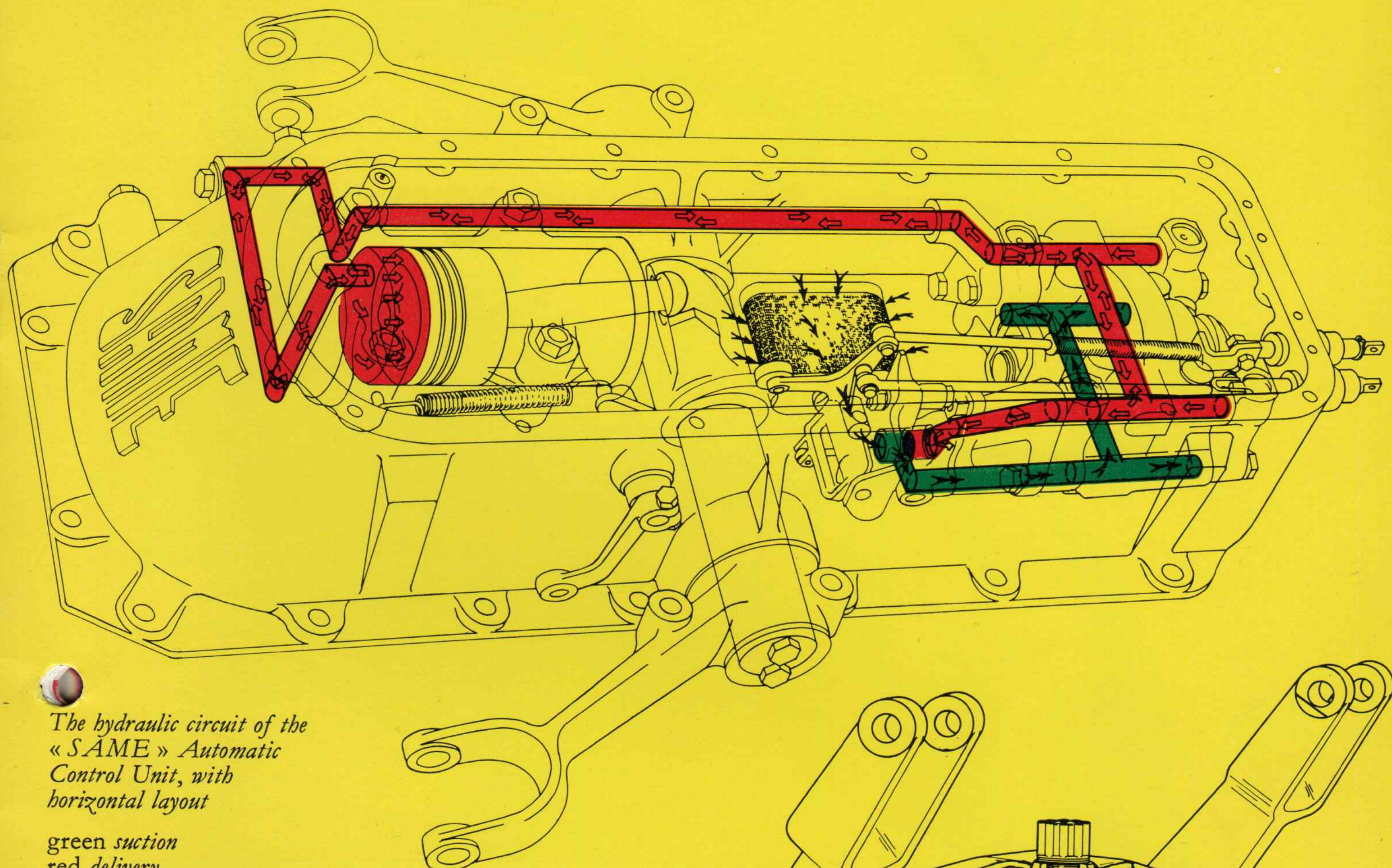
Lowering occurs after closing of the suction port and opening of the delivery port.

Stoppage of both raising and lowering (neutral position) is obtained when both ports are closed.

The control valve has manual and automatic controls, the latter being independent of direct human action.

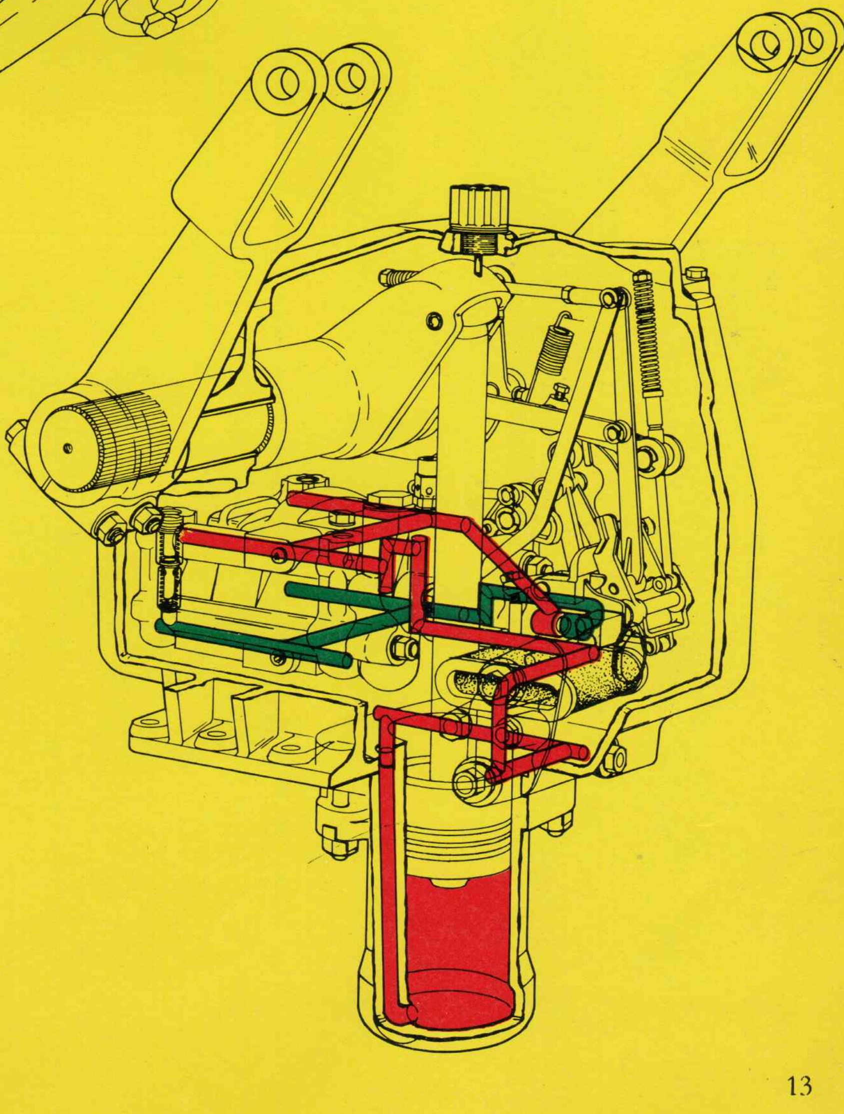


The three positions of the distributor valve



The hydraulic circuit of the « SAME » Automatic Control Unit, with horizontal layout

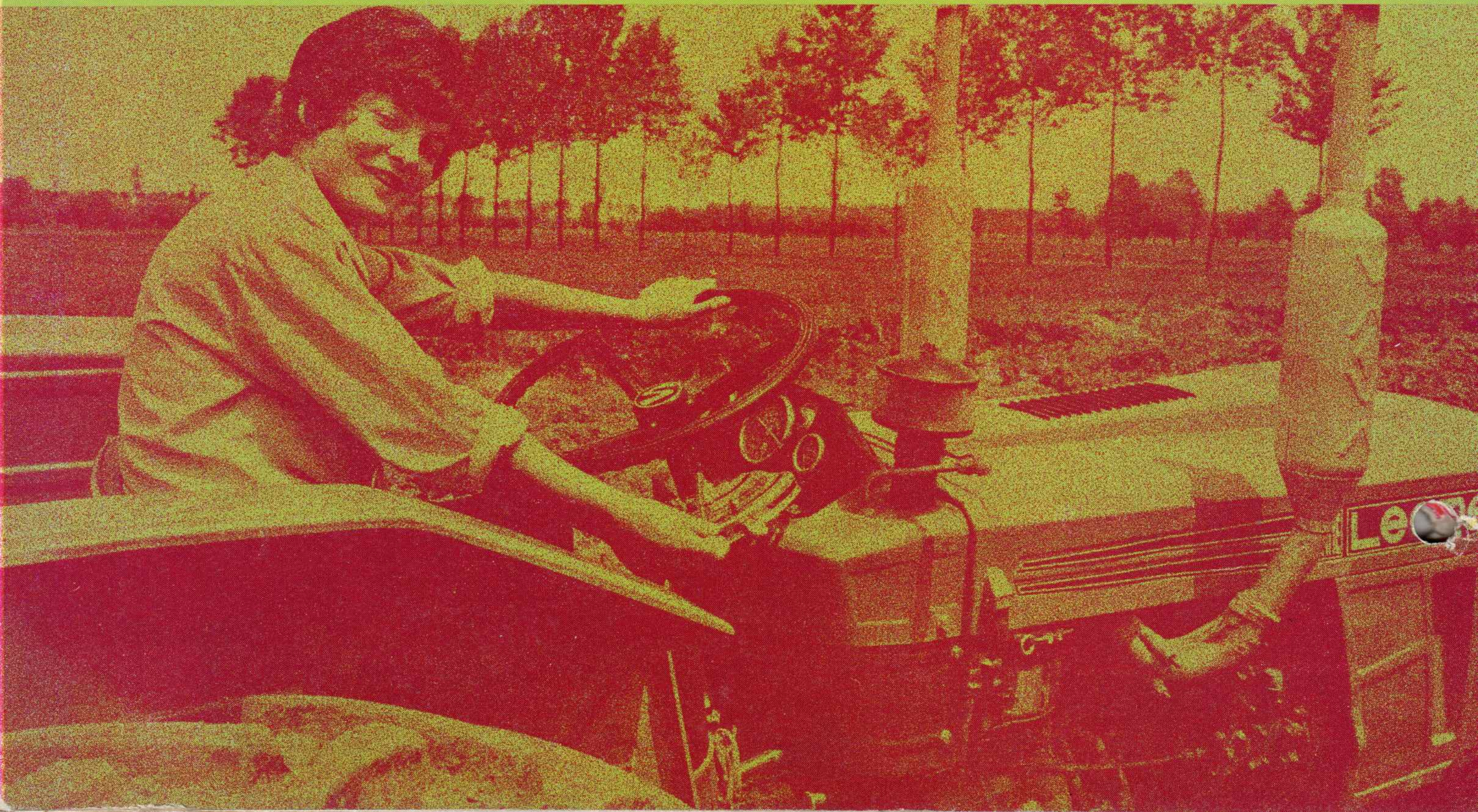
green *suction*
red *delivery*



The hydraulic circuit of the « SAME » Automatic Control Unit with vertical layout

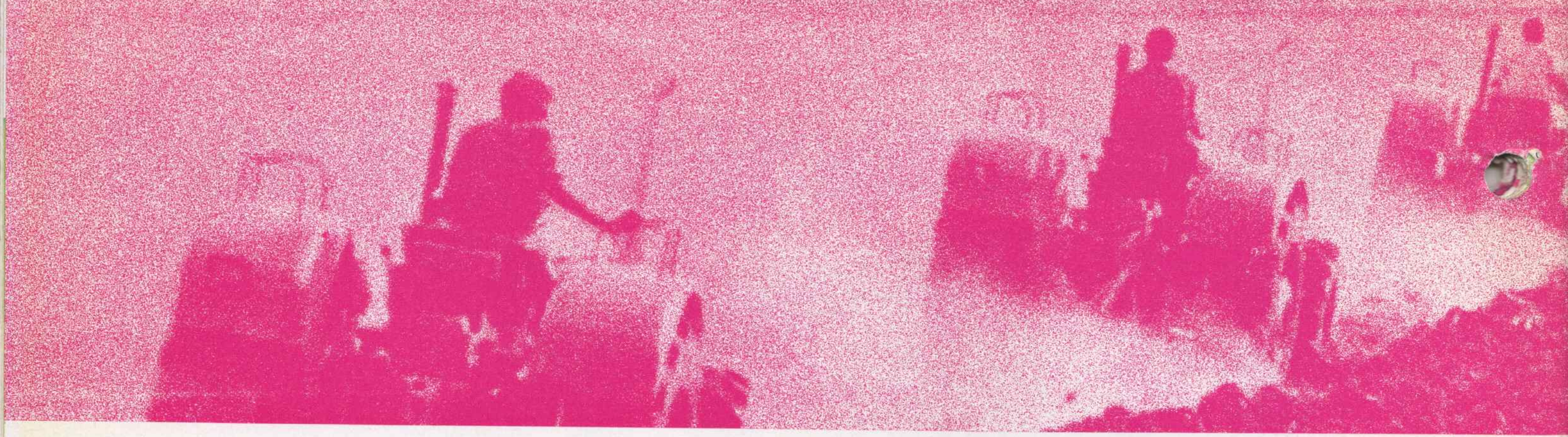
green *suction*
red *delivery*

Automatic Control Unit control panel



This is positioned below the steering wheel and is within immediate and easy reach of the driver. It has two levers, the longer upper one with a yellow hand-grip and the lower shorter one with green hand-grip. These levers move within the limits of a circular sector onto which is fixed an arc-shaped plate divided into two concentric fields. The inner field, to which the longer lever with yellow hand-grip belongs, is divided into three parts: a blue part bearing the word POSIZIONE, a red part with the wording FLOTT, and a green part with the wording CONTR. The outer field, to which the lower, shorter lever with the green hand-grip belongs, is entirely green and bears a numeration from 0 to 12, with the numbers uniformly distributed. Both the levers act on the distributor valve: the yellow hand-grip lever, also called control lever, does so directly, by means of a system of levers; the green hand-grip lever, also called regulation lever, does so indirectly by speeding up and delaying the action of the working parts solicited by the towing effort.

the functions of the Automatic Control Unit and the position of the control and regulation hand-levers



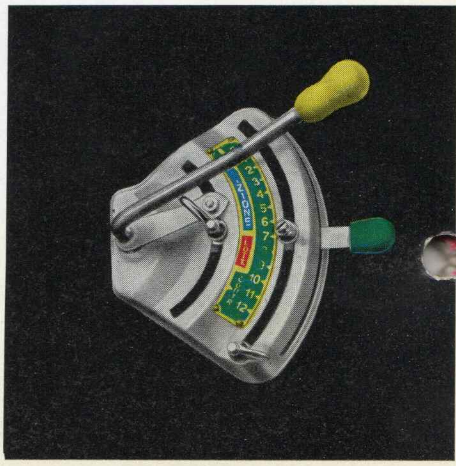
raising

Raising occurs when the control lever is brought to the extreme upper section of the blue part of the inner field. In this way, with the implement lowered, the distributor valve so acts as to open the suction port and close the delivery port. And so the pump, which is always mechanically in operation, aspirates the oil and sends it at a pressure determined by the weight of the implement to the jack, which provides the mechanical energy necessary for the raising.
Once the maximum raising height has been reached, the process is halted by means of a cam forming part of the arm-bearing shaft, which — automatically — takes the distributor valve to neutral position.

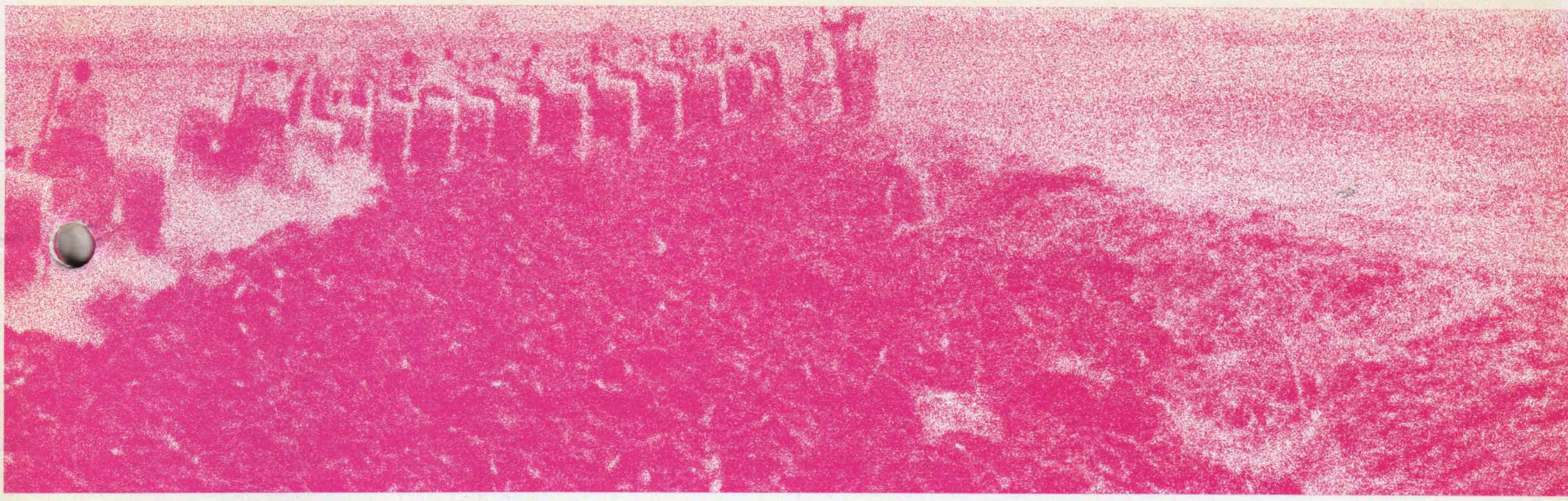
lowering

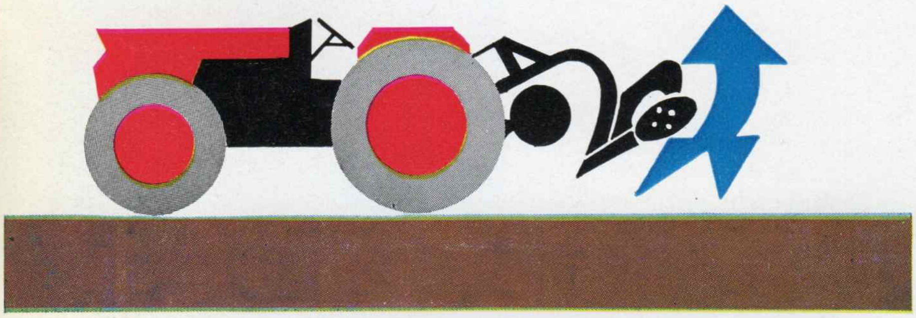
Lowering occurs when the control lever is taken into the red inner field (FLOTT) or the green inner field (CONTR.) In this way, with the implement raised, the distributor valve so acts as to close the suction port and open the delivery port, through which the oil put under pressure by the weight of the implement in descent can flow.

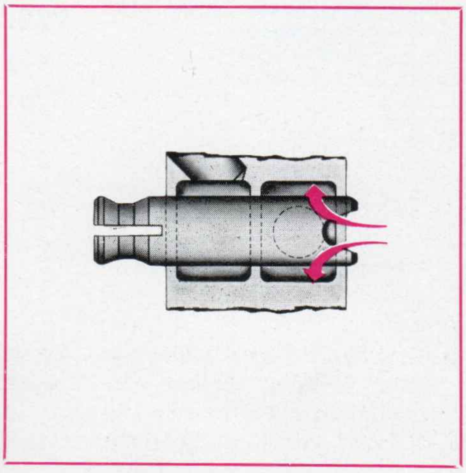
position control

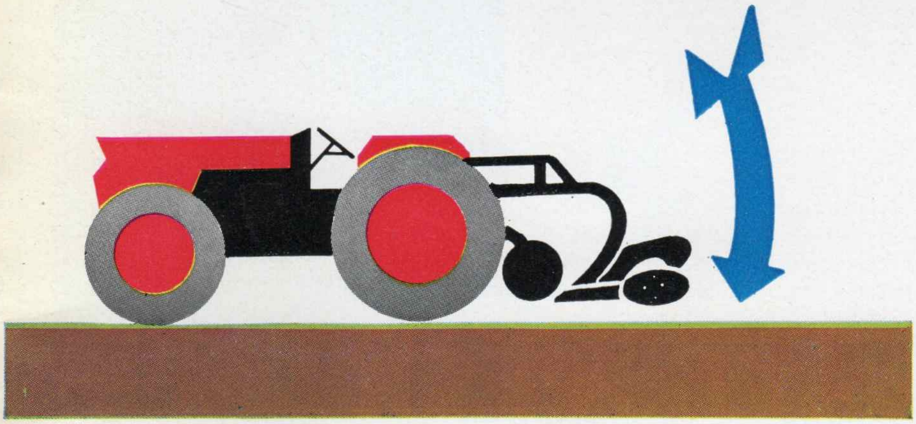


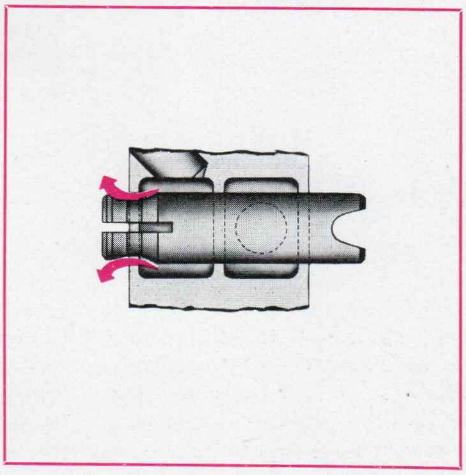
Position control is brought into play when the control hand-lever is within the limits of the blue part of the inner field. Within this position, to every position of the hand-lever there corresponds a well-defined height-wise position of the implement. This is due to the fact that with the control hand-lever there is determination of the point of the arm-bearing shaft at which the distributor valve takes up the neutral position. Thus, if the implement is above this point the delivery port is opened until the point is reached. If the implement is below the said point, the suction port opens until it is reached.

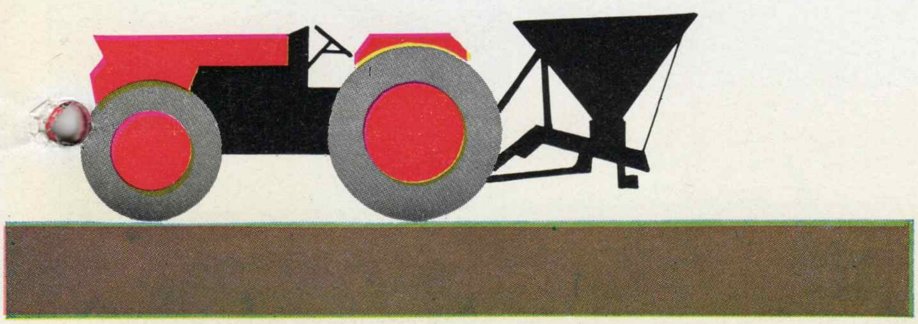


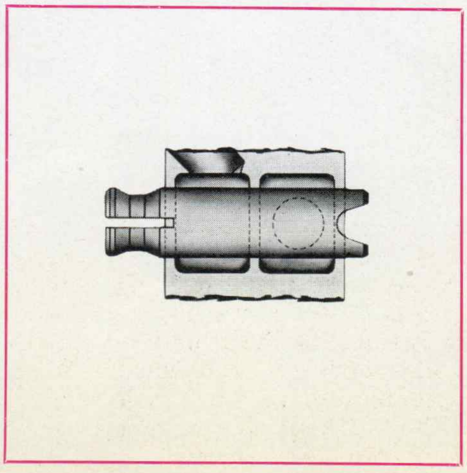




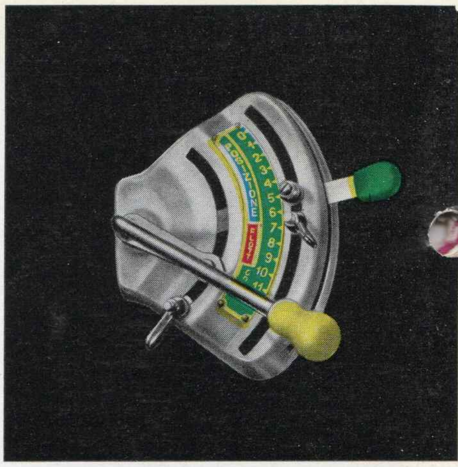




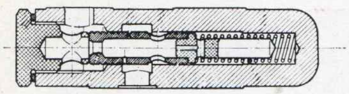




draft control



This is also called depth control, since for a given implement and a given soil the towing effort acting on the lower coupling bars is proportional to the depth. This control comes into play only when the control handlever is in the green section of the inner field of the plate (CONTR.), while the degree of force is established by the position given on the green field to the regulation hand-lever, starting from number 3.
In this way, there is determined the degree of compression of the springs of the working parts at which there will be a series of very slight raisings and lowerings which will keep work-depth practically constant.



valvematic

control of implement drop speed

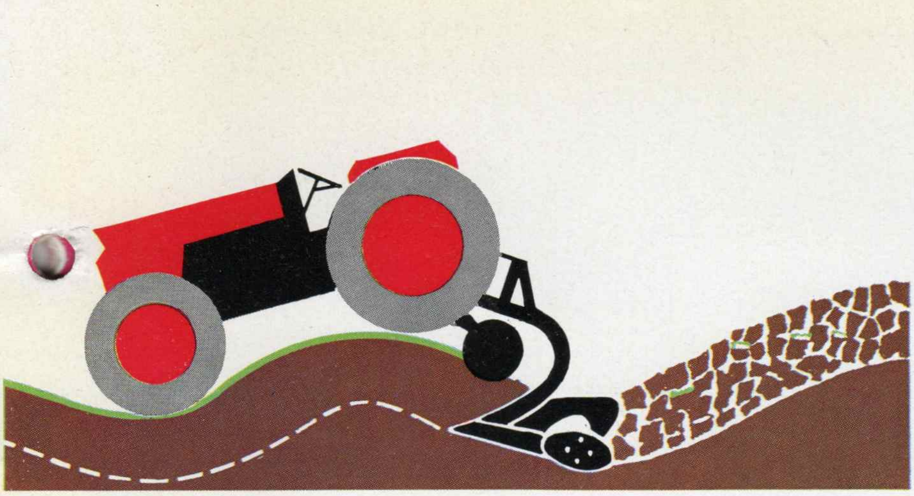
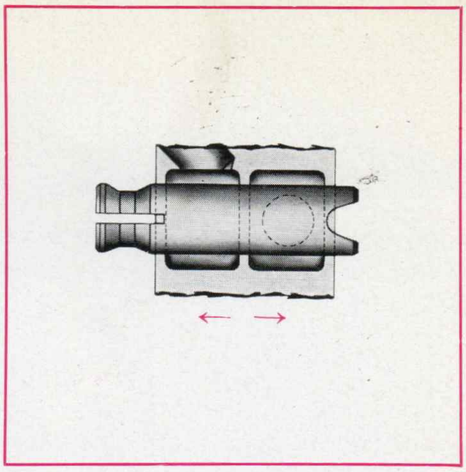
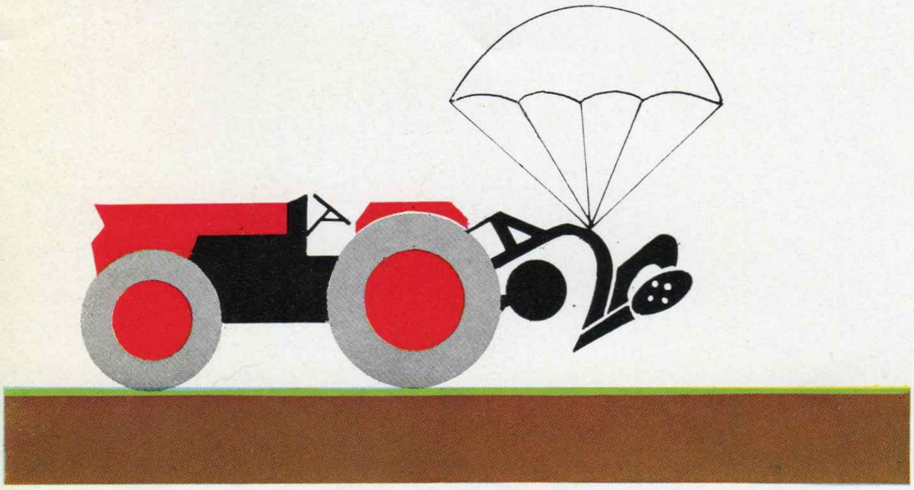
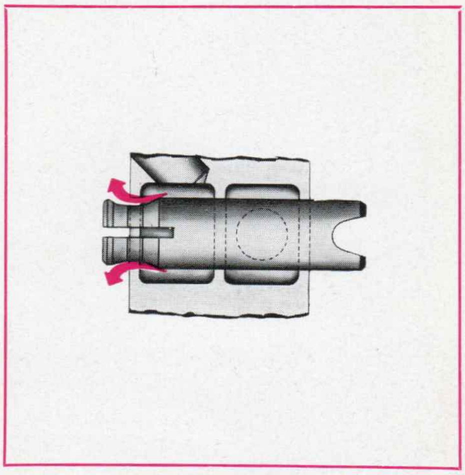
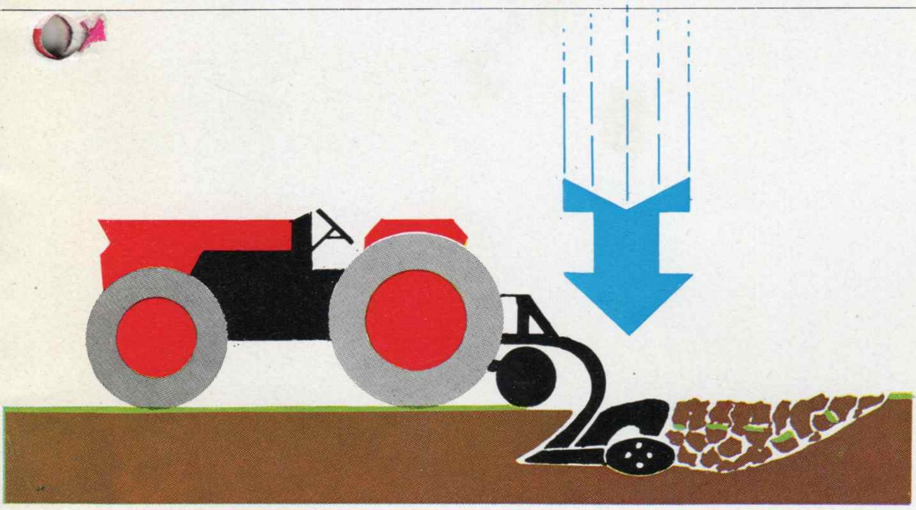
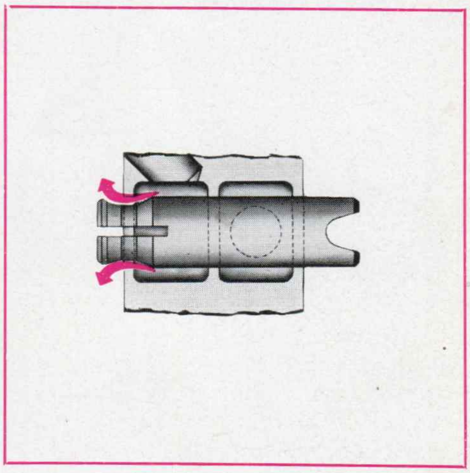
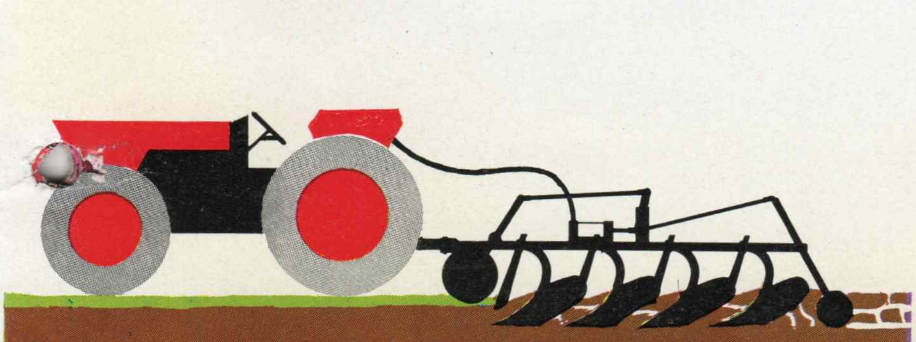
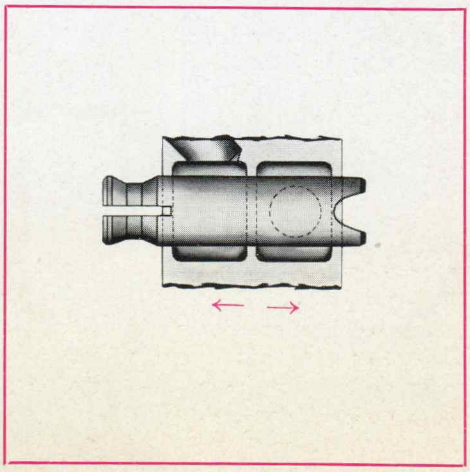
This is brought about by the « valvematic » valve which, during the lowering, automatically slows up the flow of delivery oil coming from the hydraulic jack; and so the implement, after a rapid start of fall, slows up its fall-movement so as to touch the soil gently.

rapid implement sinking

When at the start of the furrow the implement is lowered and the control hand-lever is kept for a few seconds in the red section of the inner field of the plate, rapid sinking occurs; the reason for this is that the automatic force regulation does not operate because the disengagement cam takes up a position that prevents the said regulation when the control hand-lever is on the blue or the red of the inner field. As soon as the desired work-depth is reached the force control is made operative again by bringing the control hand-lever into the green section of the inner field.

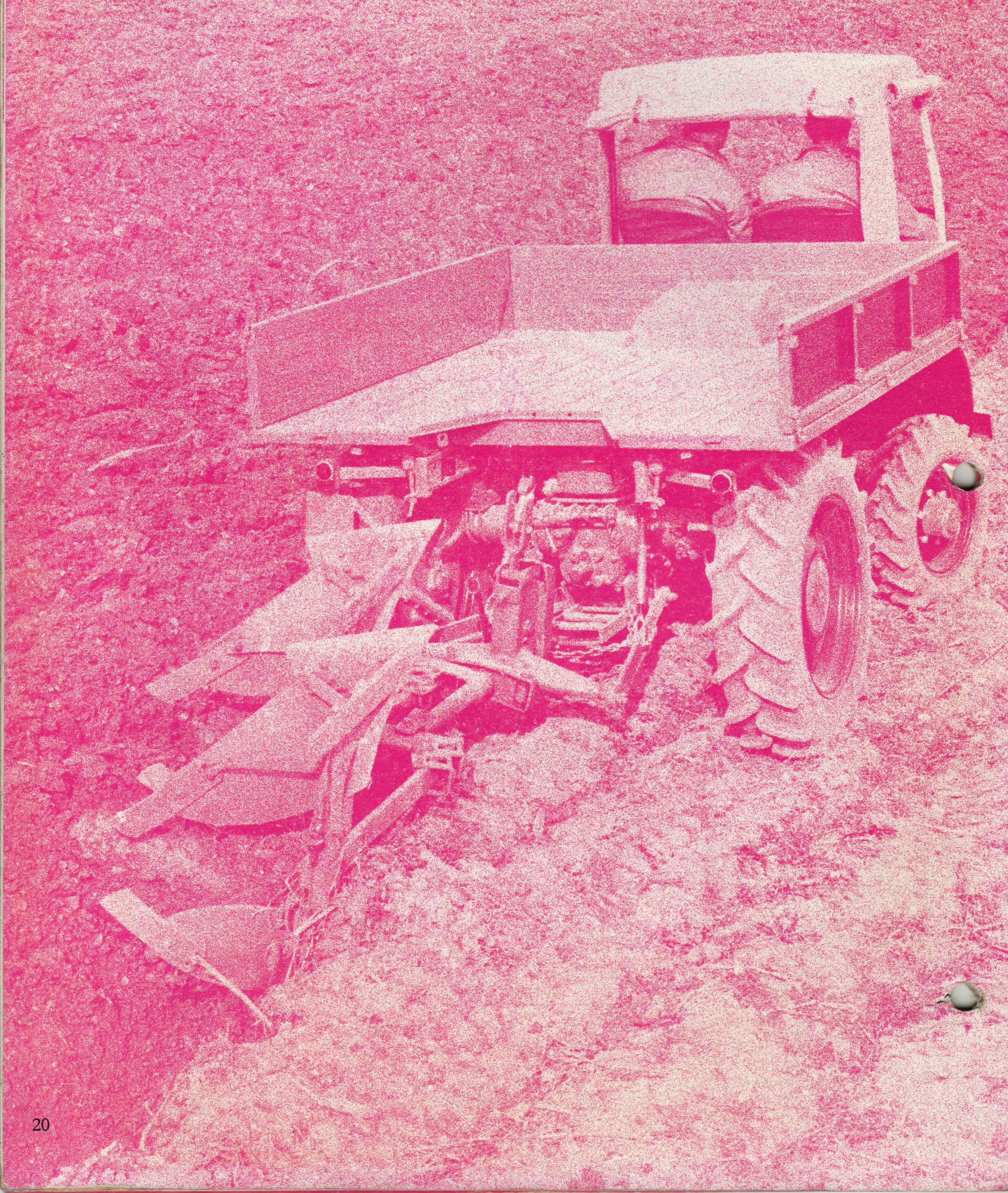
force control-trailed implements

The operative mechanism is the same as with the three-point hitch. However, it is necessary for the trail coupling to be made on the two lower coupling levers and for the regulation to be effected with the implement's own hydraulic jacks connected to the delivery section of the Automatic Control Unit.

In practical use, the fundamental functions of the « SAME » Automatic Control Unit are: tractor transfer with implement raised; work with sunk and surface implements (plough, grubber, harrow, etc.) with controlled force, or effort; work with implements that work both sunk and unsunk in controlled position. The position of the hand-levers for the single cases are now given:

how the SAME automatic control unit behaves in practice



tractor transfer with implement raised

The raising hand-lever should be taken to the highest point of its blue field, while the depth-control hand-lever can be placed at any point of its own field, beyond the number 3. With the controls in these positions the implement is raised to maximum.

controlled draft work with sunk and surface implements (plough, grubber, seeder, etc.)

When starting to till, the regulation hand-lever (green hand-grip) is taken upwards to the number 3, while the raising hand-lever (yellow hand-grip) is pushed into the red section, which section brings rapid implement sinking.
Once the required depth has been reached, the raising hand-lever should be pushed decisively onto the green field and then the regulation hand-lever (green hand-grip) should be at once drawn downwards until the required work-depth is attained; fix this limit with the wing nut.
In the successive furrows or runs, operate only the raising hand-lever (yellow handle), which should be taken as far as it will go upwards at the end of the furrow or run, while at the start of the successive furrow it should be pushed downwards towards the green field, with a shot « stay » in the red section for rapid sinking.

work in controlled position with implements operating sunk and unsunk

Beyond the number 3, the position of the regulation hand-lever is of no importance. By shifting the raising hand-lever into the blue section of its field innumerable implement position possibilities are obtained, because a determined position of the Control Unit raising arms corresponds to each position of the raising hand-lever in the blue field. Once the work-depth or height has been determined, limit the raising hand lever with the wing nut provided for the purpose. To raise the implement, take the said lever back to the highest point of its field. When it is brought successively against the wing nut, the implement returns to the identical position of height or depth.

simplicity and convenience: a new SAME style of tilling the soil

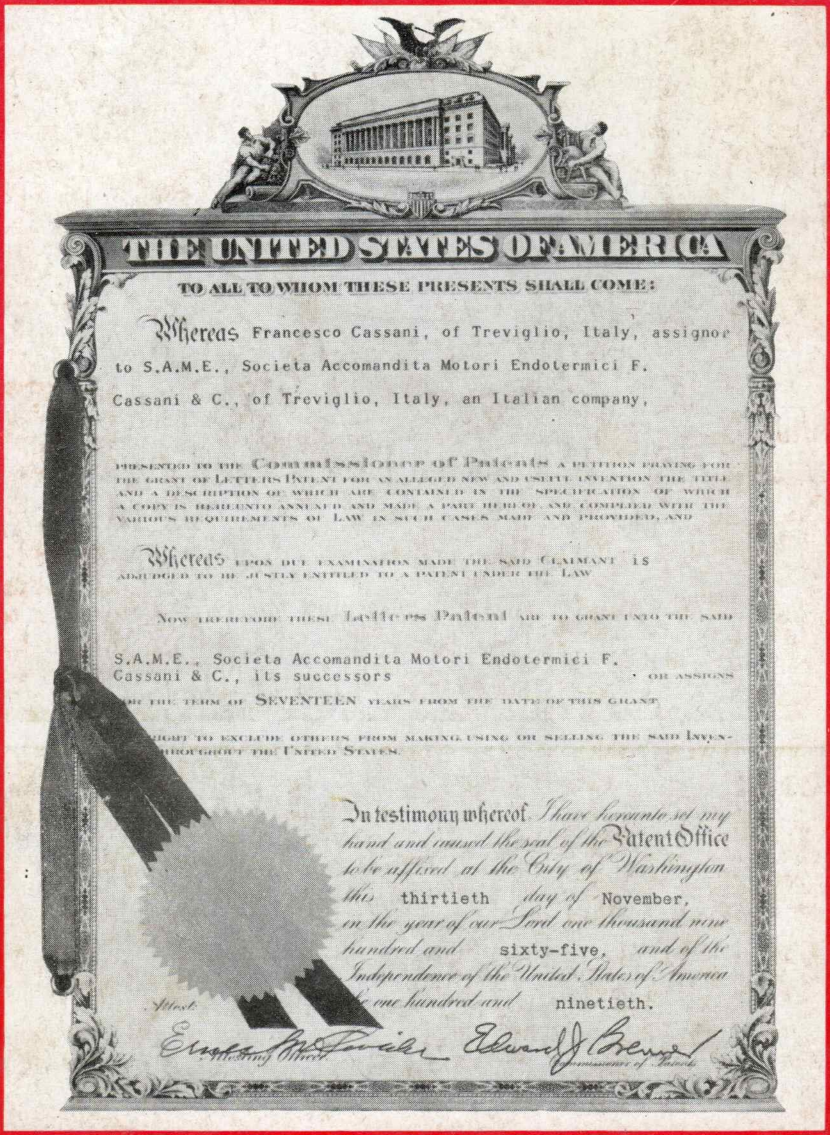
It can be understood from the manner in which all the operations described are carried out that the fatigue and effort of the driver as regards implement manoeuvre are cut down to minimum. Everything is reduced to an easy and effortless rotation of the control and regulation hand-levers, which involves not the slightest body-shifting on the driver's part.

increased towing capacity

It is known that, unloaded, the total weight of a tractor sub-divides over the four wheels, to the extent of about one-third on the front wheels and two-thirds on the rear. With the coupling and raising of a carried implement this distribution is altered, since not only does the entire weight of the implement come to bear on the rear wheels, but also the share of weight transferred from the front wheels. Even when the implement is operative and sunk into the earth the same thing happens during the small raisings for automatic regulation of work-depth, with consequent increase of adhesion and thus of towing capacity, without the addition of superfluous, not to say prejudicial, weights. Increased adhesion means less slipping, with consequently greater mechanical efficiency and longer life for the tractor, and less wear on the tyres.

the Automatic Control Unit improves tractor stability

The longitudinal stability in respect of pitching is undoubtedly improved because the upper strut (rod of the third hitch point) pushes the front wheels downwards under the effect of the resistance forces met by the implement.
As regards transversal stability, the solid and close linkage between tractor and sunk implement makes lateral overturning very unlikely indeed.


THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas Francesco Cassani, of Treviglio, Italy, assignor to S.A.M.E., Societa Accomandita Motori Endotermici F. Cassani & C., of Treviglio, Italy, an Italian company,

presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful invention the title and a description of which are contained in the specification of which a copy is hereunto annexed and made a part hereof, and complied with the various requirements of Law in such cases made and provided, and

Whereas upon due examination made the said Claimant is adjudged to be justly entitled to a patent under the Law

Now therefore these Letters Patent are to grant unto the said

S.A.M.E., Societa Accomandita Motori Endotermici F. Cassani & C., its successors or assigns

the term of SEVENTEEN years from the date of this grant

right to exclude others from making using or selling the said Inven-
throughout the United States.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this thirtieth day of November, in the year of our Lord one thousand nine hundred and sixty-five, and of the Independence of the United States of America the one hundred and ninetieth.

Attest:

Attesting Officer

Commissioner of Patents

Official recognition in U.S.A. of the originality of the SAME Automatic Control Unit

SAME

SAME
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