Amsler Original Planimeters

AMSLER ORIGINAL PLANIMETERS

INVENTED IN 1854 BY PROF. J. AMSLER-LAFFON.
Developed and Improved by the
AMSLER WORKS
for High Precision Instruments
on the basis of over 80 years' experience
and unceasing studies.

OVER 80,000 AMSLER ORIGINAL PLANIMETERS ARE IN USE IN ALL PARTS OF THE WORLD

Some points for the Amsler Original Planimeters :

SIMPLE IN CONSTRUCTION — SIMPLE IN USE
HIGH CLASS WORKMANSHIP — FINE FINISH
RELIABLE RESULTS — LASTING ACCURACY
CONVENIENT AND SMART MAKE-UP

■

The quality, reliability and accuracy of adjustment of each instrument is guaranteed by the facsimile signature of the inventor :

which is engraved on every real Amsler Original Planimeter.

LOOK OUT FOR THE ABOVE TRADE-MARK !
Insist on AMSLER ORIGINAL PLANIMETERS !

AMSLER ORIGINAL PLANIMETERS

GENERAL DESCRIPTION.

Planimeters are small, handy instruments of high-class workmanship suitable for measuring areas of any shape. They are altogether the best and most exact means for the computation of figures of irregular outlines. The instruments being perfect, the accuracy of the results obtained is subject only to the possibility of the hand following exactly the outline of the figure to be evaluated.

AMSLER Original Planimeters are made in many sizes and shapes. They are divided into two main categories ;

(*a*) The POLAR PLANIMETERS and

(*b*) The LINEAR PLANIMETERS

and each of these categories again can be subdivided into two classes :

(1) The **fixed-arm** Planimeter, having a tracing arm of permanent and unalterable length, and

(2) The **sliding-arm** Planimeter with adjustable tracing arm.

The Fixed-arm Polar Planimeter shown in fig. 2 represents the simplest form of an AMSLER Planimeter. It can be made to one scale only, and measures the actual area of the figure which is being circumscribed, in square inches and decimals for the English instrument, and square centimetres and decimals for the metric one.

The Sliding-arm (or Proportional) Polar Planimeter, of which fig. 4 represents the simplest form, has an adjustable tracing arm, divided into a number of scales, i.e., positions at which the length of the tracing arm stands in a certain relation to the scale of the figure to be evaluated, which allow the result to be obtained in the most convenient way. In addition to these scales, the sliding arm can be provided with a fine division and vernier, permitting paper shrinkage to be accounted for.

DETAILS OF THE INSTRUMENTS :

(A) POLAR PLANIMETERS :

These instruments consist in the main of

(*a*) **The Polearm.** This is a square, hollow bar, cranked at one end to escape contact with other parts of the instrument. The cranked end is provided with a joint or a pair of vertical pivots, so that the bar can move freely in a horizotanl direction only. The free end is called the **Pole** and is fitted with the pole-needle holder through the centre of which passes the pole-needle.

(*b*) **The Tracing Arm.** This can be either of permanently fixed length or of adjustable length. One end of the tracing arm is jointed to the Polearm ; the other end carries the **tracing point,** by means of which the outline of the figure to be measured is very carefully followed.
Close to the tracing point, there is a small support adjustable in height. This support has no bearing on the instrument proper ; it is an accessory and prevents the tracing point sliding directly on the paper, thereby spoiling the tracing, sticking on the paper or becoming damaged.

(*c*) Fitted directly to the tracing arm, or in the case of the sliding-arm instruments to the tracing arm holder, is the **Measuring Unit.** This consists of the Measuring wheel of very carefully adjusted circumference, carried on a pivoted axis. The wheel, made of high grade steel, has a celluloid drum attached to it, which is divided into 100 parts, every tenth being numbered. A vernier opposite the celluloid drum permits 1/1000th of a revolution to be read.
The axis of the measuring wheel is cut with an endless screw, meshing with a worm wheel of 10 teeth which forms part of the **counting disc,** recording the number of complete revolutions of the measuring roller.

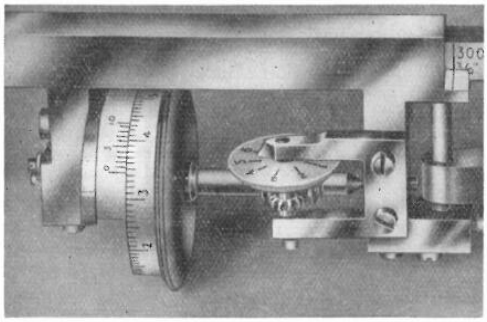

Fig. 1.

TAKING READINGS.

Each reading usually, is a figure of 4 digits. On the English instrument (giving the area in square inches), the reading on the counting disc represents the unit, that on the celluloid drum, the tenths and hundredths, and that on the vernier the thousandths. On the metric instrument the counting disc gives the 1,000, the celluloid drum the 100 and 10, and the vernier the 1.

Fig. 1 shows the measuring unit of a sliding-arm AMSLER Planimeter. In an English instrument, the reading would be 5.343 ; in a metric one 5343.

When taking readings, it must be remembered that the worm drive has an unavoidable backlash and that it may happen that when 0 of the measuring roller is opposite 0 of the vernier, the dash on the counting disc may not be exactly opposite the index mark, but slightly ahead or slightly behind. This will, however, influence neither the accuracy of the instrument nor the ease of taking readings.

If the initial reading is a high figure — say for instance 9875 it is likely that during the evaluation the counting disc will pass beyond the zero with the result that the final reading will be smaller, possibly quite considerably smaller, than the initial one (say 0225). In this case a 1 must be added in front of the second reading, i.e., in the above instance the figure must be completed to 10225. In the case of oversize instruments and very large figures the 0 of the counting disc may pass the index more than once in which case the 5th digit to be added must represent the number of times the 0 has passed the index.

USING THE POLAR PLANIMETERS.

A Polar Planimeter can be used in two ways : Either

(*a*) with the Pole **outside** the figure to be evaluated, or

(*b*) with the Pole **inside** the figure to be evaluated.

The former method is the more convenient and it is recommended that this method be adopted whenever possible, i.e., unless the figure to be measured is too large.

The drawing, map, etc., which must be measured, must be placed on a plane table, drawing board, etc. It is advisable to fasten it by means of drawing pins.

(*a*) Using the Planimeter with the POLE OUTSIDE THE FIGURE.

Take the instrument from the case and place it on the drawing, map, etc., in such a way that the tracing arm lies about across the middle of the figure and the tracing point is about $\frac{1}{2}$ to 1-in. outside the same. Swing the polearm out almost as much as it will go, and then gently press the pole needle into the table or drawing board. Load the pole needle with the small weight which is in the case, in order to steady the instrument.

Mark any point on the outline of the figure to be evaluated and set the tracing point to this mark.

Take the initial reading, noting it down on a paper.

Carefully follow with the tracing point the outline of the figure, in the direction of the movement of the hands of a watch, until you arrive again at the starting point.

Take the second reading, writing it above the initial one.

Deduct the initial reading from the second one.

The **difference in readings** thus obtained, multiplied by a constant, indicates either the actual area in square inches or square centimetres of the figure circumscribed, or the area represented by that figure, according to the type of instrument or the setting of the same. For further details see hereafter under the respective instruments.

To get accurate results, the outline of the figure must be followed very minutely. Straight lines may be traced along a slip of horn or the thin edge of a ruler. For tracing curves and irregular figures it is advisable to use both hands, holding the knurled knob on top of the tracing point with thumb and index finger of one hand, and steadying the movements with the other hand.

When setting the instrument on the paper, care should be taken to get a position where the measuring disc runs on a surface as far as possible free from creases, etc. It should also be avoided, whenever possible, that the measuring disc has to run on and off the drawing paper, map, etc., particularly obliquely.

(*b*) Using the Planimeter with the **POLE INSIDE THE FIGURE.**

Large figures cannot be evaluated in one operation with the Pole outside the outline. They will have to be divided up into several sections, or else the Pole of the Planimeter must be placed inside the figure.

For the latter method of computation, set the instrument on the drawing in such a way that the Pole is more or less in the centre of the figure. Mark a starting point on the outline, set the tracing point to this position, take the initial reading, follow the circumference carefully with the tracing point, in the manner already described, and take the second reading. Deduct the initial reading from the second one, and add the 5-figure constant (which is engraved on the Pole weight in the case of fixed-arm Planimeters, or over the respective scale in the case of sliding-arm Planimeters) to the difference in readings obtained, if the total movement of the measuring roller has been a forward one, or deduct the difference in readings from the constant if the total movement has been a backward one.

The 5-figure constant mentioned above, represents the area of the zero circle, i.e., of that circle lying between the pole and the tracing point when the axis of the measuring wheel is exactly at right angle to the pole, and is called zero circle, because the measuring wheel will not revolve at all if a circle of the given area is circumscribed, the pole being at the centre. If a figure is measured with the pole inside the same, the Pole arm will sweep around its zero circle, the measuring wheel thereby adding up whatever lies outside, and again deducting whatever lies inside the circle. Evidently, if all, or the major part of the figure lies outside the zero circle more area will be added than is being deducted, the total movement of the measuring roller will be forward, the second reading will be in excess of the initial one and the difference in readings will have to be added to the constant. Vice-versa if the major part of the figure to be traced lies inside the zero circle, more area will be deducted than added, the total movement of the measuring roller will be backward, the second reading will be smaller than the initial one and the difference in readings obtained will have to be deducted from the constant.

When evaluating with the pole inside the figure, it is always best to make a preliminary, rough tracing in order to ascertain whether the total movement of the roller is forward or backward. Quite large figures or quite small figures, may add or deduct quite a lot to or from the initial reading, causing the counting disc to pass beyond or below 0 which will need some further consideration (see example page 6).

CHECKING THE INSTRUMENT.

All Planimeters are liable to the following disturbances :—

(1) The movement of the measuring roller over the paper is partly a rolling and partly a sliding one. This latter is liable, in course of years of very hard use, to wear the steel disc. On a new instrument the circumference of the measuring disc is slightly roughened (noticeable only with a magnifying glass) in order to increase the adhesion to the surface. If this tread is worn off, the instrument is liable to slide when it ought to roll, and small errors may creep in. In such a case, the entire instrument must be returned to the makers for fitting a new measuring disc and for subsequent re-adjustment.

(2) The Polearm may have become bent. This will not influence the accuracy of the instrument, if used with the Pole outside the figure, but will change the constant or constants for using the instrument with the Pole inside.

(3) The Tracing arm may have become bent, in which case the instrument is out of adjustment for both ways of use. In such a case, customer may try to straighten the bent arm or return the instrument to makers for re-adjustment.

(4) The axis of the measuring roller, which must be in perfect alignment with the tracing arm, may have become displaced. This will not happen unless the customer has taken the instrument to pieces or otherwise has tampered with the original adjustment.

The **accuracy** of AMSLER Planimeters can best be **checked** by means of an AMSLER CHECKING RULER (see page 26). If no such ruler is available, a finely drawn square or circle may be circumscribed by hand, the result obtained being compared with the area as obtained by arithmetic means.

Generally speaking, customers should not try to make any adjustments themselves other than adjusting the play in the longitudinal direction of the axis carrying the measuring roller. In course of use, the pivots of this axis may become dirty and sticky, in which case the roller may be removed for cleaning by undoing the pivot with the fine adjusting screw just sufficient to permit of the removing of the roller, or the pivots may work loose, in which case they can be slightly tightened.

GENERAL REMARKS.

The **accuracy** of the mechanism of any of the Amsler Original Planimeters is greater than the accuracy with which a figure can be followed with the tracing point by hand when using the greatest possible care.

Avoid touching the rim of the measuring roller. It is made of hardened steel and is liable to be spoiled by rust. Remember that the roller and the pivot points of the axle are particularly subject to injury.

Therefore, do not attempt to set the roller to zero, the more so as this would involve more time and trouble than taking the reading as it stands.

The roller must rotate very easily and should have very little shake between the pivot centres. The edge of the celluloid drum should not touch the vernier. The vertical axle of the pole arm should turn without back-lash.

Oil the pivot-centres occasionally with fine oil and avoid bending of tracing arm and tracing point, as this would disturb the adjustment of the planimeter.

For replacing a broken needle point, slacken the little clamp screw at the holder, press the broken needle backward, put another in its place, clamp it and break off the portion standing out on the top of the bar, Suitable needles are R. Hemming & Son's blunts 7.

The sliding foot near the tracing point should be adjusted in height, so that the tracing point is just clear of the diagram paper.

All Amsler Planimeters bear the Signature of the Inventor :

Beware of Imitations.

AMSLER ORIGINAL PLANIMETERS

No. 1 (brass)
No. 2 (electrum)

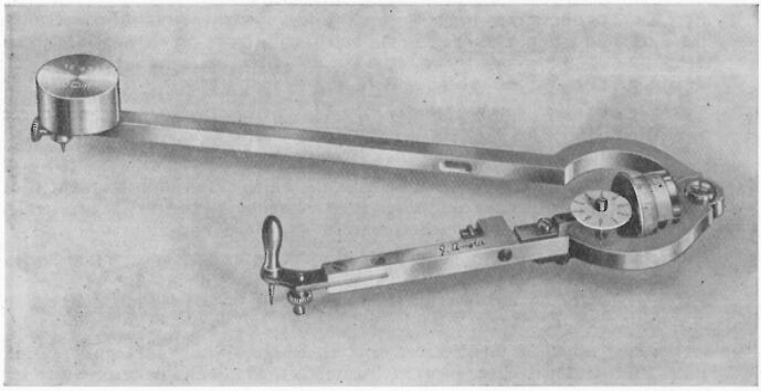

Fig. 2.

These instruments are of the fixed kind, i.e., the tracing arm is not adjustable in length and the instrument permits of measuring only in one particular scale.

They indicate the actual area of the figure circumscribed in square inches, or in square centimetres.

RANGES OF INSTRUMENTS		*English*	*Metric.*
Pole **outside** the figure.	Circle diameter ...	8-in.	30 cm.
	square	7 in.	27 cm.
	rectangle ...	5 x 14 in.	18 x 50 cm.
Pole **inside** the figure.	Circle diameter ...	18 in.	64 cm.
	Square	14 in.	45 cm.
	Rectangle ...	10 x 18 in.	40 x 50 cm.

On the pole weight there are engraved two sets of figures. The one (10 sq. inch) on an English instrument, denotes the value of one complete revolution of the measuring roller, i.e., the value of the counting disc reading, or on a metric instrument (0.1 □ cm) the value of the vernier unit. The other figure, of 5 digits, is the constant for use with the pole inside the figure, i.e., the value of the zero circle.

EXAMPLES.

	English.	*Metric.*
Pole **outside** the figure :		
To evaluate a circle having a diameter of	4 in.	10 cm.
Take the initial reading to be ...	2730	2258
The second reading will be ...	1473	1473
Difference between readings is	1257	785
This multiplied by	10	0.1
results in an area of...	12.57 sq. in.	78.5 sq. cm.

	English.	*Metric*
Pole **inside** the figure :		
To evaluate a circle having a diameter of (A rough tracing of the outline has shown that the total travel of the measuring roller has been a backward one.)	10 in.	40 cm.
Take the initial reading to be	2.675	2675
which must be completed to ...	12.675	12675
The second reading will be	4.414	10173
Difference between readings is ...	8.261	2502
Figure on weight	16.115	15068
Less : Difference between readings	8.261	2502
Difference	7.854	12566
This multiplied by	10	0.1
results in an area of	78.54 sq. in.	1256.6 sq.cm.
Pole **inside** the figure :		
To evaluate a circle, having a diameter of (A rough tracing of the outline shows that the total travel of the measuring roller is a forward one).	15 in.	50 cm.
Take the initial reading to be ...	4.994	8005
The second reading will be ...	3.438	3438
Difference between readings is ...	1.556	4567
Add figure on weight	16.115	15068
	17.671	19635
Multiplied by	10	0.1
results in an area of	176.71 sq. in.	1963.5 sq.cm.

This instrument may also be used on the following scales by multiplying the difference of readings by the respective factor similarly to the method explained under No. 3 or No. 4 Amsler Planimeter.

ENGLISH INSTRUMENT.

Value of one complete revolution of roller D (multiplier)	Scale of the drawing
10 □ in	Full size
10 □ ′	1″ to 1′
40 □ ′	½″ „ 1′
1000 □ ′	1″ „ 10′
4000 □ ′	1′ „ 20′
1000 □ y	1″ „ 30′
4000 □ y	1″ „ 60′
0.25 ac	1″ „ 33′
1 ac	1″ „ 66′
4 ac	1″ „ 2 ch

METRIC INSTRUMENT.

Value of vernier reading (multiplier)	Scale of drawing
2.5 □ dm	1 : 50
0.1 □ m	1 : 100
0.4 □ m	1 : 200
2.5 □ m	1 : 500
10 □ m	1 : 1000
40 □ m	1 : 2000
2.5 Ar	1 : 5000

(″ = in., ′ = ft., y = yards, ch = chains, ac = acres)

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AMSLER ORIGINAL PLANIMETERS

No. 1a (Brass)
No. 2a (Electrum)

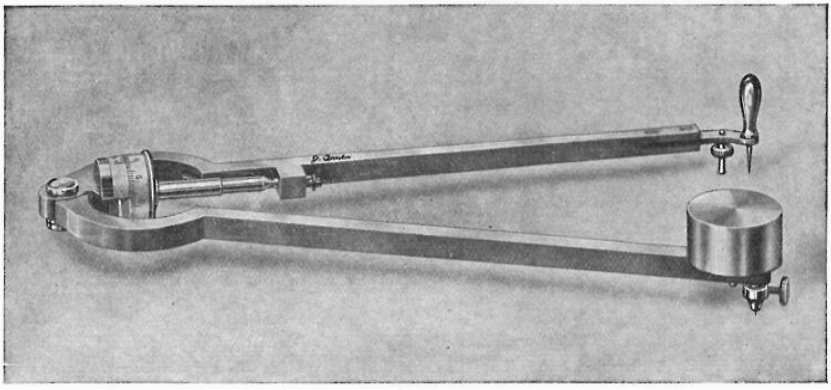

Fig. 3.

These instruments are similar to the No. 1 and No. 2, but have NO counting disc for indicating complete revolutions of the measuring roller.

The reading obtained thus is a figure of 4 digits only, the 5th one having to be estimated, if necessary, and added.

These instruments are not well suited for evaluating large figures.

For method of use, look up Planimeters No. 1 and 2.

The Measuring Roller, Vernier and Counting Disc on all Amsler Original Planimeters are Celluloid and are provided with very clear and exact graduations, **ensuring convenient and accurate readings.**

Every AMSLER Original Planimeter bears the signature of the Inventor

J. Amsler

Beware of Imitations.

AMSLER ORIGINAL PLANIMETERS

No. 3 (Brass)
No. 4 (Electrum)

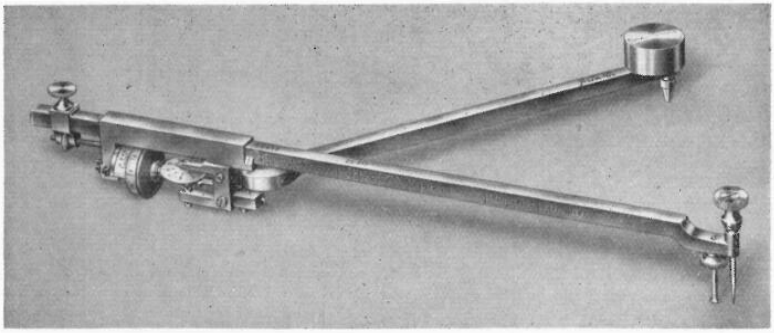

Fig. 4.

Arranged for measuring areas in several scales and units of measurement (English, Metric, or both) according to specifications.

These instruments are especially suitable for geometricians and surveyors.

RANGES OF INSTRUMENTS.		*English*	*Metric*
Pole **outside** the figure.	Circle — diameter	11½ in.	29 cm.
	Square — sides ...	10 in.	26 cm.
	Rectangle	7 x 19 in.	18 x 48 cm.
Pole **inside** the figure.	Circle — diameter	25 in.	63 cm.
	Square — sides ...	18 in.	45 cm.
	Rectangle ...	16 x 19 in.	40 x 48 cm.

The TRACING ARM is ADJUSTABLE in LENGTH to suit various scales.

ADJUSTING THE INSTRUMENT to the desired scale.

Loosen the thumb screw on the left of the instrument by a half turn and then displace the sliding tracing arm until the line **on the left** of the desired scale is about in line with the short index on the frame. Tighten the thumb screw slightly and adjust the line exactly to the index by means of the fine adjustment screw below the thumb screw.

THE STANDARD SCALES ARE AS FOLLOWS :—

ENGLISH INSTRUMENT.

on back	200 ac 6″ = 1 mi	10 ac 1 : 2500 0.4 ac 1 : 500	5 ac 1 : 2500 0.2 ac 1 : 500		
on front	100 □ cm	100 □ ′ 3/8″ = 1′	200 □ ′ 1/4″ = 1′ 50 □ ′ 1/2″ = 1′	10 □ in.	100 □ ′ 1/4″ = 1′ 400 □ ′ 1/8″ = 1′

METRIC INSTRUMENT.

on front	10 □ m 1 : 1000 0.4 □ m 1 : 200	2 □ m 1 : 500 0.5 □ m 1 : 250	1 □ m 1 : 400	
	5 □ m 1 : 1000	1 □ m 1 : 500		

ENGLISH AND METRIC INSTRUMENT.

on front | 300 ac 0.6 ac
6″ = 1 Mi | 1 : 500
1 : 2500 | 100 □′ $\frac{3}{8}$″ = 1″ | 50 □′ $\frac{1}{2}$″ = 1′
200 □′ $\frac{1}{4}$″ = 1′

| 10 □ in. | 100 □′ $\frac{1}{4}$″ = 1′
400 □′ $\frac{1}{8}$″ = 1′

on back | 100 □ cm 1 : 1 | 4 Ar 1 : 200
1 Ha 1 : 100 | 5 Ar 1 : 250
0.2 Ha 1 : 500 | 0.1 Ha 1 : 400

| 0.5 Ha 1 : 1000
2 Ha 1 : 2000 | 0.1 Ha 1 : 500
2.5 Ha 1 : 2500

METRIC AND ENGLISH INSTRUMENT.

on front | 10 □ m 1 : 1000
0.4 □ m 1 : 200 | 2 □ m 1 : 500
0.5 □ m 1 : 250 | 1 □ m 1 : 400

| 5 □ m 1 : 1000 | 1 □ m 1 : 500

on back | 0.3 ac 0.015 ac
6″ = 1 mi 0.0006 ac | 1 : 2500
1 : 500 | 0.1 □′ $\frac{3}{8}$″ = 1″ | 0.2 □′ $\frac{1}{4}$″ = 1′
0.05 □′ $\frac{1}{2}$″ = 1′

| 0.01 □ in. | 0.1 □′ $\frac{1}{4}$″ = 1′
0.4 □′ $\frac{1}{8}$″ = 1′

The figures **on top** of the tracing arm are the constants for using the instrument with the Pole **inside** the figure.

These markings mean :

In the ENGLISH instrument

That if a figure drawn to the scale of say $\frac{3}{8}$″ = 1′ is evaluated with the Planimeter set to the line immediately on the left of the respective marking on the tracing arm, each complete revolution of the measuring roller, i.e., each unit of the difference in readings represents 100 sq. feet.

In the METRIC instruments

That if a figure drawn to the scale of say 1 : 1000 is evaluated with the Planimeter set to the line immediately on the left of the respective mark on the tracing arm, each unit of the difference in readings represents 10 square metres.

In other words, to get the actual area represented by the figure evaluated and drawn to the scales mentioned above, in the case of the

ENGLISH instrument

The difference in readings must be multiplied by 100, the result obtained being square feet.

METRIC instruments.

The difference in readings must be multiplied by 10, the result obtained being square metres.

EXAMPLE :

	English	*Metric*
Pole **outside** the figure :		
To evaluate a drawing, drawn to the scale of	$\frac{1}{4}$″ = 1 ft.	1 : 500
representing a square of ...	25 ft. side	50 m. side
Take the initial reading to be, ...	9.695	7820
Second reading will be	6.570	6570
Difference between readings is	3.125	1250
This Multiplied by	200	2
results in an area of	625 sq. ft.	2500 sq. m.
Pole **inside** the figure :		

Look up examples page 6, and multiply difference in readings appropriately.

AMSLER ORIGINAL PLANIMETERS

No. 5 (Electrum)

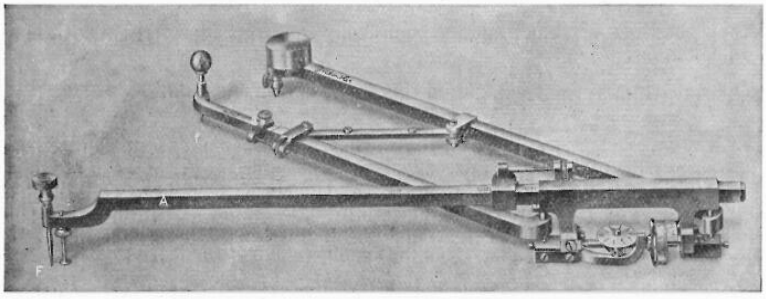

Fig. 5.

For measuring with equal accuracy both very large and very small figures. Both tracing arms are adjustable. Arranged for various scales and units both for English or Metric measurements.

This pantographic instrument is especially suited for ordnance map work. Large figures are circumscribed with the tracing point F (value of vernier .0125 to .025 sq. in. = 8 to 16 sq. mm.) and very small ones with the tracing point f (value of vernier .001125 to .002 sq. in. = .08 to 1.25 sq. mm.)

RANGES OF INSTRUMENTS.		*English*	*Metric*
Pole **outside** the figure.	Circle — diameter ...	17 in.	45 cm.
	Square — sides ...	15 in.	40 cm.
	Rectangle	12 x 27 in.	30 x 70 cm.
Pole **inside** the figure.	Circle — diameter ...	39 in.	100 cm.
	Square — sides ...	27 in.	70 cm.
	Rectangle	23 x 31 in.	60 x 80 cm.

STANDARD SCALES AND UNITS.

ENGLISH INSTRUMENT.

Tracing arm A | 100 □′ $\frac{1}{2}$″ = 1′ | 400 □′ $\frac{1}{4}$″ = 1′ | 40 □′ $\frac{3}{4}$″ = 1′ | 20 □ in. | 100 □ cm. | 400 □′ $\frac{3}{8}$″ = 1′ | 200 □′ $\frac{1}{4}$″ = 1′ | 800 □′ $\frac{1}{8}$″ = 1′

Tracing arm a. | 20 ac 6″ = 1 mi | 5 □′ $\frac{1}{2}$″ = 1′ | 20 □′ $\frac{1}{4}$″ = 1′ | 10 □ cm. | 2 □in. | 2 ac 1 : 2500

METRIC INSTRUMENT.

Tracing arm A. | 1 □ m. 1 : 250 | 4 □ m. 1 : 500 | 0.6 □ m. 1 : 200 | 15 □ m. 1 : 1000 | 20 □ m. 1 : 1250 | 80 □ m. 1 : 2500 | 10 □ m. 1 : 1000 | 40 □ m. 1 : 2000 | 2 □ m. 1 : 500 | 2 Ar 1 : 5000

Tracing arm a. | 0.2 □ m. 1 : 500 | 20 □ m. 1 : 5000 | 1 □ m. 1 : 1000 | 4 □ m. 1 : 2000 | 2 □ m. 1 : 1250 | 8 □ m. 1 : 2500

Other divisions can be provided instead of the above, on special request.

HOW TO USE THE INSTRUMENT.

1. For measuring **large areas** set the slide to the proper division on the bar A For doing this, hold the bar A with the right hand and shift the slide with the left hand whilst the parallelogram hangs down.

Then place the instrument upon the drawing and proceed exactly as with No. 3 or No. 4 Planimeter.

The tracing point *f* not being used thereby is better taken off.

2. For measuring **small areas**, the smaller sliding bar *a* is to be adjusted so that the proper mark on the bar comes even with the end face of the tube in which the bar slides (the bar *A* need not now be adjusted). Then lead the point *f* round the diagram by holding the point *F* with the hand, but following the point *f* with the eye. This can be done with great ease and accuracy, the two points *f* and *F* describing nearly similar paths. The area will then be expressed in the unit shown at the mark on bar *a*.

From the difference in readings obtained, the area is computed in a similar way as with the No. 3 or 4 Planimeter — which please look up.

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AMSLER ORIGINAL PLANIMETERS

No. 6 (Electrum).

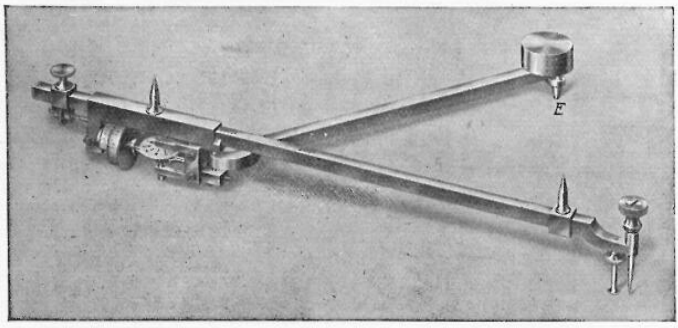


Fig. 6.

Similar instrument to No. 4, but with steel points on top of the tracing arm for rapidly finding the **mean height of Indicator diagrams and of other diagrams.**

The AMSLER ORIGINAL PLANIMETER No. 6 is made in **three** sizes, viz. :

RANGES OF INSTRUMENTS.

		English	*Metric*
Small size			
Pole **outside** the figure.	Circle — diameter	7 in.	18½ cm.
	Square — sides ...	6½ in.	16½ cm.
	Rectangle ...	10½ x 5¼	27½ x 13½ cm.
	Diagram — length	1½ to 5 in.	3½ to 13 cm.
Pole **inside** the figure.	Circle — diameter	17¼ in.	45 cm.
	Square — sides }	of any size which can be drawn	
	Rectangle }	within the above circle.	
Standard size			
Pole **outside** the figure.	Circle — diameter	11½ in.	29 cm.
	Square — sides ...	10 in.	26 cm.
	Rectangle ...	7 x 19 in.	18 x 48 cm.
	Diagrams — length	2 to 8 in.	5 to 20 cm.
Pole **inside** the figure.	Circle — diameter	25 in.	63 cm.
	Square — sides ...	18 in.	45 cm.
	Rectangle	16 x 19 in.	40 x 48 cm.
Large size			
Pole **outside** the figure.	Circle — diameter	27 in.	68 cm.
	Square — sides ...	24 in.	60 cm.
	Rectangle ...	19¼ x 38½ in.	49 x 98 cm.
	Diagram — length	5 to 16 in.	13 to 40 cm.
Pole **inside** the figure.	Circle — diameter	60 in.	150 cm.
	Square — sides }	of any size which can be drawn	
	Rectangle }	within the above circle.	

STANDARD SCALES.

The tracing arm, which is adjustable in length, has the following scales — unless otherwise ordered by the customer.

Small size instrument.

ENGLISH | 200 □′ $\frac{1}{4}$″ = 1′ / 50 □′ $\frac{1}{2}$″ = 1′ | 10 □ in. | 50 □ cm. | 100 □′ $\frac{1}{4}$″ = 1′ / 400 □′ $\frac{1}{8}$″ = 1′

METRIC | 0.08 □ cm. / 200 □ cm. 1 : 50 | 40 □ cm. 1 : 25 | 0.05 □ cm. / 20 □ cm. 1 : 20 | 400 □ cm. 1 : 100

Standard size instrument.

ENGLISH

on back | 200 ac 6″ = 1 mi. | 10 ac. 1 : 2500 / 0.4 ac. 1 : 500 | 5 ac 1 : 2500 / 0.2 ac 1 : 500

on front | 100 □ cm | 100 □′ $\frac{3}{8}$″ = 1′ | 200 □′ $\frac{1}{4}$″ = 1′ / 50 □′ $\frac{1}{2}$″ = 1′ | 10 □ in. | 400 □′ $\frac{1}{8}$″ = 1′

METRIC | 0.1 □ cm 1 : 1 / 40 □ cm. 1 : 20 | 200 □ cm 1 : 50 / 50 □ cm 1 : 25 | 100 □ cm 1 : 40

| 0.05 □ cm. 1 : 1 / 500 □ cm. 1 : 100 | 100 □ cm. 1 : 50

ENGLISH AND METRIC.

on back | 100 □ cm. 1 : 1 | 1 □ m. 1 : 10 / 4 □ m 1 : 20 | 5 □ m 1 : 25 / 20 □ m 1 : 50 | 100 m 1 : 40

| 0.5 □ m 1 : 10 / 50 □ m 1 : 100 | 2.5 □ m 1 : 25 / 10 □ m 1 : 50

on front | 300 ac. 0.6 ac. / 6″ = 1 mi. 15 ac. | 1 : 500 / 1 : 2500 | 100 □′ $\frac{3}{8}$″ = 1′ | 50 □′ $\frac{1}{2}$″ = 1′ / 200 □′ $\frac{1}{4}$″ = 1′

| 10 □ in. | 100 □′ $\frac{1}{4}$″ = 1′ / 400 □′ $\frac{1}{8}$″ = 1′

METRIC AND ENGLISH.

on back | 0.3 ac. 0.015 ac. / 6″ = 1 mi. 0.0006 ac. | 1 : 2500 / 1 : 500 | 0.1 □′ $\frac{3}{8}$″ = 1′ | 0.2 □′ $\frac{1}{4}$″ = 1′ / 0.05 □′ $\frac{1}{2}$″ = 1′

| 0,01 □ in. | 0.1 □′ $\frac{1}{8}$″ = 1′ / 0.4 □′ $\frac{1}{8}$″ = 1′

on front | 0.1 □ cm. 1 : 1 / 40 □ cm. 1 : 20 | 200 □ cm. 1 : 50 / 50 □ cm. 1 : 25 | 100 □ cm. 1 : 40

| 0.05 □ cm. 1 : 1 / 500 □ cm. 1 : 100 | 100 □ cm. 1 : 50

Large size instrument

ENGLISH.

on back | 60 ac 1″ = 264′ | 600 ac 6″ = 1 mi. / 6000 □ y 1″=40′ | 5000 ac 2″=1 mi / 20000 ac 1″=1 mi | 100 ac. 1 : 5000 / 400 ac. 1 : 10000

| 400 ac. 6″ = 1 mi. / 4 ac. 1″ = 88′ | 20 ac. 1 : 2500 / 0.8 ac. 1 : 500 | 60 ac. 1 :500

on front | 150 □′ $\frac{1}{2}$″ = 1′ / 600 □′ $\frac{1}{4}$″ = 1′ | 250 □′ $\frac{3}{8}$″ = 1′ | 2000 □′ $\frac{1}{8}$″=1′ / 8000 □′ $\frac{1}{16}$″=1′

| 30 □ in. / 3000 □′ 1″ = 10′ | 50 □′ $\frac{3}{4}$″ = 1′ / 800 □′ $\frac{3}{16}$″ = 1′ | 100 □′ $\frac{1}{2}$″ = 1′ / 400 □′ $\frac{1}{4}$″= 1′

| 20 □ in. / 20 □′ 1″ = 1′ | 100 □ cm. 1 : 1 / 100 □ m. 1 : 100 | 100 □′ $\frac{3}{8}$ = 1′

METRIC.

on front | 1.5 □ m 1 : 250 / 6 □ m. 1 : 500 | 0.2 □ cm 1 : 1 / 0.2 □ m. 1 : 100 | 100 □ cm. 1 :25 / 400 □ cm. 1 : 50 | 15 □ cm. 1 : 10 / 60 □ cm. 1 : 20

| 200 □ cm. 1 : 40 | 0.1 □ cm. 1 : 1 / 40 □ cm. 1 : 20 | 50 □ cm. 1 : 25 / 200 □ cm. 1 : 50

HOW TO USE THE INSTRUMENTS.

(*a*) **For evaluating areas.** Proceed exactly as with a No. 4 Planimeter (Please look up the instructions pages 2 and 9).

(*b*) **For finding the mean height of diagrams,** proceed as follows :

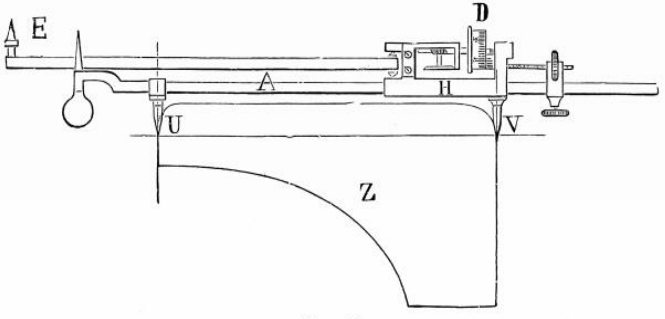


Fig. 7.

Take the diagram lengthwise between the steel points *U* and *V* on the upper side of the instrument, by shifting the slide *H* on the bar *A* and keeping the planimeter upside down (as shown in figure 7.) Then place the planimeter, without altering the relative position of slide *H* and bar *A*, in the usual way upon the drawing — needle-point *E* outside the diagram — and follow the outline of the diagram with the tracing point.

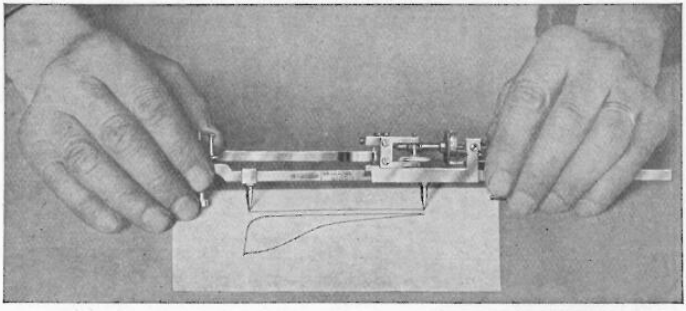


Fig. 8.

ENGLISH INSTRUMENT.

The difference in readings divided by 0.4 will then be the mean height of the diagram, expressed in inches.

Example : Let initial reading be 1.913
and second „ 2.361

Result :

Second reading 2.361
less initial reading 1.913

0.448 ÷ 0.4
= 1.12 in.
= mean height.

If the diagrams for up and down stroke are measured jointly, divide by 0.8 instead of 0.4.

Mean pressure = Mean height × Scale of spring of indicator. Supposing the scale of the spring in the above example is 1″ = 80 lbs. per sq. in., then

$$\text{Mean pressure} = \frac{0.448}{0.4} \times 80$$

= 89.6 lbs. per sq. in.

The number of lbs. per inch of height being usually a multiple of 4, the arithmetical work is thus extremely simple.

METRIC INSTRUMENT.

The difference in readings, multiplied by 0.06 will then be the mean height of the diagram, expressed in millimetres.

Example : Let the initial reading be 3336
and the second 3767

Result : Second reading 3767
Initial „ 3336

431 x 0.06
= 25.86 mm.
= mean height.

If the diagrams for up and down stroke are measured jointly, multiply by 0.03 instead of 0.06.

Mean pressure = Mean height divided by scale of indicator. Supposing the scale of the spring to be 12 mm. height of diagram = 1 At. steam pressure, then

$$\text{Mean pressure} = \frac{25.86}{12} = 2.155 \text{ Ats (kg/cm2)}.$$

For diagrams of the same length, the adjustment in length of the tracing arm remains unaltered.

When circumscribing a diagram, care must be taken that the pole needle is placed in such a position that the measuring roller passes over the edge of the diagram card in a perpendicular direction, and in no case in an oblique direction.

AMSLER ORIGINAL PLANIMETERS

No. 7 (Electrum).

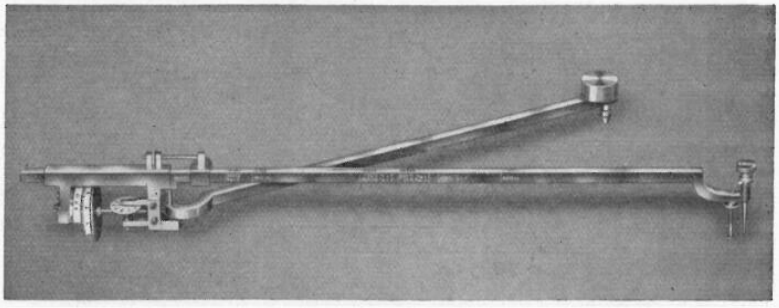


Fig. 9.

(For measuring large figures)

The instrument differs from the Planimeter No.4 only by its greater size, both as regards the measuring roller and the length of the pole and tracing arms.

The material used is heavier too than in the case of the No. 4.

RANGES OF INSTRUMENTS.		*English*	*Metric*
Pole **outside** the figure.	Circle — diameter ...	19 in.	48 cm.
	Square — sides ...	17 in.	44 cm.
	Rectangle	13 x 30 in.	35 x 75 cm.
Pole **inside** the figure.	Circle — diameter ...	42 in.	108 cm.
	Square — sides ...	30 in.	75 cm.
	Rectangle	25 x 33 in.	65 x 85 cm.

The Tracing arm is adjustable in length to suit various scales.

STANDARD SCALES.

ENGLISH INSTRUMENT.

on back | 40 ac. 1 : 2500 | 600 ac. 6″=1 mi. | 400 ac. 6″ = 1 mi. | 20 ac. 1 : 2500
| 1.6 ac. 1 : 500 | | | 0.8 ac. 1 : 500

on front | 0.03 □ m. | 300 □′ $\frac{3}{8}$″=1′ | 40 □ in. | 500 □′ $\frac{1}{4}$″=1′ | 800 □ ′ $\frac{3}{16}$″=1′
| | | | 2000 □′ $\frac{1}{8}$″=1′ | 50 □′ $\frac{3}{4}$″=1′
| 100 □′ $\frac{1}{2}$″ = 1′ | 20 □ in. | 100 □ cm.

METRIC INSTRUMENT.

on front | 0.3 □ cm. | 1 □ m. 1 : 200 | 5 □ m. 1 : 500 | 1 Ar 1 : 2500
| 0.3 □ m 1 : 100 | 4 □ m. 1 : 400 | 20 □ m. 1 : 1000 | 4 Ar 1 : 5000
| 0.8 □ m 1 : 250 | 10 □ m 1 : 1000
| | 40 □ m 1 : 2000

HOW TO USE THE INSTRUMENT.=The instrument is used in exactly the same manner as the number 4. Please look up the instructions for this latter instrument, page 9.

AMSLER DISC POLAR PLANIMETER

No. 8 (Brass or Electrum).

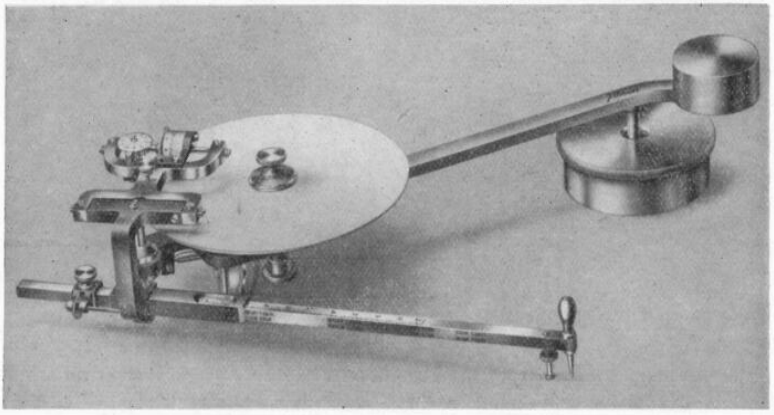


Fig. 10.

The instrument revolves around a fixed pole consisting of a ball-joint let into a round plate resting on the drawing table. When tracing the outlines of the figure, a conical pinion wheel runs with its edge along the drawing surface and transmits its movements to a small pinion fixed to the axis of a paper-faced horizontal disc. The measuring roller moves on this paper disc. Its play, consequently is independent of the condition of the drawing surface.

Compared with the Planimeters Nos. 1 to 7, the Disc Planimeter No. 8 has the further advantage that larger readings on the roller are obtained per unit of measurement, ensuring still greater accuracy of the result.

In addition to the scales mentioned below, the tracing arm is provided with a fine division with vernier, which is useful for setting the instrument to scales not engraved on the tracing arm, or for compensating for the shrinkage of the paper of the drawing or diagram.

The Measuring Roller, Vernier and Counting Disc on all Amsler Original Planimeters are Celluloid and are provided with very clear and exact graduations, **ensuring convenient and accurate readings.**

RANGES OF INSTRUMENTS.			*English*	*Metric*
Pole **outside** the figure.	Circle — diameter	...	10 in.	25 cm.
	Square — sides	...	$9\frac{1}{2}$ in.	24 cm.
	Rectangle ...	...	6 x 21 in.	16 x 52 cm.
Pole **inside** the figure.	Circle — diameter	...	32 in.	80 cm.
	Square — sides	...	22 in.	56 cm.
	Rectangle ...	...	18 x 26 in.	45 x 65 cm.

STANDARD SCALES.

ENGLISH

100 □′ $\frac{1}{4}$″ = 1′ 400 □′ $\frac{1}{8}$″ = 1′	40 □ cm.	40 □′ $\frac{3}{8}$″ = 1′ 100 ac. 6″ = 1 mi.	5 □ in. 0.2 ac. 1 : 500	
4 □ in. 4 ac. 1 : 2500	5 □′ $\frac{3}{4}$″ = 1′ 50 ac. 6″ = 1 mi.			

METRIC

4 □ m 1 : 1000 1 □ m. 1 : 500	80 □ m. 1 : 5000 20 □ m. 1 : 2500	0.4 □ m. 1 : 400 0.1 □ m. 1 : 200	8 □ m. 1 : 2000 2 □ m. 1 : 1000

HOW TO USE THE INSTRUMENT.

Place the Planimeter on the drawing as shown in figure 10. Adjust the bar, so that the index mark on the side coincides with the desired scale. Shift the pole plate into such a position that the whole outline of the figure can freely be circumscribed. Now proceed exactly as with the No. 3 or 4 Planimeters. (See page 9.)

For placing a fresh paper on the disc, fold the planimeter unit back, withdraw the disc from the instrument, unscrew the nut on top of the disc and fit on a new paper. Use a plain drawing paper of about the same grain as the one fitted on originally.

Every AMSLER Original Planimeter bears the signature of the Inventor :

Beware of Imitations.

AMSLER DISC LINEAR PLANIMETER

No. 9 (Brass or Electrum.

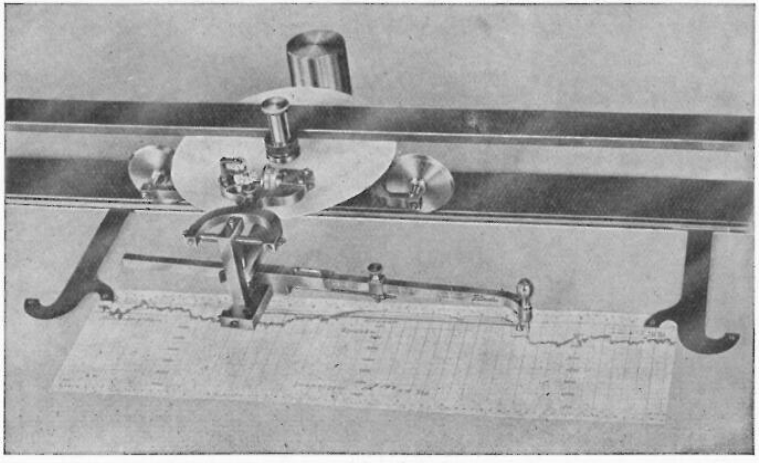


Fig. 11.

The Instrument forms a carriage which can be moved backwards and forwards on two wheels in the groove of the lower rail. A pinion engages the rack of another rail fixed above the first one. The counterweight seen behind the disc ensures proper play. When the carriage is moved along the track the gear device rotates the disc on which rests the measuring roller the direction of rotation of which is governed by the tracing arm.

The main advantages of this instrument over the No. 1 to 7 Amsler Polar Planimeters are :

(*a*) The rotating disc and the measuring roller are entirely independent of the condition of the drawing surface ;

(*b*) The readings per unit of measurement are greater than in any other type of Planimeter, and consequently

(*c*) The accuracy of the results obtained is the greatest.

The Instrument is especially suited for measuring with great accuracy long-drawn figures, such as for instance diagrams of registering apparatus.

A fine division with vernier on top of the tracing arm allows the shrinkage of the paper to be compensated.

Instrument and rail are packed together in a solid polished, wooden case.

RANGES OF INSTRUMENTS.

	English	*Metric*
Rectangle	20 x 9 in.	50 x 23 cm.
Total length of Guide Rail	30 in.	75 cm.

STANDARD SCALES.

ENGLISH	0.5 ac. 1 : 1000 20 □ cm.	0.02 □ *f*	5 □′ $\frac{3}{4}''$ = 1′ 20 □′ $\frac{3}{8}''$ = 1′	10 □′ $\frac{1}{2}''$ = 1′ 40 □′ $\frac{1}{4}''$ = 1′	2 □ in.	10 □ cm.
METRIC	0.02 □ m. 1 : 100 0.08 □ m. 1 : 200	0.1 □ m. 1 : 250 0.4 □ m. 1 : 500	2 □ m. 1 : 1250 8 □ m. 1 : 2500	1 □ m. 1 : 1000 4 □ m. 1 : 2000		

HOW TO USE THE INSTRUMENT.

Place the rail on the drawing board, as shown in the above figure, and the carriage upon the rail in such a way that the two wheels run in the groove on the lower straight edge and that the pinion on the top of the revolving disc gears into the rack of the upper straight edge. The disc and part of the carriage will then lie between the two straight edges. Place the counterweight into the arm standing out behind the rail. The adjustment of the length of tracing arm and the measurement is done in the same way as with No. 3 or No. 4 Amsler Planimeter. (See page 9.)

The complete revolutions of the measuring roller being very numerous in this type of Planimeter, two counters are provided. The second one records the complete revolutions of the first. **Readings therefore, are always figures of 5 digits** instead of 4, the units being read on the first counting disc.

For **putting a fresh paper on the disc,** swing back the little frame carrying the roller, withdraw the disc from the instrument, take off the screw-nut at the bottom of the disc and withdraw the axle.

The **TWO GAUGES** for holding the diagram, and for setting the instrument on the zero line of the same, shown in figure 11, are supplied on special order only. When using these gauges it is not necessary after circumscribing the diagram proper, to trace back along the zero line to the starting point. Any individual section of the diagram can also be very easily worked out.

For using these gauges, place the paper holder, which is provided with a pin, on the diagram in such a way that the straight index line runs even with the zero line of the diagram. Then set the tracing point to the left end of the diagram. Take the initial reading. Follow the outline of the diagram, in the direction of the clock, starting at the zero line, and ending again on the zero line. Take the second reading.

UNLESS SPECIALLY ORDERED, INSTRUMENTS FOR GREAT BRITAIN, HER DOMINIONS AND COLONIES AND FOR THE U.S.A. ARE SUPPLIED IN ENGLISH SCALE. FOR ALL OTHER COUNTRIES IN METRIC SCALE.

AMSLER LINEAR PLANIMETER

No. 10 (Brass or Electrum).

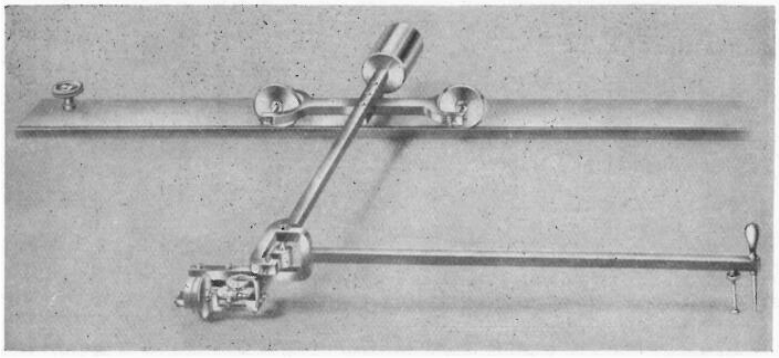


Fig. 12.

These are instruments especially designed for measuring figures of great length, such as, for instance, diagrams. They are arranged for one unit of measurement and for one definite scale only, and are thus similar to the AMSLER ORIGINAL PLANIMETERS No. 1 and 2, except that the instrument forms a carriage which can be moved backwards and forwards in the groove of a steel rail.

RANGES OF INSTRUMENTS.	*English*	*Metric*
Rectangle	16 x 51 in.	40 x 128 cm.
Length of guide rail	59 in.	150 cm.

Guide rail and instrument are packed in two separate polished wooden cases.

HOW TO USE THE INSTRUMENT.—Place the instrument on the drawing as shown by the illustration. Then proceed exactly as in the case of a No. 1 or 2 Polar Planimeter. (See pages 5.)

TWO GAUGES can be supplied on special order, by means of which the instrument can quickly and accurately be set to the zero line of diagrams. When using these gauges it is not necessary to trace along the zero line back to the starting point after circumscribing the diagram proper. Portions of a diagram can also be conveniently evaluated.

UNLESS SPECIALLY ORDERED, INSTRUMENTS FOR GREAT BRITAIN, HER DOMINIONS AND COLONIES AND FOR THE U.S.A. ARE SUPPLIED IN ENGLISH SCALE. FOR ALL OTHER COUNTRIES IN METRIC SCALE.

AMSLER LINEAR PLANIMETER

No. 11 Brass or Electrum.

Similar to AMSLER LINEAR PLANIMETER No. 10, but arranged for measuring diagrams of great length drawn by recording instruments whose recording arms move in the arc of a circle the length of which is proportional to the registered magnitude.

The tracing arm of this Planimeter can be adjusted to any length from 3 to 8 in. (7 to 20 cm.), corresponding to the length of the arm of the Recording Apparatus.

The angle movement of the tracing arm is at the maximum, 40 degrees to either side of the middle line.

The instrument can also be used for determining the area of diagrams having rectangular co-ordinates.

Length of guide rail	...	30 in. (75 cm.)
Available travel of Planimeter		24 in. (60 cm.)

Guide rail and instrument are packed together in a strong wooden case.

On special request the instrument can be arranged for evaluating diagrams the ordinates of which are not exactly proportional to the length of the arc of circle inscribed by the arm of the recording apparatus.

Every AMSLER Original Planimeter bears the signature of the Inventor :

Beware of Imitations.

AMSLER COMPENSATING PLANIMETER

No. 12 (Electrum).

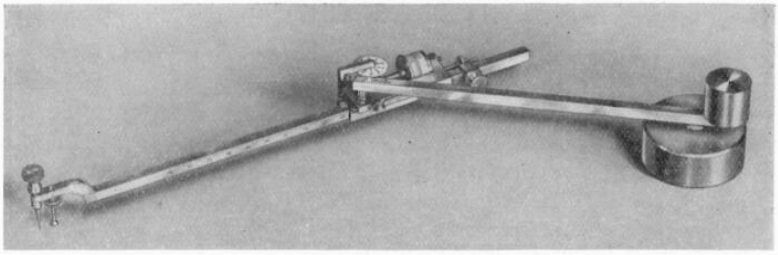


Fig. 13.

The AMSLER Compensating Planimeter is so designed that the tracing arm and measuring roller can pass freely underneath the Pole arm. By circumscribing the figure twice, first with the tracing arm on the left of the stationary pole, and again by having it on the right of the same, errors in the instrument can be compensated provided they are due to lateral deformation of the tracing arm or tracing point. Errors due to vertical deformation of the tracing arm, or to deformations of the tracing point in the direction of the tracing arm, however, cannot be compensated simply by changing the position of the tracing arm in relation to the pole. In such a case the instrument must be repaired and readjusted.

The AMSLER Compensating Planimeter No. 12 has an adjustable tracing arm, arranged for several scales and units of measurement, and is thus similar to the No. 4 Polar Planimeter. It has in addition a fine division on the tracing arm, with vernier and micrometer screw for fine adjustment, for setting the instrument to any desired scale or unit of measurement.

RANGES OF INSTRUMENTS.			*English*	*Metric*
Pole **outside** the figure.	Circle — diameter	...	12 in.	30 cm.
	Square — sides	...	11 in.	27 cm.
	Rectangle ...	...	7 x 21 in.	17 x 53 cm.
Pole **inside** the figure.	Circle — diameter	...	27 in.	68 cm.
	Square — sides	...	19 in.	48 cm.
	Rectangle ...	...	15 x 21 in.	38 x 53 cm.

STANDARD SCALES.

ENGLISH INSTRUMENT.

on back	200 ac 6″ = 1 mi	10 ac. 1 : 2500 0,4 ac. 1 : 500		5 ac. 1 : 2500 0,2 ac 1 : 500	
on front	100 □ cm.	100 □′ $\frac{3}{8}$″ = 1′	200 □′ $\frac{1}{4}$″ = 1′ 50 □′ $\frac{1}{2}$″ = 1′	10 □ in.	100 □′ $\frac{1}{4}$″ = 1′ 400 □′ $\frac{1}{8}$″ = 1′

METRIC INSTRUMENT.

on back	10 □ m 1 : 1000 0,4 □ m. 1 : 200	2 □ m 1 : 500 0,5 □ m 1 : 250	1 □ m 1 : 400
	5 □ m 1 : 1000	1 □ m 1 : 500	

HOW TO USE THE INSTRUMENT.

Place the pole plate on the drawing and set the pole socket into the pole plate, the measuring unit being on the left of an imaginary straight line between tracing point and pole. Proceed with the evaluation of the figure as in the case of a No. 4 Planimeter (See page 9.) Now pass the measuring roller underneath the pole arm to the other side of the imaginary line between tracing point and pole, without moving the poleplate, and make a second measurement. Take the average of the two readings thus obtained.

AMSLER RADIAL PLANIMETER

No. 13 Electrum.

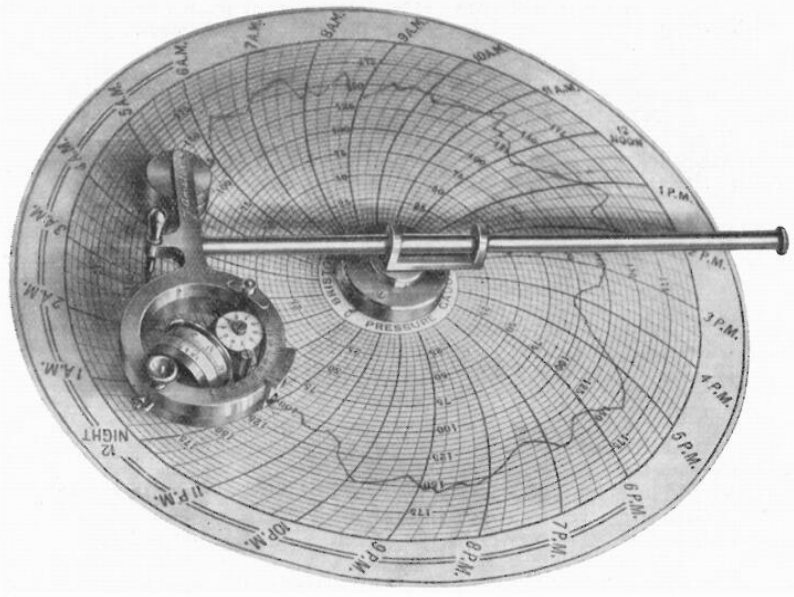


Fig. 14.

for measuring diagrams drawn in polar co-ordinates.

Most of the diagrams made by instruments recording air pressure, temperature, water pressure, mechanical work, etc., are drawn in polar co-ordinates. The disc on which the card is placed generally makes one revolution every 24 hours.

The Amsler Radial Planimeter is useful for measuring the mean ordinate of such diagrams, a measurement which cannot be made by means of the ordinary planimeter. Its construction is such that circular diagrams of various types can be evaluated.

The axis of the integrating wheel and the counter for it are set in a stout ring, having graduation marks from 0 to 90. This ring is let into the frame of the instrument which is also circular, and carries an index with a vernier division. If the zero on the vernier is opposite to zero on the scale, the axis of the wheel is parallel to the tracer arm. Any other adjustment changes the angle between the two directions and consequently the value of the unit of vernier of the instrument. It is simple to determine arithmetically and empirically for each different kind of diagram, a position of the ring which permits the evaluation of the diagram in question, after circumscribing it, by means of an easy calculation. The values corresponding to each setting of the ring, and the constants to be used, are given with every instrument.

When ordering a Radial Planitmeter it is however advisable to send specimens of all the diagram cards for which the instrument is to be adapted.

The operation of the instrument is similar to that of the usual type of Amsler planimeters.

Two exchangeable Pole hubs of $\frac{1}{4}''$ and $\frac{1}{2}''$ diameter are supplied with each instrument to fit into the central aperture of the diagram cards which are most commonly used. If different Pole hubs to fit other sizes (English or Metric) of central holes of diagrams are required, they must be clearly specified when ordering.

The usual model of this instrument takes a radius of 15 cm. (say 6″). On special request, and at a somewhat higher price, instruments can be supplied to take diagram cards of larger size.

USING THE INSTRUMENT.

On the inside of the instrument case there is a table indicating the corresponding factors for adjusting the instrument so as to determine the mean value of the diagram in the respective unit of measurement, also in inches or in millimetres.

For averaging a diagram, turn the adjustable ring in which the measuring roller is seated in such a way that the index is exactly opposite the division on the circular scale which is given in the table for the actual diagram. Place the instrument in the centre hole of the chart. Set the tracing point to any starting point on the graph (which should be marked), take a first reading, and then circumscribe the area between the graph and the inside circle (zero circle) of the chart in the following way : (see fig. 15) :

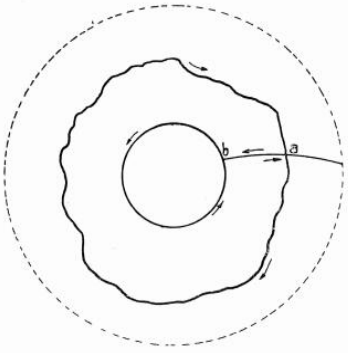


Fig. 15.

From the starting point (*a*) in a clockwise direction to (*a*), then along the arc to (*b*) of the inner circle, now along the inner circle, in an anticlockwise direction to (*b*), and thence back along the arc to (*a*).

Take a second reading, and subtract the first reading from the second one.

The average value of the polar ordinate, expressed in the proper (i.e. printed) scale of the diagram, is obtained by the formula :

$$\text{Average value} = \frac{\text{Factor x Difference of readings}}{\text{Number of hours}}$$

Under the expression " number of hours " is understood the number of hours over which the diagram extends. For a diagram extending over the whole circle the number of hours thus is 24. If the number of hours is less than 24, it will be sufficient to circumscribe only the sector-shaped diagram, in the manner described above.

Sketch No. 16 shows how to average a diagram recording for less than 24 hours. Care must be taken to return with the tracing point always to the starting point.

In the case of diagrams having the zero circle at the periphery of the card (the figures increasing from the outside towards the centre,) proceed exactly as described above and always circumscribe first the outer lines of the figure in a clockwise direction.

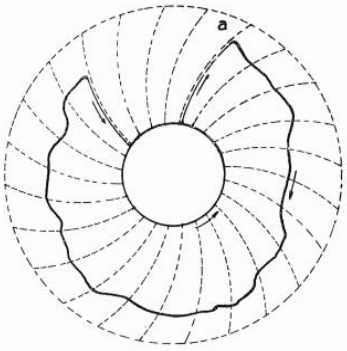


Fig. 16.

The Measuring Roller, Vernier and Counting Disc on all Amsler Original Planimeters are Celluloid and are provided with very clear and exact graduations, **ensuring convenient and accurate readings.**

SPECIAL ACCESSORIES

For Amsler Original Polar Planimeters.

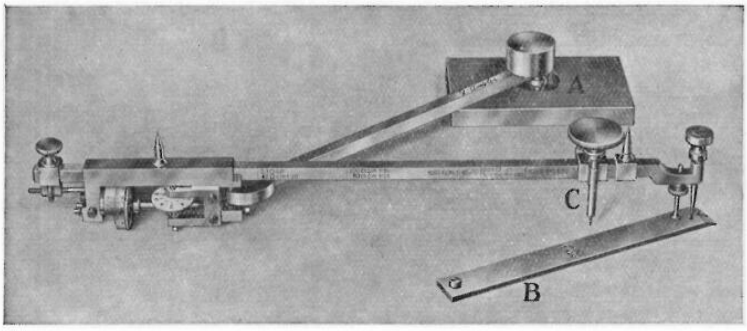


Fig. 17.

Amsler Original Planimeter No. 6 with Pole Plate (A), Checking Rule (B), and Auxiliary Screw (C).

POLE PLATE FOR AMSLER ORIGINAL PLANIMETERS NOS. 1—7.

The **Pole plate** (see A in the above illustration) prevents the drawings, maps, diagrams, etc., from being damaged by the Pole needle, and, by being moved, allows the measuring roller to be quickly set to zero or to any other even figure, thus facilitating readings. The Pole plate consists of a metal block — Brass or Electrum to correspond with the Instrument — with a cavity on top, into which the Pole fits.

CHECKING RULE (ELECTRUM) FOR ALL AMSLER ORIGINAL PLANIMETERS, Nos. 1 to 12.

Planimeters can be checked by circumscribing a drawing, the area of which can easily be worked out. A far more reliable means of checking the instrument, however, is provided by the **Checking Rule** (see B in the illustration above). It is quite independent of any inexactitudes of a drawing ; it guides the tracing point more steadily than the most careful hand operation will allow, and the results, consequently, are absolutely accurate.

How to use the Checking Rule.

The checking rule has at one end a pivot point and at the other end a small hole upon which the tracing point of the planimeter is to be set for checking. The rule represents the radius of a standard circle the area of which is engraved on the rule.

Press the pivot point into the drawing surface, set the index mark at the bevelled edge of the rule to a pencil line drawn on the paper, read the roller, move the rule once round the pivot point till the index mark coincides again with the pencil line, and read again the roller.

The area obtained thus should be the same as that engraved on the rule.

AUXILIARY SCREW (FOR AMSLER ORIGINAL PLANIMETER No. 6 only).

The Auxiliary Screw (see C in the above illusttation) is very convenient when any number of diagrams of equal length are to be averaged. It can always remain fixed to the tracer arm of the Planimeter, even if not used, as it does not hinder the free movements of the instrument. The Auxiliary Screw can also be ordered subsequently, and be fitted to the Planimeter by the customer himself.

Its purpose is to lift the sliding foot and tracing point from the paper, so as to allow an exchange of diagrams to be made without disturbing the reading of the roller. During the travel of the tracing point the auxiliary screw should not touch the paper. For exchanging diagrams the screw must be lowered a little. This operation does not affect the roller, and the final reading obtained on the first diagram may be used as the initial reading for the measurement of the second diagram. In this way the roller is to be read off but once for each diagram.

FINE DIVISION OF TRACING ARM (Millimetre division).
The AMSLER Original Planimeters Nos. 3, 4, 5, 6 and 7 can be provided with a **fine division** with vernier on the tracing arm, with the help of which, the instrument can be set to any desired scale of measuring unit. Paper shrinkage can also be very conveniently compensated for.

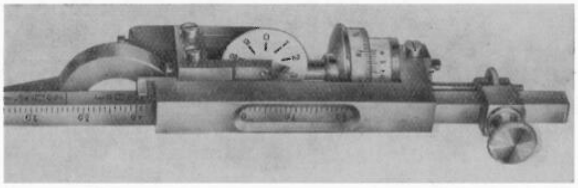


Fig. 18.

Amsler Original Planimeters

TABLE OF WEIGHTS

for single instruments
(approximate only).

Amsler Original Planimeter No.	Size of case		Weight without case		Weight with case		Gross weight	
	inches	cm	lbs.	kg.	lbs.	kg.	lbs.	kg.
1 English	8.8 x 2 x 1.6	22.5 x 5 x 4	0.31	0.14	0.68	0.31	1.63	0.74
1 Metric	8.8 x 2 x 1.6	22.5 x 5 x 4	0.33	0.15	0.70	0.32	1.65	0.75
1a English	8.8 x 2 x 1.6	22.5 x 5 x 4	0.25	0.12	0.61	0.28	1.61	0.73
1a Metric	8.8 x 2 x 1.6	22.5 x 5 x 4	0.26	0.12	0.63	0.29	1.63	0.74
2 English	8.8 x 2 x 1.6	22.5 x 5 x 4	0.26	0.12	0.65	0.29	1.63	0.74
2 Metric	8.8 x 2 x 1.6	22.5 x 5 x 4	0.28	0.13	0.66	0.3	1.65	0.75
2a English	8.8 x 2 x 1.6	22.5 x 5 x 4	0.25	0.12	0.61	0.28	1.61	0.73
2a Metric	8.8 x 2 x 1.6	22.5 x 5 x 4	0.26	0.12	0.63	0.29	1.63	0.74
3	11.8 x 2 x 1.6	30 x 5 x 4	0.35	0.16	0.88	0.4	2.13	0.97
4	11.8 x 2 x 1.6	30 x 5 x 4	0.35	0.16	0.88	0.4	2.13	0.97
5	12.6 x 2.7 x 2.1	32 x 7 x 5.5	0.66	0.3	1.56	0.71	3.08	1.4
6 Stand. Mod.	11.8 x 2 x 1.6	30 x 5 x 4	0.37	0.17	0.88	0.4	2.16	0.98
6 Small Mod.	10 x 2 x 1.6	25.5 x 5 x 4	0.33	0.15	0.77	0.35	1.98	0.9
7	16.9 x 2.7 x 2	43 x 7 x 5	0.62	0.28	1.76	0.8	3.74	1.7
8	15.7 x 8 x 4.1	40 x 20.5 x 10.5	3.53	1.6	8.59	3.9	16.09	7.3
9 Instr.	31.1 x 9.4 x 11	79 x 24 x 11	2.86	1.3	20.83	9.45	35.27	16
Rail			7.16	3.25				
10 Instr.	15 x 9.5 x 3.1	38 x 24 x 8	1.87	0.85	5.3	2.45	10.14	4.6
Rail	60 x 3.1 x 2.4	153 x 8 x 6	7.16	3.25	11.22	5.09	18.18	8.25
11	14.9 x 9.4 x 3.1	38 x 24 x 8	1.87	0.85	5.4	2.45	10.14	4.6
12	13.3 x 2.7 x 2	34 x 7 x 5	1.04	0.47	2.02	0.92	3.5	1.6
13	8 x 4.1 x 1.8	20.5 x 10.5 x 4.5	0.44	0.2	0.99	0.45	2.4	1.1

Other Specialites of the Amsler works are :

AMSLER SQUARE ROOT PLANIMETERS

AMSLER INTEGRATORS

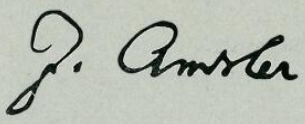
AMSLER HARMONIC ANALYSERS

AMSLER CURRENT METERS

AMSLER WATER LEVEL RECORDERS

AMSLER TESTING MACHINES

All AMSLER Original Planimeters bear the signature of the inventor:



Beware of Imitations.

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