



56389



# PRICE LIST

OF

## BINOCULARS

(For MILITARY or MARINE SERVICE, and SPORT)

## TELESCOPES

## COMPASSES

And other Scientific Instruments

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## LAWRENCE & MAYO

*MANUFACTURING OPTICIANS*

*and Contractors to His Majesty's Government*

BY SPECIAL APPOINTMENT TO

H.E. The Viceroy and Governor-General of India; Field-Marshal Earl Roberts, V.C., K.G.;  
General Sir George White, V.C., &c., &c.

HEAD OFFICES:

**67 and 69 Chancery Lane, LONDON**

BRANCHES IN THE EAST:

**BOMBAY, CALCUTTA, MADRAS & RANGOON**

Telegraphic Code Address for England, "STOCKADE," London.

Telegraphic Code Address for Branches in the East, "LYNX."

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# INTRODUCTION.

**W**E venture to hope that this, our latest publication, will prove a useful guide, being based upon our long business relations with and consequent knowledge of the requirements of Military Officers and other users of scientific instruments in all parts of the world.

We have for many years studiously devoted our attention to the manufacture of scientific instruments, and the appreciation of our efforts in this direction have been most satisfactory and encouraging. Residents in the East now fully realise the advantage of being able to obtain every kind of scientific instrument of the highest grade without the trouble and risk of importation, as it frequently happens, when importing them from Europe, that after waiting several months for their arrival they are received in a damaged condition, and therefore practically useless.

Our "Lynx" Military Field Glass is now so widely known and appreciated throughout the British Army at home and abroad that it is needless for us to dwell on its merits. We may, however, mention that the mechanical parts of this popular field glass have been recently improved, and we have also endeavoured to render the solid leather case dust-proof besides adding detachable saddle straps for the use of Cavalry and Mounted Infantry.

Our files contain thousands of letters from Military Officers stationed in all parts of the Empire testifying to the general satisfaction the "Lynx" has given, admitting it to be the best and most complete military field glass ever produced at the price.

Before closing these few introductory remarks we beg to invite the attention of Surveyors to the pages devoted to surveying instruments, which are of the highest grade and at lower rates than it would be possible to import them from Europe.

All kinds of scientific instruments are kept ready for delivery, and we shall be pleased to submit estimates and designs for any instrument not included in this publication, which chiefly includes those generally used for Military and Naval purposes.

# BUSINESS TERMS.

THE prices quoted in this list are net. The small margin of profit on the cost of production will not admit of any discount.

Orders must be accompanied by a remittance in full or a satisfactory Banker's reference.

Remittances may be made by cheque or draft, crossed a/c Lawrence and Mayo.

To avoid delay and inconvenience it is absolutely necessary that the purchaser's name and address should be legibly written on the order.

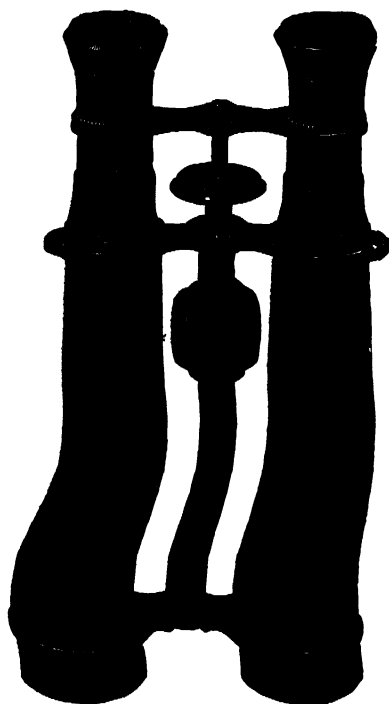
As every possible precaution and care is taken in the packing of articles forwarded by rail or post, we cannot hold ourselves responsible for any damage that may occur in transit.

This list cancels all previous issues, and the prices quoted are subject to alteration without notice.

Time contracts subject to strikes and trade disputes.

**REPAIRS OF ALL OPTICAL AND SCIENTIFIC INSTRUMENTS  
UNDERTAKEN.**

## The "LANTERN" Binocular Telescope.

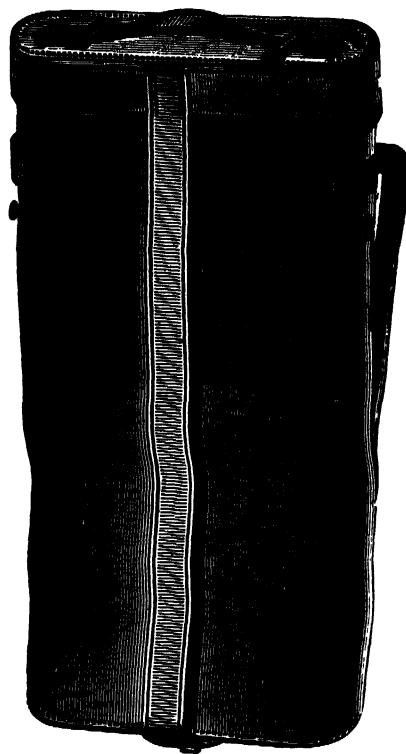


Lawrence & Mayo's Improved "Lantern" Binocular Telescope, being a combination of two Telescopes, gives **nearly four times the power of the ordinary Binocular Field Glass**. The body is strongly made of hard metal to stand rough use, and in substantial aluminium, which is much lighter, both metals being specially grained to imitate Morocco leather. The horizontal bars are jointed, and by bending the tubes inwards, they are, of course, brought closer together, so that the pupil of each eye may be placed exactly opposite the centre of each tube, without which perfect binocular vision cannot be obtained. A scale of millimetres is marked on the middle bar, by means of which the pupillary distance can be noted and the joint always set immediately. The wheel on the top horizontal bar belongs to another improvement known as the "Rapid

Draw," which not only saves time and trouble in focussing, but also reduces the wear on the rack and pinion to a minimum. When focussing, first draw out the tubes to *their full length, then adjust the focus in the usual way by means of the large central screw*. When the correct focus is once obtained, the tubes may be closed by pressure from the top and drawn out again to exactly the same focus without further adjustment, as it is registered by the degrees marked on the pillar immediately beneath the top bar.

We can confidently recommend the "Lantern" as a very superior instrument where high power, portability, and a good field of view are essential.

The following Prices include a superior-finished solid Leather Case, with shoulder straps and detachable saddle straps:—

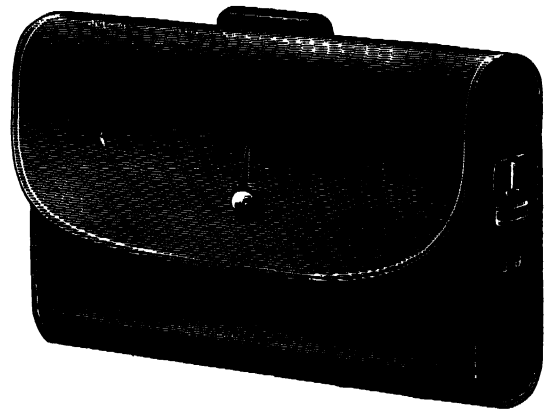
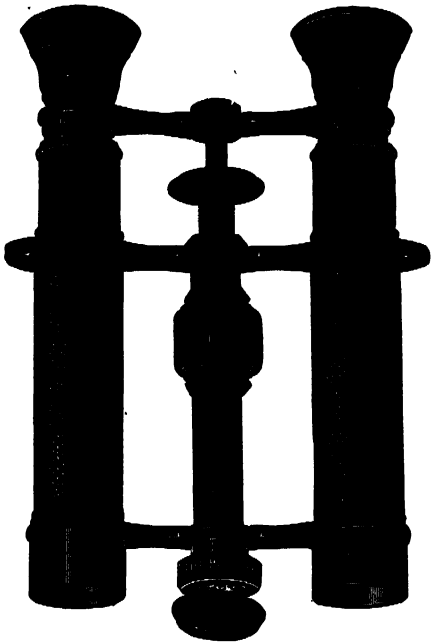


No.	Diameter of Object Glass.	Magnifying Power.	Field of View at 1000 yards.	Length Closed.	PRICES.			
					Hard Metal.	Telegraphic Code Word.	Hard Metal Bars and Aluminium Bodies.	Telegraphic Code Word.
1	$\frac{7}{8}$ inches	11 diams.	About 60 yards	7 ins.	<b>Rs. 105</b>	Eclipse	<b>Rs. 140</b>	Light
2	$1\frac{1}{4}$ "	16 "	" 40 "	$8\frac{1}{2}$ "	<b>Rs. 135</b>	Electric	<b>Rs. 170</b>	Ladder
3	$1\frac{5}{8}$ "	21 "	" 30 "	$9\frac{1}{2}$ "	<b>Rs. 180</b>	Ensign	<b>Rs. 210</b>	Luculent

**LAWRENCE & MAYO, Manufacturing Opticians,**

67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## The "BIRDSEYE" Binocular Telescope.



The "Birdseye" Binocular Telescope is in every sense of the term a pocket instrument, as it only occupies the same space in the pocket as an ordinary cigar-case. The power and field of view is extraordinary for the size of the instrument, and we recommend it as a **perfect glass for outdoor requirements.** The lenses are of

the highest grade, and carefully combined so as to produce the best possible results—the high power in no way interfering with the large and brilliant field of view which is usually only obtained in glasses of small magnifying power.

The focussing adjustments and means for regulating and registering the pupillary distance are on exactly the same principle as our "Lantern" Binocular Telescope, described on page 4. A serviceable pearl dial Compass, with luminous N. and S. points, and protected by a hinged lid, is fitted between the object lenses.

Magnification 8 diameters. Field of view at 1,000 yards, about 80 yards.

Diameter of object lenses,  $\frac{5}{8}$  in. Height when closed,  $5\frac{7}{8}$  in.

Weight of Binocular with Hard Metal Body,  $12\frac{1}{4}$  ozs.

" " " Aluminium "  $9\frac{1}{2}$  ozs.

PRICE, in Hard Metal, including solid leather Pouch Case, with loop at the back for belt and shoulder strap (also superior-finished Morocco leather cigar-shape Pocket Case), **Rs. 110.**

Code Word for Telegrams—"BIRD."

The same Lenses, with Aluminium Body and Hard Metal Bars, **Rs. 140.**

Code Word for Telegrams—"EAGLE."

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON ; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The "BULWARK" Binocular Telescope!

The "Bulwark" Binocular Telescope is an *exceptionally powerful glass*, the lenses giving a magnification of **32 diameters**. The focussing adjustments and means of regulating and registering the pupillary distance are on exactly the same principle as our Lantern Binocular Telescope (described on page 4). A portable Tripod Stand, as illustrated, is supplied to hold the instrument whilst keeping objects under observation. The Binocular with stand fits compactly into a Walnut Case for convenience in carrying, and can be rapidly fitted up for use when required.

The "Bulwark" Binocular Telescope can be strongly recommended to those whose residences command extensive views, and for long range observations it is unsurpassable.

Price, complete with Tripod Stand and Walnut Case,

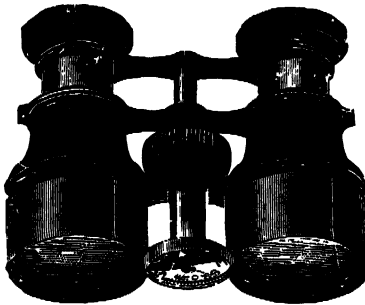
**Rs. 350.**

Code Word for Telegrams—"BULWARK."



This illustration shows the Telescope and Tripod packed in its Case.

# THE "LYNX" BINOCULAR FIELD GLASS



Fixed Bars and Open Face Compass.

As supplied to His Majesty's Forces.  
Specially designed for MILITARY and NAVAL Purposes.

Fitted with a serviceable compass, suitable for Day and Night Use, having luminous North and South Points.

Height when closed,  $2\frac{1}{4}$  inches ;  
diameter of object lens, 1 inch.

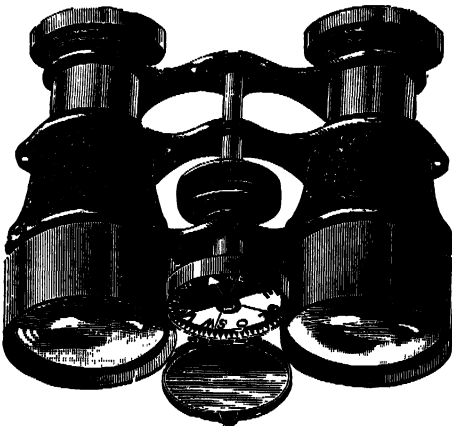
The "Lynx" is now popular in all parts of the world, and universally pronounced to be the most compact and useful military and naval field glass ever produced at the price. The body is constructed of both hard metal and aluminium, grained to imitate Morocco leather.

A useful adjunct to the "Lynx" is a serviceable Aluminium Dial Compass fixed between the object glasses, with an agate centre and luminous North and South points, suitable for day and night use.

Although compactness and portability are the chief features of the "Lynx," a wide and distinct field of view has not been sacrificed, but, on the contrary, increased.

Extract from a Lecture on "Field Glasses and Telescopes," delivered at the Royal Artillery Institution, Woolwich, by Lt.-Colonel Phillips, R.A. —

"As samples of small useful binoculars I would show you this one, No. 8 (The 'Alert'), which is about + 6, a high magnifying power for such a light and small glass; and this, No. 9 (The 'Lynx'), a smaller one by the same makers. Looking at it one is almost inclined at first to think it a toy, but it has a magnification of + 4, with a field of view of over  $5^\circ$ , is very light, and is in a most portable little case."



Jointed Adjustable Bars and Hinged Lid Compass.



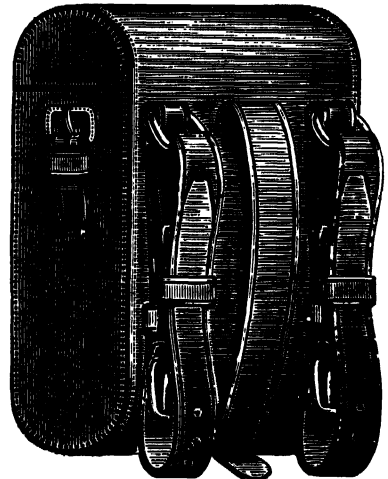
Front View of Solid Leather Case.

Lawrence and Mayo's "Lynx" Series comprises Four Field Glasses, A, B, C, D, the Lenses of which are of the same quality and calibre, the difference in price being due to the mounting.

- |  |        |                                    |
|--|--------|------------------------------------|
| A. Hard Metal body with fixed horizontal bars, and open face compass $\frac{1}{2}$ inch diameter ..  | Rs. 25 | Code Word for Telegrams. "LAUREL." |
| B. Aluminium body (which is much lighter) with rigid hard metal fixed horizontal bars and open face compass $\frac{1}{2}$ inch diameter ..   | Rs. 35 | "LEGION."                          |
| C. Hard Metal Body with jointed adjustable bars, for obtaining the correct pupillary distance, and compass 1 inch diameter, with hinged lid and automatic stop ..                  | Rs. 35 | "LAMP."                            |
| D. Aluminium body, with rigid hard metal jointed adjustable bars, for obtaining the correct pupillary distance, and compass 1 inch diameter, with hinged lid and automatic stop .. | Rs. 45 | "LUCIFER."                         |

All Orders should distinctly state whether A, B, C or D is required.

The above prices include a superior Brown or Black Solid Leather Regulation Case, with Loops for Sam Browne Belt, Shoulder Straps, and detachable Saddle Straps.



Back View of Case. Showing Loop for Belt and Detachable Saddle Straps.

LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## The "LYNX" Day and Night Combination Field Glass and Telescope or SCOUT'S COMPANION.

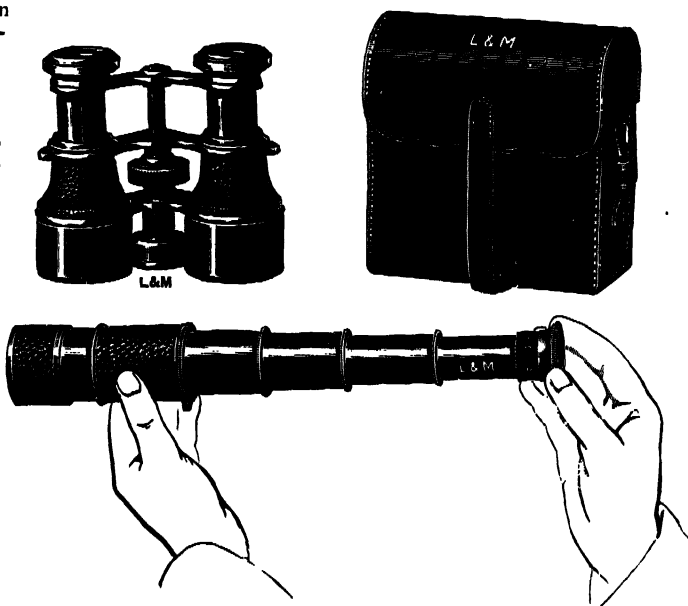
The "Lynx" Day and Night Combination has been specially designed to meet the requirements of Military Officers who desire to have in a compact and portable form the necessary optical aid for all scouting purposes by DAY or NIGHT. The Telescope, which has four draws, is a marvel of strength and compactness, and having a magnification of NEARLY 18 DIAMETERS, is specially suitable for distinguishing objects at greater distances than could be seen with any ordinary Field Glass. It also has the advantage of a rapid focussing eye-piece, obviating the difficulty always experienced in focussing a telescope, and rendering it as easy to focus as a binocular field glass, the instrument being immediately available for use by simply extending the tubes to full length. The length of the Telescope when fully drawn out is 12 inches, when closed 4½ inches. Diameter of object glass, 1½ inches clear aperture.

The Binocular Field Glass is our popular "Lynx" described on page 7. The magnifying power of this glass is considered by experts to be the best for use at dusk, and at night, or under unfavourable conditions of light and atmosphere. It has been found by experience that glasses of very high power are practically useless in foggy or hazy weather, the high magnification and consequent loss of light rendering the hazy condition of the atmosphere still more apparent.

The "Lynx" being an excellent Night Glass is pre-eminently suitable for use under these unfavourable conditions, and combined with the Telescope, which in clear weather will give even better optical results than any Field Glass of the highest magnification, renders the Combination Field Glass and Telescope A MOST SERVICEABLE ADDITION TO A MILITARY OUTFIT. The outside measurements of the case, which contains both Telescope and Field Glass, is only 5½ inches long, 2 inches wide, and 4½ inches deep, and takes up even less space on belt or saddle than an ordinary field glass alone.

The total weight of the Combination in hard metal, including case, is about 33 ozs.; Lynx Binocular, with part aluminium body, and Lynx Telescope of hard metal body, 25 ozs.

The "Lynx" Combination Set has met with great approval from competent military experts, and is referred to in the lecture on "Field Glasses and Telescopes," delivered by Lieut.-Colonel Phillips, R.A., at the Royal Artillery Institution.



### PRICES.

"Lynx" Binocular Field Glass and Telescope, with Hard Metal Bodies, **Rs. 60**

Code Word for Telegrams, "TWIN."

"Lynx" Binocular Field Glass, with part Aluminium and Hard Metal Body, and "Lynx" Telescope, with Hard Metal Body, **Rs. 70**

Code Word for Telegrams, "SPARTAN."

The above prices include Solid Leather cases with Loops for Sam Browne Belt, Detachable Saddle Straps, and Shoulder Straps.

"Lynx" Telescope only, Hard Metal Body, in Solid Leather Case, **Rs. 35**

Code Word for Telegrams, "EMERY."

Testimonial for the "Lynx" Combination Set from Major J. M. Burt, R.A., Colchester. "Enclosed please find cheque for your Combination Glasses. As far as I am able to say at present they are certainly all that you claim for them. The effect of the binoculars at dusk is more than I ever hoped for, and the Telescope is an excellent Glass."

## Testimonials for the "LYNX" Binocular Field Glass.

- From Commander F. H. PEYTON, R.N., H.M.S. "Gleaner," Gravesend.** I beg to inform you that I have given the pair of "Lynx" Binocular Field Glasses an exhaustive trial, and I can only say that I think them wonderful value for the small cost. They are excellent night glasses, and, as such, of great value to a naval officer. I enclose cheque for £1 15s., as per enclosed account, and will only add that the whole outfit is most excellently finished and I am very glad I have got it.
- From Colonel Sir WALTER SHAKERLEY, Bart., Commanding 5th Volunteer Battalion The Cheshire Regiment.** I have put a pair of your "Lynx" Field Glasses to a very thorough test during a fortnight's training on Salisbury Plain, and can safely say I never saw anything like them at the price. I find a large number of my officers have already got them since you first introduced them, so there is no need for me to recommend them.
- From Sergeant-Major J. ROBERTSON, 5th Volunteer Battalion Royal Highlanders, Birnam.** I am directed by Colonel the Marquis of Breadalbane to acknowledge receipt of the pair of "Lynx" Field Glasses. I may explain that His Lordship was so pleased with the pair ordered by me that he decided to give a pair to the Colour-Sergeant going with our Service Company to South Africa.
- From Lt. A. H. REED, R.N., H.M.S. "Argonaut," China.** I have received the "Lynx" Glass, which I consider excellent in every respect. The Compass attached to it was in perfect condition, and quite true as tried by our Standard Compass on board.
- From Captain W. SHEPHERD, 1st Fifeeshire Volunteer Artillery, Leven.** I wish to present two of my subalterns with "Lynx" Glasses, same as you recently supplied to me. They are the best value in that line I have seen, and, in my opinion, are better than many at two or three times the cost. Kindly forward the glasses to me with invoice.
- From Captain C. de M. FRANKLYN, R.E., Adjutant 1st Sussex Royal Engineers (Volunteers), Eastbourne.** I beg to enclose cheque for Ten Guineas for the six pairs of "Lynx" Field Glasses you sent, which have given the greatest satisfaction. I shall recommend them to every one I can.
- From Captain E. L. RIDLEY, 1st Volunteer Battalion Dorset Regiment.** I enclose cheque for the "Lynx" Glasses you forwarded. I had much pleasure in bringing it to the notice of the Officers of this Battalion at the annual training, and I think the excellence of the glass was generally acknowledged.
- From Colonel de BERNIERE, Commanding 20th Regimental District, The Barracks, Worcester.** Please send me a pair of glasses similar to those you sent to the Adjutants of my district. I have been using the pair you sent to Captain Elwes, and they are excellent.
- From Captain G. C. FEILDEN, Adjutant 1st Sutherland Highlanders Rifle Volunteers.** I enclose cheque in payment for a pair of "Lynx" Field Glasses, which I will retain for my personal use. I have tried them on the range, and they seem very strong and at the same time very handy and light.
- From Major R. H. GRIFFITHS, Commanding 75th Regiment, Lunenburg, Nova Scotia.** Kindly send me another of your "Lynx" Military Binocular Field Glasses, and I trust that the one previously sent may be the means of making known more widely than ever the merits thereof. As one of the Captains of my Regiment is going to South Africa, it was thought the most appropriate present that could be made to him was one of your Glasses, so I surrendered it for that purpose, and am now most anxious to replace it.
- From Major R. E. WILLIAMSON, 3rd Volunteer Battalion West Riding Regiment.** I have taken the pair of Field Glasses you sent to our Adjutant on approval. In our recent Field Work they proved themselves excellent. Please forward another pair to Captain Town.
- From Captain A. LOVEBAND, Adjutant 3rd Royal Dublin Fusiliers.** I am keeping for my own use the Field Glasses you sent on approval. I consider them excellent. Cheque enclosed.
- From Quartermaster J. TINNOCK, 3rd Battalion The Welsh Regiment.** I beg to forward herewith cheque for "Lynx" Military Field Glasses supplied, and to inform you that they have given the greatest satisfaction. The officers who have used them say they are the best glasses of the kind they ever looked through.
- From Colonel J. D. LEGARD, Commanding Yorkshire Artillery, W.D.R.A.** I am keeping the pair of Field Glasses which you sent as a sample to my Adjutant. I find them excellent and cheap at the price.
- From Colour-Sergeant C. W. HOLLYER, A Co., 3rd Battalion Royal Canadian Regiment of Infantry, Victoria, British Columbia.** The "Lynx" Glasses safely to hand. I am more than pleased with them; they are the most powerful for their size that have been.
- From Lt.-Col. J. TANNAHILL, 1st Renfrew Volunteer Battalion Argyll and Sutherland Highlanders, Greenock.** Our regiment was at Camp recently and I had occasion to try the "Lynx" and have spoken to a number of officers about it. Please send me two more in brown cases.
- From Colonel M. CHURCHILL, Commanding 27th Regimental District, Finner Camp, Co. Donegal.** I enclose a cheque for the "Lynx" Military Field Glass. I think it is an excellent little glass and very good value.
- From Lieutenant J. L. VAUGHAN, 3rd Battalion South Lancashire Regiment.** I received the Field Glasses this morning, and I am very pleased with them, they are so light, handy, and very powerful.
- From Major JOHNSTON, 1st Volunteer Battalion The East Lancashire Regiment.** I enclose cheque in payment of your invoice. I have given the "Lynx" Military Field Glasses a thorough trial, and am very pleased with them.
- From Captain J. H. TREMAYNE, 13th Hussars, Dublin.** I am keeping for my own use the "Lynx" Military Field Glass you sent here on approval. Please send two more. Cheque for same enclosed.
- From the ADJUTANT, and Battalion The Royal Irish Regiment, Jubbulpore.** I have received your sample Field Glass, and thoroughly approve of it. Kindly send me six more, and I will keep the sample, making a total of seven.
- From Lt.-Col. J. M. HINDE, Commanding 1st Border Regiment, Aldershot.** I received the Field Glasses you sent and will keep them. I will show them to my officers, as I think, for the price, they are the best I have come across.
- From Major H. E. BUCHANAN, Commanding and Battalion Northumberland Fusiliers.** In reply to your letter of the 14th instant, forwarding a pair of "Lynx" Field Glasses, I have to inform you that they are considered very good at the price. I am keeping the sample, and shall be obliged if you will send me five more of the same, making six, at your earliest convenience, all in brown leather cases.
- From Captain F. W. TOWSEY, Adjutant and Battalion West Yorkshire Regiment, Dover.** I enclose a cheque in payment for Field Glasses, which I have kept myself. They appear to me to be excellent. Please forward a pair to Captain Berney.
- From Captain C. G. STEWART, and Battalion South Lancashire Regiment, Kamptee.** I enclose cheque in payment of your account. I am very pleased with the "Lynx"; it is a smart, excellent glass.
- From the OFFICER COMMANDING No. 1 Kohat Mountain Battery, Tochi Valley.** Your letter with sample "Lynx" Glasses received. It appears to be an excellent instrument, great power and field for its size. The sample sent will be kept.
- From Captain F. H. G. PLAYFAIR, Adjutant 1st Battalion Hampshire Regiment, Bareilly.** I have sent you a cheque on Messrs. King, King & Co., in payment of one "Lynx" Field Glass. I am thoroughly pleased with it.
- From Captain J. J. ASSER, 1st Battalion Dorset Regiment.** I enclose cheque in payment of the Field Glasses, which I think are excellent. Will you please send by parcel post to Major Wood, D.S.O., Captain Hammond, and Lieutenant Weymouth similar glasses.
- From Captain C. J. MELROSE, 1st Volunteer Battalion Prince of Wales' Own West Yorkshire Regiment.** I shall be glad to take the "Lynx" Field Glass which you have sent on approval, and enclose you cheque for £1 15s.
- From and Lt. C. A. H. BAILY, 3rd Volunteer Battalion Somersetshire Light Infantry.** Enclosed please find cheque in payment for pair of "Lynx" Field Glasses, which gave me great satisfaction while at Camp on Salisbury Plain. I noticed several other officers using the "Lynx," all of whom spoke highly of them.
- From Captain S. S. WILSON, R.E., Boundary Commission, Umtali, South Africa.** With reference to your letter, I have kept the Binoculars, and forward a cheque. I have found the Glasses very satisfactory, and am using them constantly in survey work.
- From Captain A. E. CROFTON, Adjutant 3rd Volunteer Battalion Northumberland Fusiliers.** I received the Sample Field Glasses and consider them so good that I have kept them for myself, for which I enclose cheque. I hope to get all the officers to have the same pattern in time.
- From Captain T. P. BARRINGTON, Adjutant and Volunteer Battalion Prince of Wales' Own West Yorkshire Regiment.** Enclosed please find a cheque for the pair of "Lynx" Field Glasses. I have much pleasure in stating that the Glasses are considered excellent by all the officers to whom I have shown them.
- From Captain J. CRABBE, Adjutant 1st Fifeeshire Light Horse Volunteers, Cupar.** I enclose cheque for Glasses you sent, and which I think are very good.
- From Major R. CARRUTHERS, Commanding 5th (Irish) Volunteer Battalion King's Liverpool Regiment.** My Adjutant (Captain Leven) handed me your letter and the "Lynx" Military Pocket Field Glasses you sent him. I have much pleasure in sending you cheque for £1 15s., and beg to say that I am exceedingly well satisfied with them. They are the best and cheapest I have seen.



# The Service Pattern Binocular Field Glass

MARK V.,

With Lawrence & Mayo's Patent Case.

The Service Pattern Binocular Field Glass has been designed in accordance with the Government Specification both as to the optical and mechanical construction.

## OPTICAL CONSTRUCTION.

Number of lenses 4 (12 glasses) object glass  $1\frac{1}{2}$  inches clear aperture, triple achromatic.

Aperture of eye lenses,  $\frac{1}{4}$  inch, triple achromatic.

Magnification,  $5\frac{1}{2}$  diameters.

Field of view, 3 degrees.

## MECHANICAL CONSTRUCTION.

Body made in German Silver, Bridges, eye pieces, sockets screw-threads and adjusting apparatus for focussing made of hard drawn brass, all other parts of hard aluminium alloy. The object lenses and eye pieces are interchangeable throughout in the same binocular, and all lenses are secured in position by counter cells. Length of binocular, when closed,  $4\frac{1}{2}$  inches; weight of binocular, 17 ounces.

## SPECIAL ADVANTAGES OF LAWRENCE & MAYO'S PATENT CASE.

FIG. 2 shows the improved form of attachment of lid to the case by means of a metal hinge, when open this lid remains in position against the outer side of the case and away from the body, it is therefore not in the way during the time the Binocular is in use.



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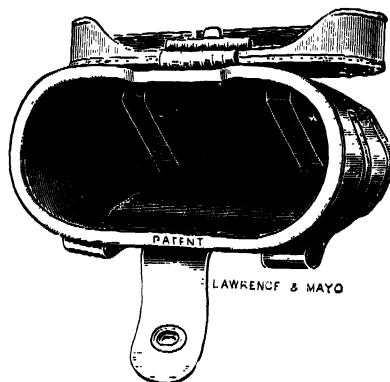
FIG. 1.

FIG. 3 shows the patent spring fitted to the inside of the case, which serves to prevent the field glass from jumping out of the case when running on foot, or galloping on horseback. The case can therefore, when desirable, always be kept open during field operations and the Binocular remain in sight for immediate use, without the necessity of constantly opening and closing the case, and is at the same time perfectly safe from loss. A shoulder is fitted to the inside of the case to enable the glass to be kept at any focus.



LAWRENCE & MAYO

FIG. 2.



LAWRENCE & MAYO

FIG. 3.

Price of Service Pattern Binocular Field Glass, complete with Lawrence and Mayo's Patent Case,

**Rs. 50.**

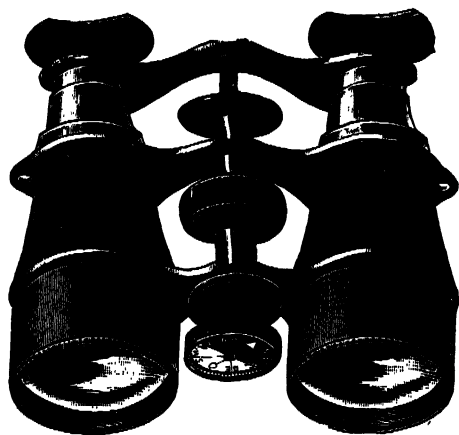
Code word for Telegrams—"Battalion."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## The "ALERT" Military Binocular Field Glass.

As Supplied to the Royal Military College, Camberley.

The "Alert" is an achromatic Military Field Glass manufactured to meet the requirements of Military Officers. The lenses are of the highest grade, with good power, large field and excellent definition. The body being made of hard metal, grained to imitate Morocco leather, is well adapted for rough use in any climate.



The "Alert" is fitted with jointed bars, marked in degrees for adjusting and registering the distance between the eyes; and is also fitted with rapid draw tubes for simplifying the focussing adjustment, which is also registered by degrees marked on the pillar in the centre of the body, rendering the glass ready for use at any time by simply drawing out the tubes to the full length, which is only the work of a moment.

A very useful adjunct to the "Alert" is a reliable Compass fixed between the object glasses, with an agate centre pearl dial and luminous N. and S. points, suitable for day and night marching. When the lid of the Compass is closed an automatic stop prevents unnecessary wear while it is not in actual use.

Diameter of object glass  $1\frac{1}{4}$  inches.

Magnification 6 diameters; field of view, at a distance of 1,000 yards, 60 yards.

Height of the "Alert" when closed 4 inches.

Weight in hard metal  $16\frac{1}{2}$  ozs.

Weight in Aluminium  $9\frac{3}{4}$  ozs.

PRICE, including superior solid brown leather regulation flounce case, with loops at the back for Sam Browne belt, shoulder strap, and detachable saddle straps, **Rs. 55.**

Code Word for Telegrams—"ALERT."

The same lenses with Aluminium body, **Rs. 75.**

Code Word for Telegrams—"ARCTIC."



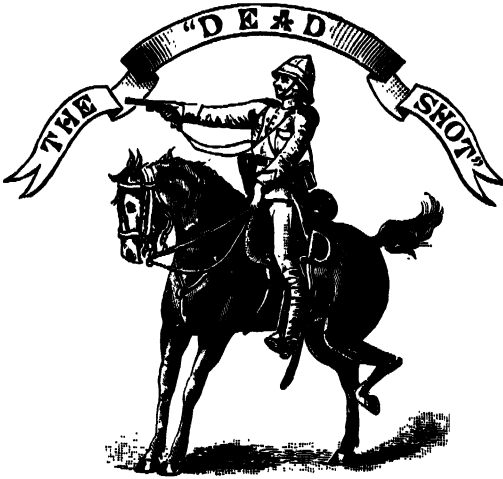
If preferred the "ALERT" can be supplied with LAWRENCE & MAYO's Patent case (similar to that supplied with the "SERVICE" Pattern Binocular described on page 10), without extra charge.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# THE "DEAD SHOT"

## Prismatic Binocular Field Glass,

*Combining the efficiency of a Telescope with the portability and convenience of a Field Glass.*



The "Dead Shot" Prismatic Binocular Field Glass is constructed on a principle calculated to produce the **highest efficiency** for Military and Naval operations and all field purposes. Extreme flatness of field and perfect definition, combined with portability and compactness, being its chief features.

The bars and bodies of the "Dead Shot" are constructed from **one solid casting** of a **specially hard alloy of aluminium**, thus ensuring the **maximum strength**, and is a great advantage over the method adopted by other makers of fastening the bars to the bodies by means of screws, etc. Consequently there are no screws or parts to become loose, and it is rendered almost impossible for the glass to get out of adjustment with regard to the optical axis. This special form of body also secures a reduced weight as compared with other prismatic field glasses.

Each tube and body consists of an objective and astronomical eye-piece, between which are placed two prisms, each of which reflects the image twice.

The effect of the prisms is shown in the illustration, where it is seen that the rays of light entering the object glass are, by reflection and deflection, carried through the upper prism to the lower one, and up again, passing out through the eye-piece, thus travelling the length of the body three times.

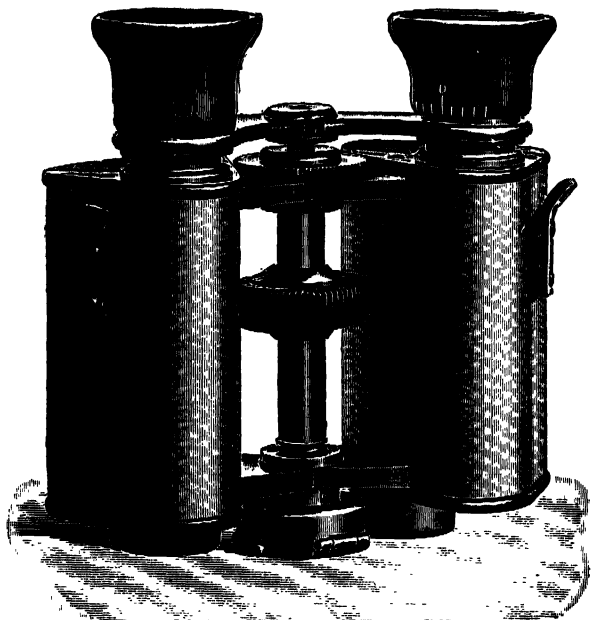
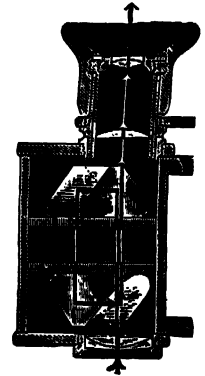
We have adopted an ingenious and safe method for fixing the adjustable bars of the "Dead Shot" to the correct pupillary distance between the eye-pieces. This consists of a milled edged wheel situated above the middle bar, and by slightly revolving it to the right towards "F" marked on wheel, the joint is securely fixed. To release it turn the wheel to the left in the direction of "L."

The scientific points so essential in the production of a perfect Prismatic Binocular Field Glass have been carefully considered, and the **Special Advantages** claimed for the "Dead Shot" are:—

- 1.—Maximum strength of body combined with minimum of weight.
- 2.—Extreme rigidity of adjustable bars, thus rendering the glass less liable to get out of adjustment.
- 3.—Short body and convenient to hold.
- 4.—High magnification in small compass.
- 5.—Large field of view owing to the special form of eye-piece.
- 6.—Perfect Achromatism, obtained by means of the special form of Astronomical eye-pieces.
- 7.—Inequality of vision in the two eyes can be corrected by the simple adjustment of one eye-piece.
- 8.—Safe and efficient method for clamping the adjustable bars to the correct pupillary distance.
- 9.—The leather case has been specially designed to allow the instrument to be replaced without altering the focus; this will be found very convenient during field operations, the glasses being always ready for use.

### TO OBTAIN EQUALITY OF VISION WITH THE "DEAD SHOT."

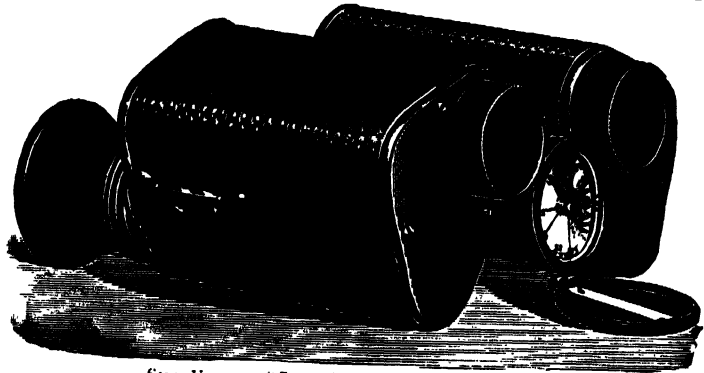
If the vision of the two eyes is unequal, close the right eye and focus the left (on an object at a distance of about 20 or 30 ft.) by means of the central focussing wheel; then close the left eye and focus the right by turning the right eye-piece. Having by this means once obtained binocular vision, distant objects may be focussed in the ordinary way by means of the central focussing wheel.



If both eyes are equal, the right eye-piece should be set at 0.

To render the "Dead Shot" complete for all Military and Naval purposes, we have designed a special form of Day and Night Compass, having a floating pearl dial 1 inch diameter, jewelled centre, revolving direction bar or pointer and luminous sight line in lid for night use, also automatic stop to prevent unnecessary wear when not in use.

The Compass, which is fitted between the object lenses, can be easily detached when desired, by turning the small thumbscrew below the lid.



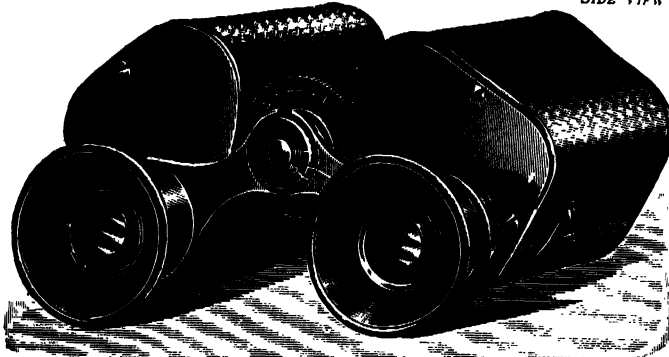
SIDE VIEW OF "DEAD SHOT" SHOWING COMPASS.

PRICES OF "DEAD SHOT" BINOCULARS.

Including a superior finished Solid Leather Case, with loops at the back for Sam Browne belt, shoulder straps, detachable saddle straps, and saddle pad.

No.	Magnification in diameters.	Field of View.	Weight with Compass.	Price.	Code word for Telegrams
1	9	4°60'	18 ozs.	Rs. 125	Tower
2	12	3°50'	18 "	Rs. 150	Turret

With No. 1 at 1,000 yards distance, a space of about 80 yards is in the field of view; with No. 2 about 60 yards.



FRONT VIEW OF "DEAD SHOT" FIELD GLASS SHOWING DIVIDED SCALE AND CLAMP FOR FIXING ADJUSTABLE BARS FOR PUPILLARY DISTANCE.



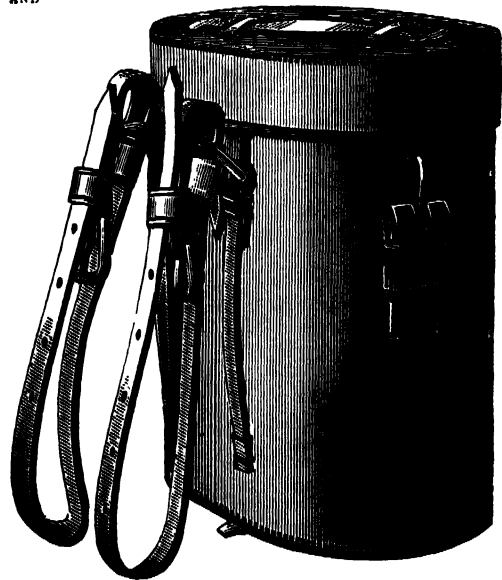
"Dead Shot" No. 1, magnifying 9 diameters, is the highest power which can be efficiently used on horseback, or where there is any considerable vibration. It is, therefore, a good glass for general use and particularly serviceable for Artillery, Cavalry or reconnoitring purposes.

"Dead Shot" No. 2, magnifying 12 diameters, gives the greatest magnification which can be obtained by any binocular instrument of an equally portable nature. The Optical portion is exceptionally perfect, and the field of view is ample. Its magnification is, however, too high for use on horseback or under circumstances which would prevent the Glass being held steadily. For Marine purposes it is as efficient as a telescope.

The "Dead Shot" can also be supplied in Monocular form without Compass attachment, complete with a solid Leather case, with loop for belt and shoulder strap.

PRICES OF "DEAD SHOT" MONOCULAR FORM.

No.	Magnification in diameters.	Field of View.	Weight	Price.	Code word for Telegrams.
Monocular No. 1	9	4°60'	6½ ozs.	Rs. 50	Lancer
" No. 2	12	3°50'	6½ ozs.	Rs. 60	Rifle



"DEAD SHOT" BINOCULAR CASE (SIDE VIEW), SHOWING LOOPS FOR SAM BROWNE BELT AND DETACHABLE SADDLE STRAPS.

For Diagrams showing the comparative size of the fields of view obtained by an ordinary form of Binocular Telescope, 10 inches high, and the "Dead Shot" Binocular Field Glass, 4½ inches high, see end of List.

## Lawrence & Mayo's Special Combination Prismatic Field Glass and Range Finder.

**A** NEED has long been felt for a light and portable Combination Prismatic Field Glass and Range Finder suitable for general Military purposes, and we are confident that our special combination will fully meet these requirements. The instrument consists

of a prismatic field glass of the highest quality, magnifying 8 diameters with the large field of view of  $5^{\circ}$  with the addition of a special prism attachment for

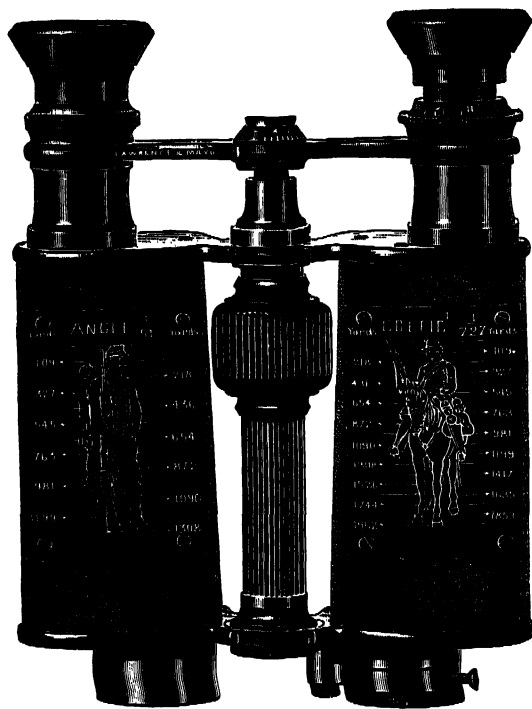
range finding purposes which can easily be adjusted in front of the right hand object glass.

This prism shows double images of distant objects, and the distance of the object is measured by the relative positions of the two images.

In order to avoid the necessity of any calculation, two telemetric bases have been taken :—

- (1). The mean height of an Infantry soldier, 5 ft. 5 ins.
- (2).       "       "       a Cavalry       "       8 ft. 2 ins.

The dimensions of these bases are magnified 8 times by the magnification of the instrument, and give very good results even in the case of very long distances. The images of an infantry man and a cavalry soldier are engraved on the *plates attached to the body of the instrument*, and a reference to the illustration on the following page gives the distance in yards.



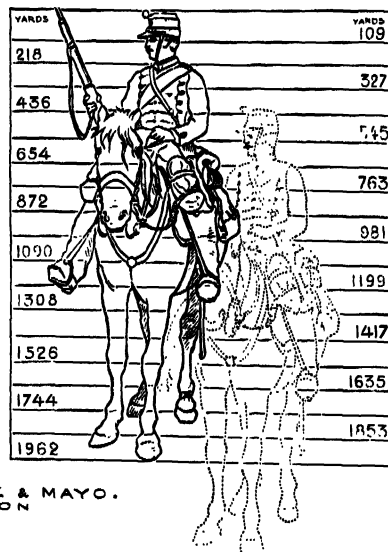
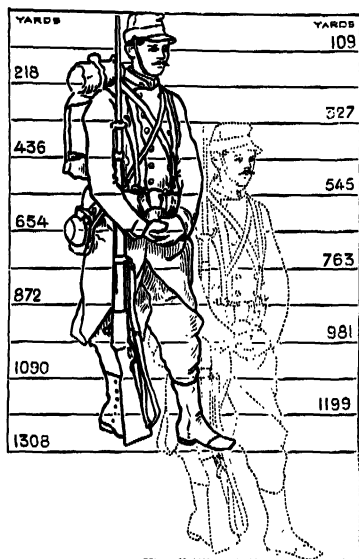

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## INSTRUCTIONS FOR USING LAWRENCE &amp; MAYO'S

## Special Combination Prismatic Binocular or Monocular Field Glass with the Range-Finder Attachment.

Before using the instrument as a field glass, look at any object with the left eye, and focus with the milled head wheel, then close the left eye and bring the right eye to focus by the divided ring fitted to the right hand eye-piece. This will compensate for any difference in the sight of each eye.

LAWRENCE & MAYO.  
LONDON

When using the instrument as a range-finder, place the prism in front of the right hand object glass. It will then be noticed that two distinct images of the same distant object will be seen. One of the images will overlap the other more or less in proportion to the distance. Then rotate the prism so that the two images of the object are in a vertical line with each other. Note the point in the stronger image where it is intersected by the weaker image, then read on the engraving the distance corresponding to the point of intersection.

The right eye alone should be used when using the binocular as a range-finder.

PRICE of the Combination Binocular Field Glass and Range-Finder, complete with Solid Leather Case and Loop for Belt; also Shoulder Straps ... .. **Rs. 145.**

Code Word for Telegrams—"APPAREL."

PRICE of the Combination Monocular Field Glass and Range-Finder, complete with Solid Leather Case and Loop for Belt; also Shoulder Strap ... .. **Rs. 65.**

Code Word for Telegrams—"ARAMEAN."

**LAWRENCE & MAYO, Manufacturing Opticians,**

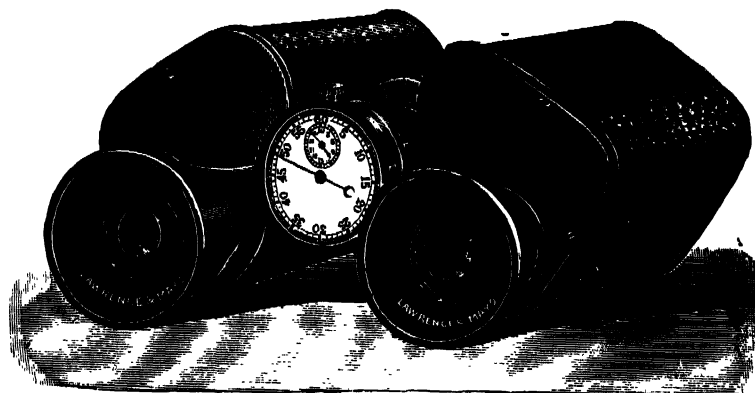
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA MADRAS and RANGOON

# The "REFEREE" Patent Prismatic Binocular Field Glass,

FOR MILITARY, NAVAL & SPORTING PURPOSES.

WE have produced the "Referee" after carefully calculating and considering the scientific points essential in the construction of a perfect prismatic binocular suitable for Military, Marine or Sporting purposes. It has an exceptionally large, flat and brilliant field of view, is perfectly achromatic, and the special combination of lenses gives the best definition possible and the greatest possible amount of light, thus rendering the "Referee" the ideal prismatic binocular for all general purposes. That the "Referee" may be complete for Naval or Sporting purposes, we have designed and fitted to the body of the binocular in a convenient position a reliable Stop Watch—a combination which commends itself as being of the greatest utility and supplies a long felt want.

FITTED WITH A RELIABLE STOP WATCH.



THE STOP WATCH IS DETACHABLE.

The advantages of having a chronograph conveniently at hand, and being able to register the time taken for a shell to burst at a given spot, or for a ship, horse or any moving object to cover a given mile or other similar standard of distances **without removing the Field Glass from the eyes** are obvious, as the object may still be kept under observation after the given distance has been covered and the time which has been automatically registered may be read off whenever it may be most convenient to the observer.

When the Stop Watch is not required, it may be easily and quickly detached from the Field Glass, by simply turning the fixing thumb screw.

The "Referee" is made in two sizes with magnifying powers of 6 and 8 diameters, both sizes having the central screw focussing adjustment, thus enabling the focus to be obtained with ease and rapidity, and is a great advantage over those patterns where the focussing adjustment has to be made by means of the eye-pieces.

**To obtain Equality of Vision with the "Referee."** If the vision of the two eyes is unequal, close the right eye and focus with the left (on an object at a distance of about 20 or 30 ft.) by means of the central focussing wheel; then close the left eye and focus the right by turning the right eye-piece. Having by this means once obtained binocular vision, distant objects may be focussed in the ordinary way by means of the central focussing wheel. If both eyes are equal, the right eye-piece should be set at 0.

**Prices,** which include a superior black or brown leather case (specially designed to allow the binocular to be replaced without altering the focus), with shoulder straps and detachable saddle straps :—

No.	Magnification in diameters.	Field of View.	PRICE.	Code word for Telegrams.	
1	6	7°	<b>Rs. 155</b>	Laburnum	For diagrams showing the comparative size of the field of view obtained by an ordinary form of Binocular Telescope, 10 inches high, and the "Referee" Binocular Field Glass, + 8, 4½ inches high, see back of cover.
2	8	4° 80'	<b>Rs. 170</b>	Lapwing	

With No. 1 at 1,000 yards distance a space of about 125 yards is in the field of view; with No. 2 about 85 yards. The "Referee" may be supplied without the Stop Watch, if desired, **at a reduction on above prices of Rs. 50.**

If required a compass similar to the pattern fitted to the "Dead Shot" Prismatic Binocular (page 12) can be supplied to fit the "Referee" at an extra cost of **Rs. 7-8.**

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The “CHERUB”

## Prismatic Binocular

### Field Glass.



The “CHERUB” Prismatic Binocular Field Glass is the neatest and most compact form of Prismatic Binocular Field Glass yet introduced, it being much less in size and weight than an ordinary opera glass. It has a magnification of 4 diameters and a field of view of 170 yards at 1,000 yards distance.

Its optical and mechanical construction in every detail is exceptionally perfect, and it has been aptly described in an unsolicited testimonial as the “‘Multum in parvo’ of Prismatic Field Glasses.”

The superb defining power of the “CHERUB” cannot be too highly appreciated. For theatrical use every detail on the stage is revealed, and for sporting purposes, use at athletic games, studying birds, animals, or viewing landscape scenery, it will prove an ideal glass.

Magnification, 4 diameters. Field of view, 10°

At 1,000 yards distance a space of 170 yards is in the field of view.

Weight, without case, 11 ounces.

**Price Complete, with Solid Leather Case and Shoulder Straps, Rs. 105**

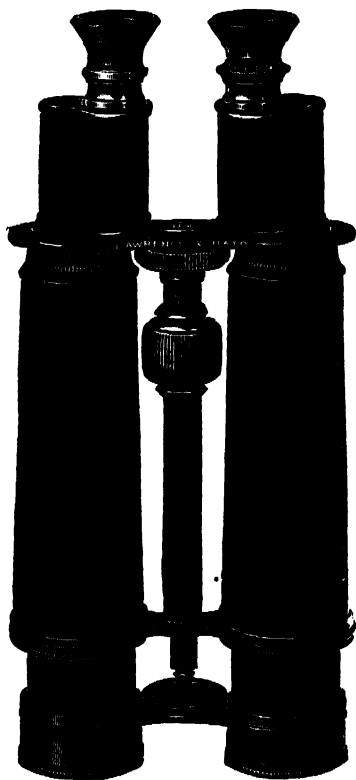
Code Word for Telegrams—“SUPERB.”

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**



# The "GLOBE"

## Prismatic Binocular Telescope.



The "Globe" Prismatic Binocular Telescope embodies all the latest improvements in Prismatic Binocular Telescopes. It has the high magnification of 18 Diameters, which, combined with its great luminosity (being double that of any binocular telescope of the same magnification) and its large field of view, renders it a perfect glass for long range observations on account of its exceptional clearness, it being possible to discern moving objects situated at long distances which would be invisible with ordinary binocular telescopes on account of their inferior luminosity. The instrument is fitted with rapid draw focussing tubes, to which are attached the object lenses, enabling them to be drawn out to approximately their focal length, the final focussing adjustment being obtained by the central thumb screw in the usual way. The improved method adopted by us in utilizing the object lens tubes for focussing permits of the body of the instrument being made much shorter than would otherwise be possible, thus giving great portability, the glass being

only  $9\frac{1}{2}$  inches in length when closed. The Binocular is fitted with a focussing eye-piece, to enable any inequality of vision in the two eyes to be easily corrected. The required pupillary distance is obtained by revolving the milled head-wheel fitted just above the focussing wheel. The body is made of hard metal, grained to imitate Morocco leather.

Magnification, 18 Diameters. Field of View,  $2^{\circ}$ . Height when closed,  $9\frac{1}{2}$  inches. Weight without Case, 38 ozs. At a thousand yards distance a space of about 33 yards is in the field of view.

**Price, including Solid Leather Case, with Shoulder Straps, Rs. 315.**

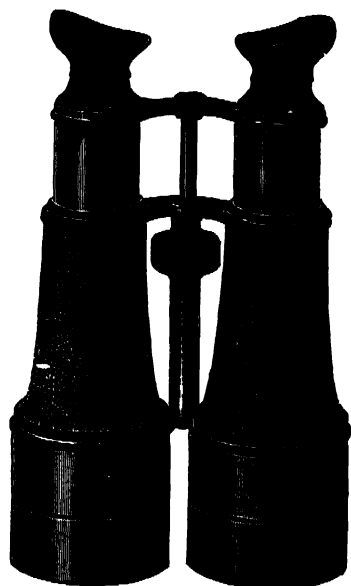
Code word for Telegrams—"PERFECTION."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## The "SEA-DOG" Naval Binocular.

The "Sea-Dog" is a **Model Achromatic Nautical Binocular** with all the essential qualities carefully combined.



1. The requisite power for clearly defining objects at sea.
2. The quality of the combination—producing excellent definition.
3. A wide field of view.
4. Rigid connecting bars, necessary to prevent the instrument getting out of adjustment, and jointed for adjusting to the width of the eyes.
5. A distinct improvement in the eye-pieces, which are large, and constructed so as to obscure the side and bottom lights by means of a shade covering the outer canthus of the eye, and curved to the model of the eyebrows.
6. Another improvement is the abolition of the old style of moveable sun and spray shades, which have always been a source of annoyance, especially at sea, as not being in constant use they are invariably corroded and not in working order when required.

The object lenses in the "Sea-Dog" are protected by being placed in fixed cells, which also serve as perfect sun and spray shades.

We can confidently recommend the "Sea-Dog" to officers of the Naval and Mercantile Services, as neither trouble or expense has been considered in our efforts to produce an excellent Nautical Binocular; and to render the "Sea-Dog" complete as a Nautical Glass we have adapted a solid-leather Waterproof Case, which has been very much appreciated.

Diameter of object glass,  $2\frac{1}{8}$  inches.

Size when closed,  $7\frac{1}{4}$  inches  $\times$   $5\frac{1}{4}$  inches  $\times$   $2\frac{7}{8}$  inches.

Weight, 2 lbs.

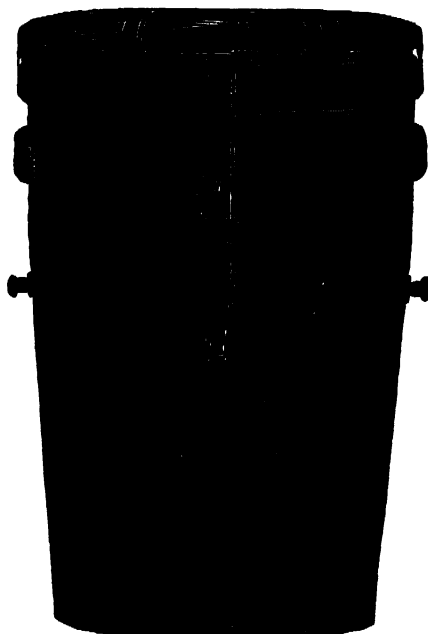
Magnifying power, 5 diameters. Angular Field,  $4^{\circ}7'$ .

Lateral Field at 1,000 yards, 80 yards.

PRICE, including solid leather Waterproof Case,

**Rs. 80**

Code Word for Telegrams—"MARINE."




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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# THE "SNAPSHOT" POCKET BINOCULAR.

THE "SNAPSHOT" Pocket Binocular is a most novel, simple and ingenious instrument, and should form a useful adjunct to the camera, sporting rifle, etc., etc. For use in public halls or theatres, and for cyclists, tourists, etc., where a high-power glass is not requisite, but where some optical aid is essential, the "Snapshot" will be found an invaluable companion. The mechanical construction of this glass is extremely simple; by pressing the snap the case opens, and the object lenses spring into position, the focus being obtained by turning the wheel in the usual way.



FIG. 1. "SNAPSHOT" BINOCULAR CLOSED.

To open the Binocular for use, press the snap and the object lenses will spring into position, then focus by the wheel in the usual way.



FIG. 2. "SNAPSHOT" BINOCULAR OPEN FOR USE.

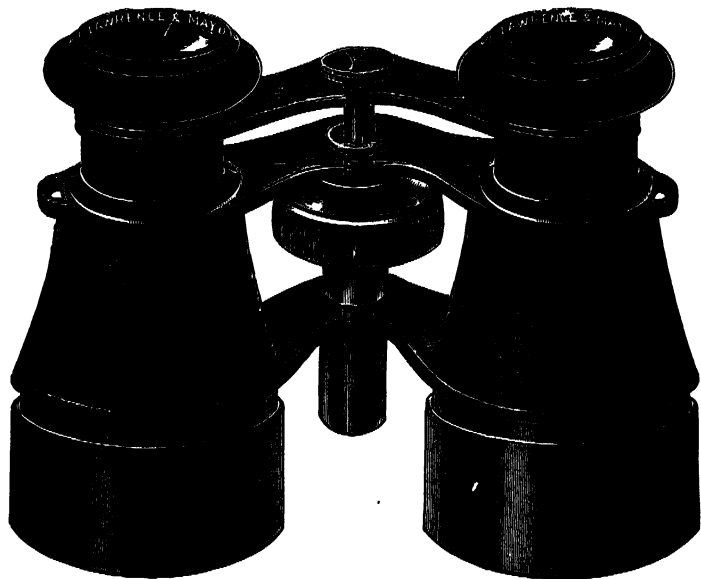
To close the Binocular simply fold the object lens plate inward, and press the sides of the case together.

PRICE, **Rs. 15.**

Code word for Telegrams—"SNAPPER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## “THE ASCOT” Ladies’ Field Glass.



The “Ascot” is essentially a Ladies’ Field Glass, it is small and daintily built, very light aluminium body, with jointed bars for obtaining the correct pupillary distance, large eye-pieces, achromatic lenses, large field of view and excellent definition.

It is particularly well-adapted to ladies’ requirements in either field or theatre, and commends itself at once as an ideal ladies’ Binocular.

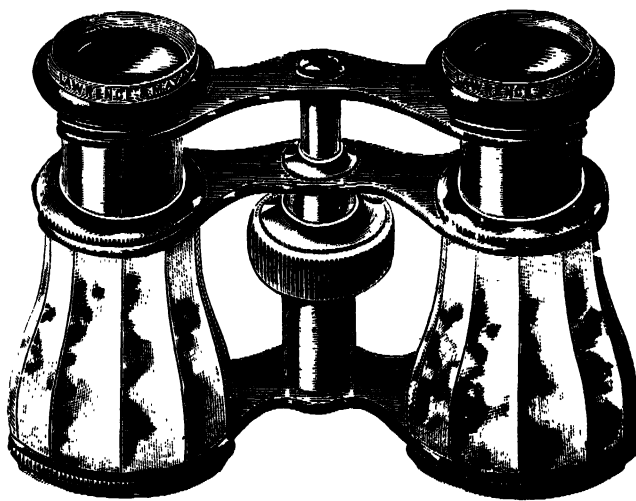
PRICE, including superior finished leather case .. .. **Rs. 70.**

Code Word for Telegrams—“Ascot.”

## The “IOLANTHE”

### Ladies’ Opera and Field Glass.

A very pretty Aluminium and White Mother-o’-Pearl Opera or Ladies’ Field Glass, of remarkably clear definition and large field of view.



PRICE, including a Silk-lined Plush Bag .. .. **Rs. 48.**

Code Word for Telegrams—“IOLANTHE.”

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

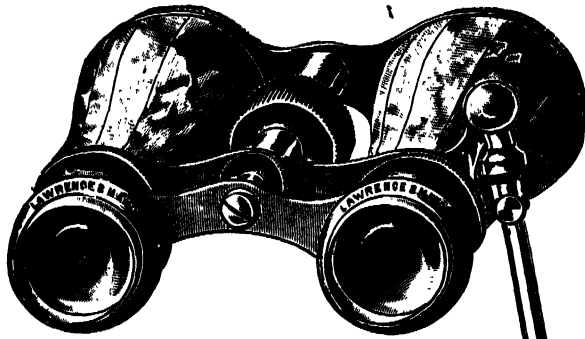


Fig. 1.

Figure 1 shows the opera glass with the handle open ready for use.

Figure 2 shows it closed.

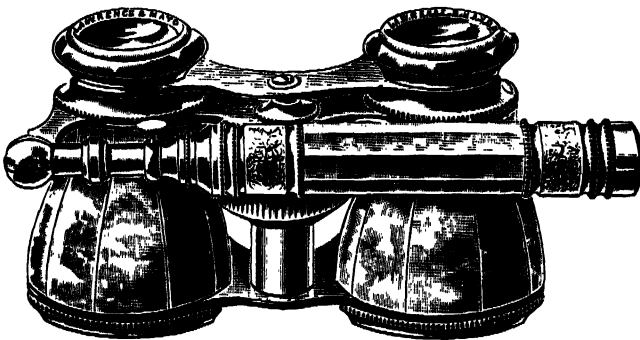


Fig. 2.

To remove the lorgnette handle press the button near the attachment piece.

Code Word for Telegrams, "LYRIC."

## The "LYRIC" Lorgnette Opera Glass for Ladies.

### A Charming Presentation Instrument.

The "Lyric" is made of aluminium and white mother-o'-pearl, with detachable telescopic lorgnette handle, a most convenient form of glass for theatres, picture galleries and public halls. The long handle enables the opera glass to be used in a natural, easy and graceful manner, as it obviates the necessity of raising the elbow above the waist.

The "Lyric" is a first class achromatic opera glass with large field of view and excellent definition.

Price, including a Plush Purse Bag, **Rs. 85.**

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON ; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

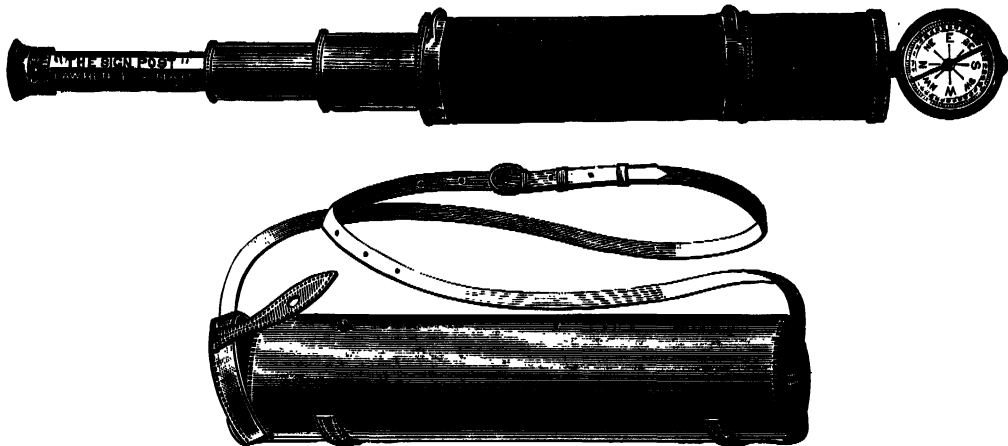
The "SIGN



POST."

## Military Telescope,

With Improved Graduated Focussing Eye-piece.



**A Powerful and Portable 3-draw Telescope** with sunshade and compass attachment. Length, when closed, 10 inches; when drawn out, 30 inches; diameter of object glass,  $1\frac{1}{2}$  inches; magnifying power, 26 diameters, the "Sign Post" Telescope has the advantage of a graduated focussing eye-piece, obviating the difficulty always experienced in focussing a telescope, and rendering it as easy to focus as a binocular field glass, the instrument being immediately available for use, by simply extending the tubes to full length and turning the eye-piece until the focus is obtained. The tubes and body are made of hard metal, grained to imitate Morocco leather. This glass has sufficient power to distinguish the hits on a target at 1,000 yards, and the time can be read on the dial of an ordinary church clock, on a clear day, at a distance of several miles.

A strongly fitted hinged lid protects the object lens when the Telescope is not in use, and fitted into this lid is a stout bar needle, agate centre, metal dial compass,  $1\frac{1}{8}$ -inch diameter, dial divided every 2 degrees to 360.

Metal loops are fixed to the body of the "Sign Post" for attaching the shoulder strap belonging to the leather case; this convenience admits of the case being temporarily discarded.

**We can strongly recommend the "SIGN POST" Telescope for field service, target practice and army signalling.**

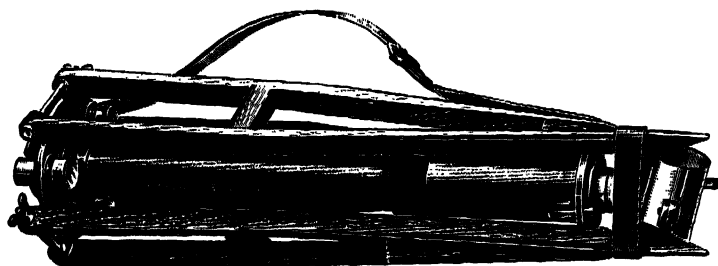
**Price, including an improved pattern, superior solid brown leather sling case, Rs. 55.**

Code word for Telegrams, "SIGN."

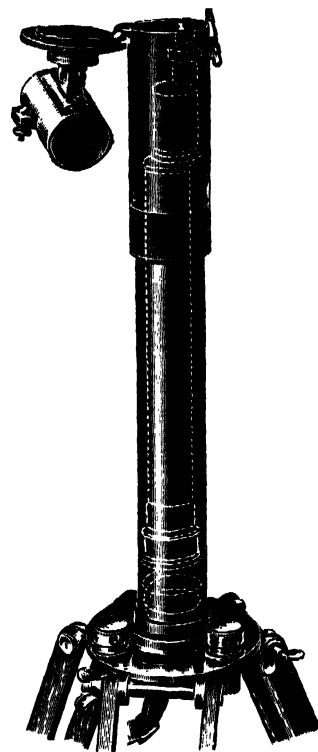
**LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## The "Searchlight" Prismatic Telescope, For Army Signalling and General Military Purposes.

The "Searchlight" Prismatic Telescope is in every respect a **Model Up-to-date Instrument**, its special mechanical and optical construction rendering it a **decided advance** on any Prismatic Telescope yet produced for Army Signalling purposes. The general construction of the Telescope is as illustrated on page 25. A particular mechanical feature of the instrument is that the Telescope, when not in use, remains in the upright pillar of the stand, thus rendering the use of a protecting case unnecessary, the tripod legs folding over the pillar and forming a case in itself. The strap attached to the tripod legs enables the instrument to be slung over the shoulder or easily carried by hand. The stand may be set up and the Telescope ready for use in less than one minute. In order to obtain the best results with the use of a Telescope for Army Signalling under all atmospheric conditions, and to interpret observations with certainty, it is necessary to have the means readily at hand so that the magnifying power can be rapidly altered when necessary, and for this purpose we have supplied three separate eye-pieces with magnifying powers of 18, 24 and 30 diameters respectively, the power giving the greatest luminosity ( $\div 18$ ) is best suited for use on a dull day, the higher powers, 24 and 30, being employed according to the clearness of the atmosphere. The eye-pieces, when not in use, are kept in separate cells fitted in the disc or table of the tripod, and are protected by caps with bayonet fastenings.



This illustration shows the "Searchlight" Prismatic Telescope closed for carrying.



This illustration shows the "Searchlight" Prismatic Telescope enclosed in the pillar of tripod stand.

### DIAMETER OF OBJECT GLASS— $2\frac{1}{4}$ inches.

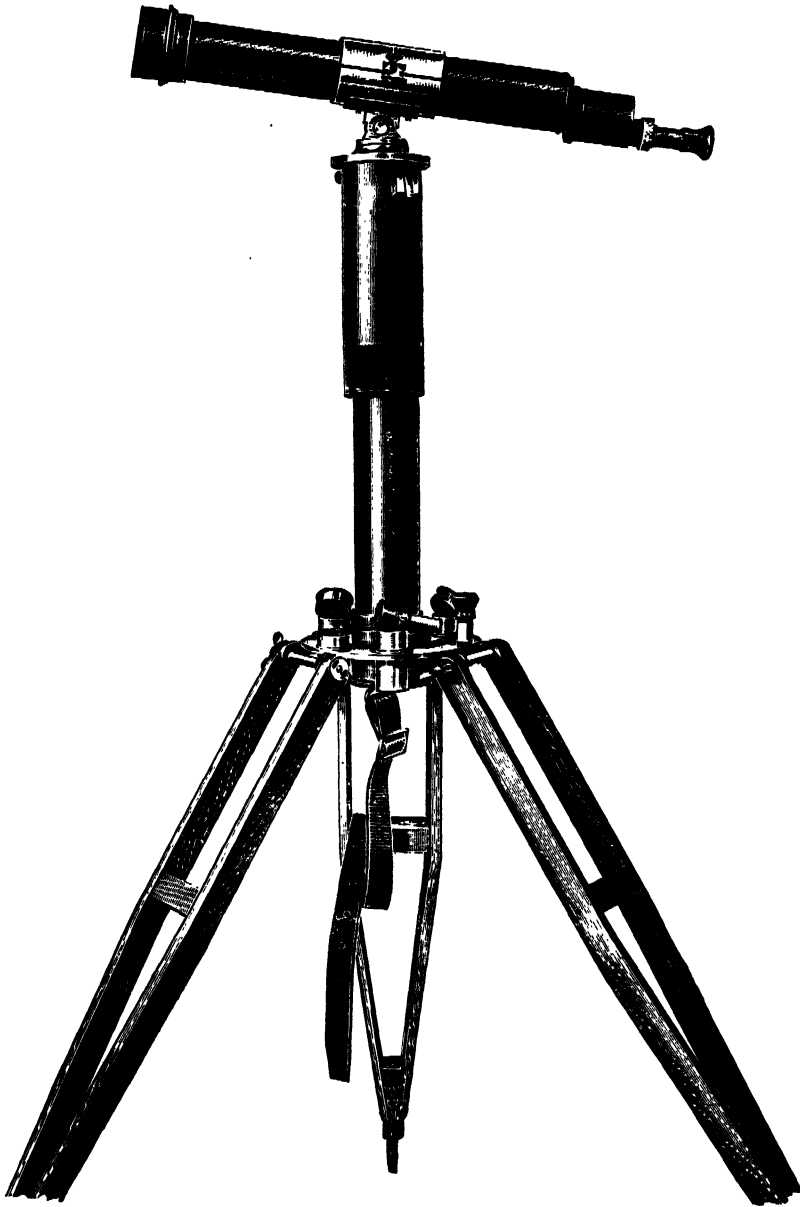
Angular field, with eye-piece $\div 18$	..	$2^{\circ}2'$	..	Lateral field at 1000 yards	35 yards.
do. $\div 24$	..	$1^{\circ}8'$	..	do. do.	30
do. $\div 30$	..	$1^{\circ}3'$	..	do. do.	25

**Price of the "Searchlight" Prismatic Telescope complete, Rs. 375.**

Code word for Telegrams—"LUMINATOR."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The "SEARCHLIGHT" Prismatic Telescope, For Army Signalling and General Military Purposes.



The above Illustration shows the "Searchlight" Prismatic Telescope (described on page 24)  
ready for use.

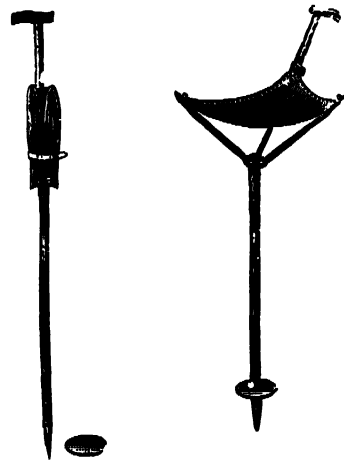
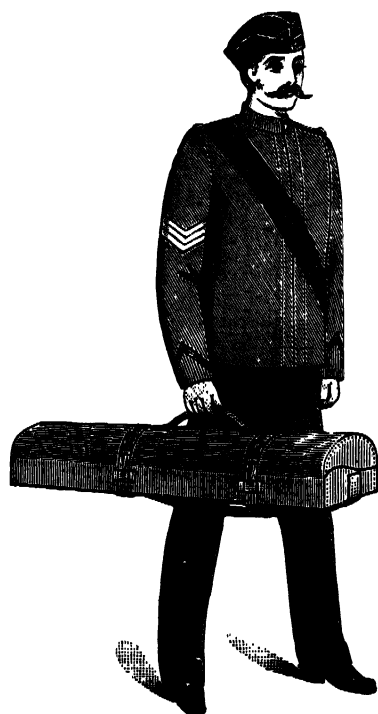


# The "BULLSEYE" Target Telescope.

(THE TARGET TELESCOPE OF THE FUTURE.)



TELESCOPE FOLDED INSIDE TRIPOD.



STICK SEAT  
CLOSED.

STICK SEAT  
OPEN FOR USE.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The "Bullseye" Combination Target Telescope

**has been carefully worked out to embody durability,  
portability, simplicity, and efficiency for field purposes.**

The instrument is of the highest grade, and has the double advantage of being permanently attached to a strong Folding Tripod Stand, which not only renders it convenient for speedy use, but forms at the same time the best possible protection to the telescope when not in actual use, forming a case in itself.

Attached to the tripod is an ingenious folding metal stand, or holder, for fixing the card or register during target practice. The Stick Seat, as shown in the illustration, has a large triangular canvas-lined leather seat, which is attached to three steel supporting bars pivoted on to the lower part of the stick, which is made of strong, light Steel Tubing, such as is used for cycles, and is strong enough to bear any weight placed upon it.

A particular feature of the "Bullseye" is that the whole combination, including Telescope, Tripod and Register Holder, slides easily into the required position without the usual trouble of screwing and unscrewing; no thumb-screw being used in its construction.

Taking into consideration the quality of the Telescope, the portability of the combination, and the simplicity of its construction, we think we may fairly claim that the "BULLSEYE" ranks first as a convenient and reliable instrument for target practice and general field purposes.

Diameter of object lens,  $2\frac{1}{4}$  inches.

**Price, complete with Stick Seat, Solid Leather Case and Shoulder Strap,**

**Rs. 325.**

Code word for Telegrams—"BULLSEYE."

## **DIRECTIONS FOR USING THE "BULLSEYE" TELESCOPE.**

First unstrap the tripod stand. Fix the tripod in an upright position on the ground and raise the Telescope into position so that the double brass folding joint is vertical; it will then sink into position through the disc into the socket, resting on the flange of the pillar. Now turn the arrow on the flange of the pillar to No. II. on the disc or table of the tripod and the instrument will be firmly locked and ready for use.

## **TO FOCUS THE TELESCOPE.**

First draw out the tube of the eye-piece to its full length, then focus by turning the milled-edged focussing wheel. This arrangement will be found much more convenient than the ordinary form.

**The Stand may be set up and the instrument ready for use in one minute.**

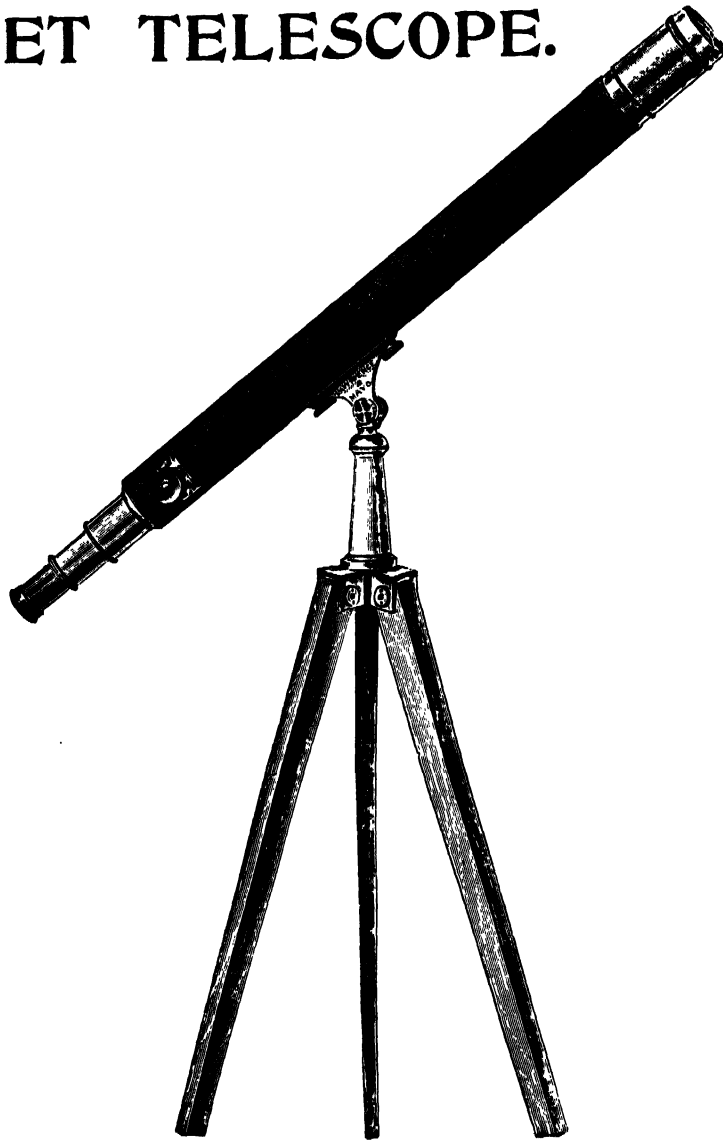
## **TO FOLD UP THE INSTRUMENT FOR PACKING IN THE LEATHER CASE.**

First place the Telescope in a vertical position, the eye-piece downwards, then turn the arrow on the flange back to No. I. on the disc, lift the double brass joint out of the socket and fold the Telescope into position between the legs of the tripod. Secure the legs of the tripod by means of the strap attached. Straps are provided inside the leather case for securing the Stick Seat.

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**LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# TARGET TELESCOPE.



A very powerful **Target Telescope**, with hard bronzed metal body, side focussing screw with rack and pinion adjustment, pancratic eye-piece, with powers of 30, 40, and 50 diameters, object glass  $2\frac{1}{4}$  inches diameter. Mounted on a strong Tripod Stand with vertical and horizontal motions.

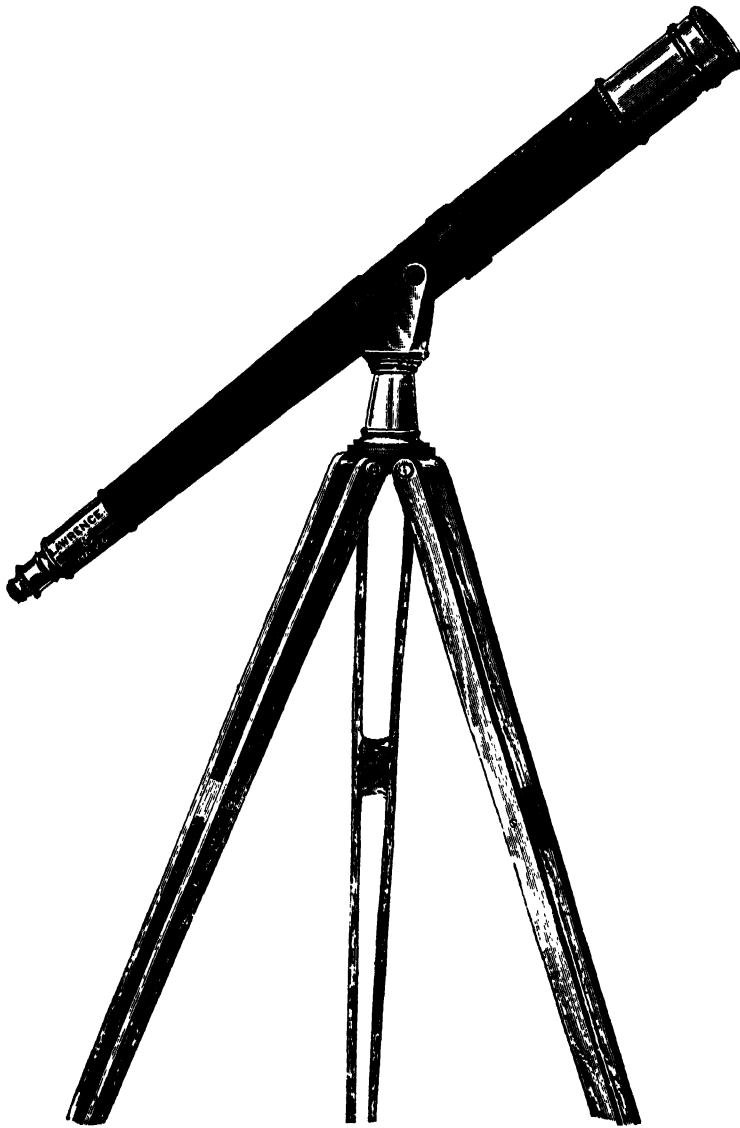
**Price, including strong Pine Case (for Telescope only), with lock and key,**

Code Word for Telegrams—"TARGET."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## “LOOK-OUT” Telescope.



A very **powerful Telescope**, used for look-out purposes, and suitable for Fortresses or elevated stations commanding long and distant views, 3 in. diameter Object Glass with magnifying power of about 30 diameters, mounted on a strong tripod stand with vertical and horizontal motions. Length of Telescope when closed, 48 inches; when fully drawn out, 57½ inches.

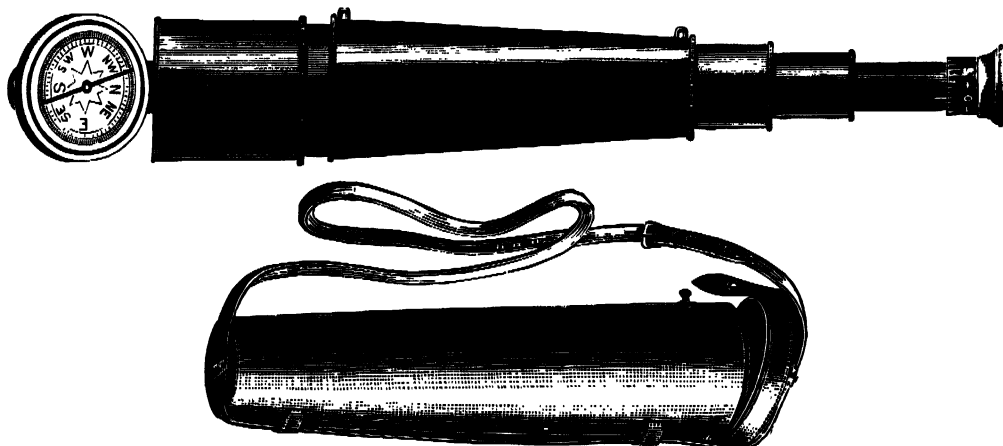
**PRICE, Rs. 300.**

Code Word for Telegrams—"FORTRESS."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The "MARKHOOR" (Improved Remington) Stalking Telescope.

WITH IMPROVED GRADUATED FOCUSSING EYE-PIECE.



The "Markhoor" is a three-draw Stalking Telescope, with high power, long range and large field of view. It is well known and considered an acquisition by sportsmen in Somaliland and the Himalayas. The body and tubes are made of hard bronzed metal, drawn nearly as light as aluminium and much more durable. The "Markhoor" Telescope has the advantage of a graduated focussing eye-piece, obviating the difficulty always experienced in focussing a telescope, and rendering it as easy to focus as a binocular field glass, the instrument being immediately available for use by simply extending the tubes to full length and turning the eye-piece until the focus is obtained.

A serviceable compass is fitted inside a strongly hinged lid which protects both object glass and compass when closed. This registered combination has been very much appreciated.

Metal loops are fixed to the body of the "Markhoor" for attaching the shoulder straps supplied to the leather case, which permits of the case being temporarily discarded.

Length of the "Markhoor" when closed, 10 inches.

When fully drawn out, 29½ inches.

Magnification 26 diameters.

Diameter of object glass, 2¼ inches.

Diameter of compass, 1⅞ inches.

The compass has a metal dial divided every two degrees to 360, with bar needle and agate centre.

PRICE, including a superior solid brown leather sling case of improved pattern, **Rs. 125**

Code Word for Telegrams—"MARKHOOR."

The same telescope as above, fitted with pancratic eye-piece (but without graduated focussing eye-piece), magnifying 30, 35, and 40 diameters, **Rs. 150**

Code Word for Telegrams—"STALKER."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON**

# The "ROCKET" Naval Telescope.

WITH MARINER'S COMPASS AND SOFT WATERPROOF PROTECTOR.



FITTED WITH METAL LOOPS FOR SHOULDER STRAPS.

The "Rocket" is a **single draw Nautical Telescope**, fitted with **Lawrence and Mayo's Improved Graduated Focussing Eye-piece**, rendering it as easy to focus as a Binocular Field Glass, the instrument being immediately available for use by extending the telescope to full length and turning the eye-piece until the focus is obtained. We can with every confidence recommend the "**Rocket**" **Naval Telescope** to officers of the Naval and Mercantile Services, as it has all the necessary qualities requisite for Marine purposes. The body is made of hard metal (grained to imitate Morocco leather), which is suitable for all climates, and therefore much more serviceable than the old style of leather covering. The lenses are of the highest grade, and the combination carefully worked out to ensure the best results when viewing objects at sea. The "Rocket" is supplied with a serviceable Mariner's Compass fitted into a strongly-hinged lid, which protects both object-glass and compass when closed; and, to render the "Rocket" more complete as a Marine Telescope, a close fitting, soft detachable waterproof covering is provided, which admits of the Telescope being used without removing the cover by simply opening both ends.

**No. 1.**—Magnifying power 25 diameters, diameter of object glass  $2\frac{1}{4}$  inches, diameter of compass 2 inches, length of telescope when closed 25 inches, when drawn out to its full length 32 inches. **PRICE**, including Waterproof Cover, **Rs. 110.**

Code Word for Telegrams - "ROCKET."

**No. 2.**—Magnifying power 25 diameters, diameter of object glass  $1\frac{9}{16}$  inches, diameter of compass  $1\frac{3}{8}$  inches, length of telescope when closed  $25\frac{1}{2}$  inches, when drawn out to its full length 32 inches. **PRICE**, including Waterproof Cover, **Rs. 80.**

Code Word for Telegrams—"NAVAL."

**No. 3.**—Suitable for Cadets. Magnifying power 20 diameters, diameter of object glass  $1\frac{1}{8}$  inches, diameter of compass  $1\frac{3}{8}$  inches, length of telescope when closed  $17\frac{1}{2}$  inches, when drawn out to its full length 24 inches. **PRICE**, including Waterproof Cover, **Rs. 55.**

Code Word for Telegrams—"CADET."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## PORTABLE STANDS for Military and other Telescopes.



### THE "UNIVERSAL" TRIPOD STAND.

This is a splendid Stand, equally suitable for either Binoculars, Binocular Telescopes, or Telescopes. It is extremely firm and rigid, and can be rapidly fixed into position, and used either sitting or standing, the required height being easily obtained by raising the brass pillar, which can be securely fixed by means of the clamping screw. The Stand, which is made of hard, well-seasoned wood and brass mounts, has horizontal and vertical adjustments, and straps for holding the instrument in position.

**PRICE, including Canvas Case with leather-bound seams, Rs. 65.**

CODE WORD FOR TELEGRAMS, "UNIVERSAL."

### THE "CLUB" IMPROVED TRIPOD STAND

**For Target or Signalling Telescopes.**

This Stand is made in a very portable form, and is very compact, light, and easy to carry, but very rigid when set up. The attachment screws and nuts are made on an improved method by which they are permanently fixed to the legs and cannot be lost.

We can strongly recommend this Stand for shooting clubs or general military purposes.

**PRICE, including Canvas Case with leather-bound seams, Rs. 70.**

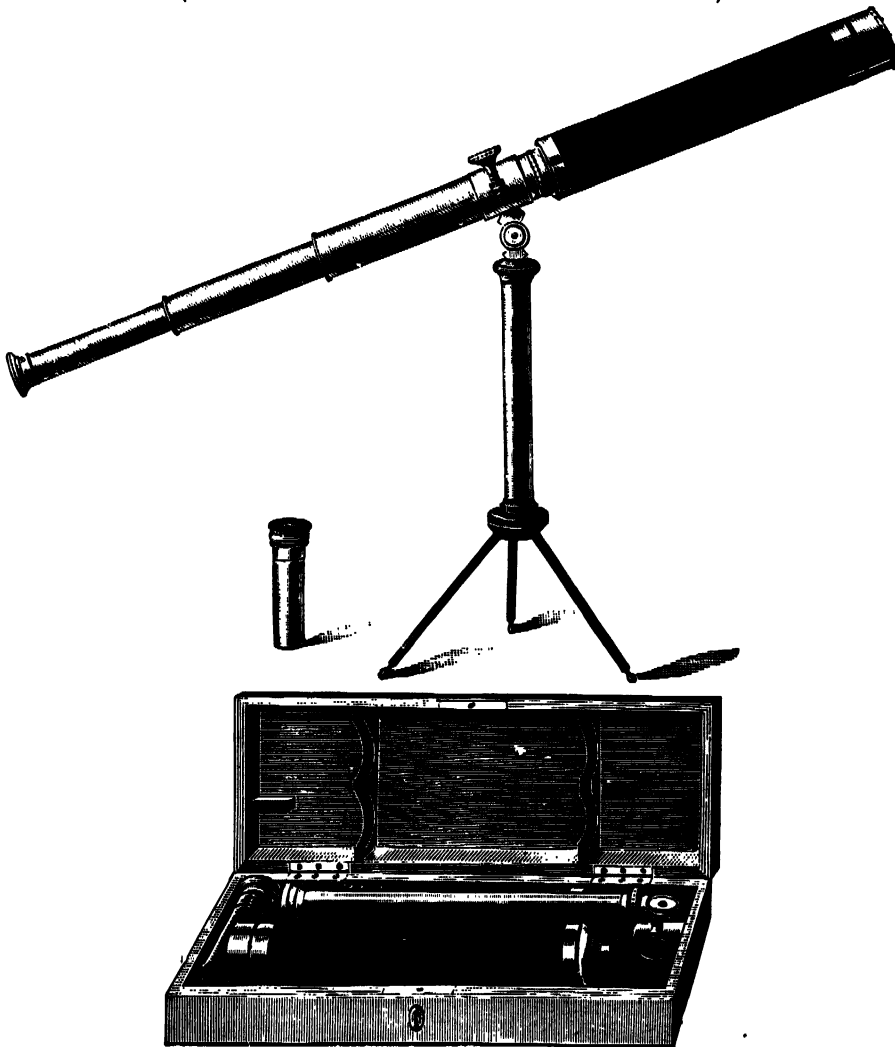
Code Word for Telegrams—"CLUB."



**LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# Portable Terrestrial and Astronomical Parlour Telescope.

(CAN BE USED AS A DEER STALKER.)



This Illustration shows the Telescope and Stand packed in its Case, 14×8×3 inches.

**THREE-DRAW TELESCOPE**, hard bronzed grained metal body. Length, 10½ inches when closed, 30 inches when fully drawn out. Diameter of object glass, 1½ inches clear aperture, fitted with a terrestrial eye-piece magnifying 30 times, and an astronomical eye-piece magnifying 50 times, dark glass for viewing the sun, brass table stand and clip with jointed pillar and steel screw for screwing into a tree or field-gate.

**PRICE**, complete in Oak Case with metal handle, and lock and key, **Rs. 95.**

Code Word for Telegrams—"PORTABLE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



# THE EDUCATIONAL TERRESTRIAL AND ASTRONOMICAL TELESCOPE.



A Brass Body Telescope, 32 inches long when closed, rack and pinion focussing adjustment,  $2\frac{1}{2}$  inch object glass, with one terrestrial eye-piece magnifying 45 diameters and one celestial eye-piece magnifying 95 diameters, also a sun glass. The Telescope is mounted on a strong polished wood tripod stand, with firm joints. Telescope, eye-pieces and appliances packed in a strong polished wood case.

**PRICE, Rs. 210.**

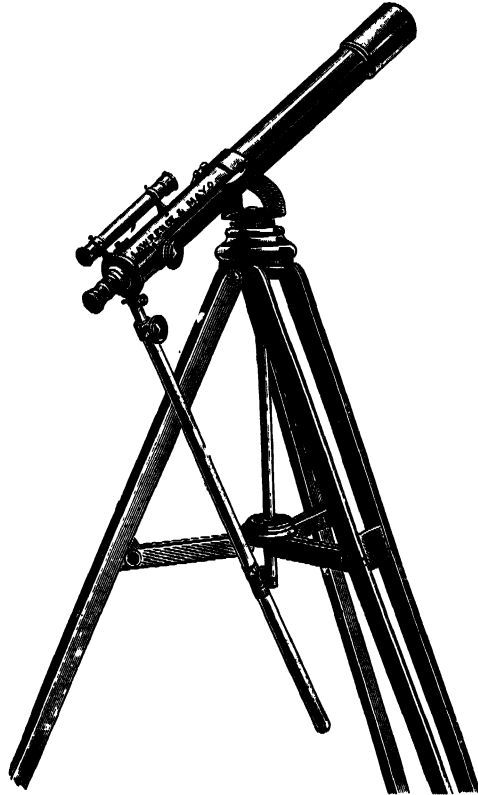
Code Word for Telegrams—"ASTRONOMY."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## STUDENTS'

### Astronomical and Terrestrial Telescope.



**STUDENTS' ASTRONOMICAL and TERRESTRIAL TELESCOPE**, fitted with first quality object glass,  $3\frac{1}{4}$  inches clear aperture, star finder, dew cap, two Astronomical eye-pieces, giving magnifying powers of 60 and 120 diameters, and one Terrestrial eye-piece magnifying 55 diameters.

Mounted on tall altazimuth stand, with steady rod and vertical rack.

Telescope with eye-pieces, dew cap, and top of stand, packed in strong case with lock and key.

**PRICE, Rs. 675.**

Code Word for Telegrams—"STUDENT."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# ASTRONOMICAL TELESCOPE.

Can also be used for Terrestrial Purposes.



**ASTRONOMICAL TELESCOPE**, equatorially mounted, adjustable to different latitudes from 0 to 70°. Fitted with first quality object glass, 3 inches clear aperture. Three Astronomical eye-pieces giving magnifying powers of 60, 120 and 200 diameters, and Pancratic Terrestrial eye-piece giving magnifying powers from 45 to 65 diameters. Tangent screw motion in right ascension, star-finder and dew cap, mounted on strong oak tripod stand with stretcher. Telescope and dew cap packed in strong case.

PRICE, **Rs. 825.**

Code Word for Telegrams—"LATITUDE."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## TERRESTRIAL AND ASTRONOMICAL TELESCOPE.



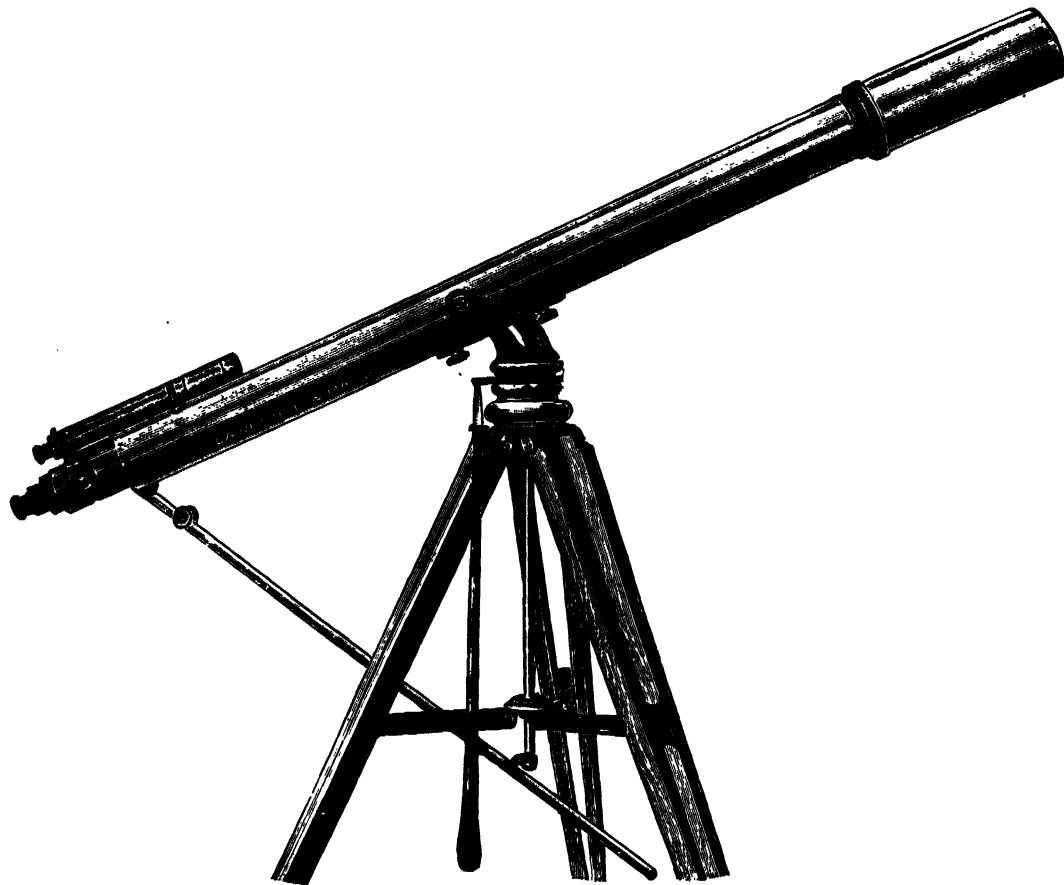
First Class Terrestrial and Astronomical Telescope, fitted with first quality object glass,  $3\frac{1}{2}$  inches clear aperture, 3 Astronomical eye-pieces, with magnifying powers of 60, 120 and 200 diameters, one Pancratic Terrestrial eye-piece giving powers from 45 to 65 diameters, star finder and dew cap, equatorial mounting adjustable to different latitudes from 0 to 70 degrees. Declination circle  $4\frac{1}{2}$  inches diameter divided on brass, with vernier reading to 2 minutes of arc, adjustable hour circle  $3\frac{1}{2}$  inches diameter divided on brass with two sets of divisions and verniers reading to 30 seconds of time. Tangent-screw motion in right ascension and slow motion in declination; levels and all necessary means of adjustment; brass clasps for holding telescope, and strong oak tripod stand with stretcher. Equatorial mount and telescope packed in separate cases.

**PRICE, Rs. 1,300.**

The quality and workmanship of the above instrument is throughout of the highest grade.

Code Word for Telegrams—"EQUATORIAL."

## ASTRONOMICAL AND TERRESTRIAL TELESCOPE.



*ASTRONOMICAL and TERRESTRIAL TELESCOPE* with first quality object glass 4 inches clear aperture and 60 inch focus, brass body with finder, rack and pinion adjustment for focussing, perfect vertical and horizontal motion by tangent screw, one best quality pancratic Terrestrial eye-piece magnifying 65 to 130 diameters. Three best quality Astronomical eye-pieces with dark sun glass heads giving magnifying powers of 60, 120 and 260 diameters, one best quality sun prism, superior finished oak tripod stand with stretcher. The optical and all other parts of the Telescope finished in best style by the most experienced workmen.

**PRICE (including best finished Case for Telescope, Eye-Pieces,  
and Top of Stand), Rs. 1,750.**

Code word for Telegrams, "SUPERIOR."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## Military Compasses, suitable for Day and Night Marching.

*Extract from New Infantry Drill Book, 1892.*

"A good magnetic compass is an indispensable part of every officer's field equipment. With a view to night attacks, it is desirable, that, in future, these compasses be prepared with luminous paint. The magnetic bearing of the enemy's position from the place of rendezvous should be known to every officer and non-commissioned officer of the attacking force."

In military marching, all magnetic directions are given from  $0^{\circ}$  to  $360^{\circ}$  counting from Right to Left, it is therefore necessary that all military compasses having *fixed* dials of degrees, should be figured from Left to Right—and all compasses having moveable or floating dials of degrees, should be figured from Right to Left—this will be apparent by the following examples:—

To set a compass having a *fixed* dial of degrees to a given magnetic bearing—say  $45^{\circ}$ —the compass should be turned until the magnetic needle stands directly over the point at  $45^{\circ}$  and the march made in the direction of the North point on the dial, but to set a compass having a floating dial of degrees, to the same magnetic bearing, the compass should be turned until the central or luminous line in the lid of compass is directly over the point at  $45^{\circ}$  and the march made in the direction of the central line in lid of case. The same angle of direction will be attained in either case.

## The New Service Pattern Prismatic Compass, Mark V 1904

**T**HIS compass is the most complete Military Surveying Compass up to the present date—embracing many of the advantages introduced by Colonel Verner, **with recent additions.**

Its size is  $2\frac{1}{8}$  inches diameter and  $\frac{3}{4}$  inches depth, with the projection of the prism box added. The case is made of strong metal oxidized. The outer band of the case is graduated to a scale of degrees and compass points, for simplicity when in use on map, for plotting and for plane table use, also when adjusting the index to a known bearing; for instance, if the bearing is known to be  $270^{\circ}$  West, the index would be revolved, until it coincides with that figure and letter, the luminous line in cover would then point in the direction to be followed.

The dial is made of mother-o'-pearl, and is graduated on the outer circle to  $360^{\circ}$ —the figures being *reversed* to read *erect* when seen through the prism sight. The inner circle of graduations is figured erect for use of reading without the prism. The centre of the dial is covered with luminous paint. A black arrow is painted on the centre, with its head pointing to Magnetic North and its tail to South.

The index ring is made to revolve, and has a milling on its edge for this purpose, upon which is cut an index point. The glass fitted tightly in the index ring has a radial line painted on the under side, and is in direct contact with the outer index line.

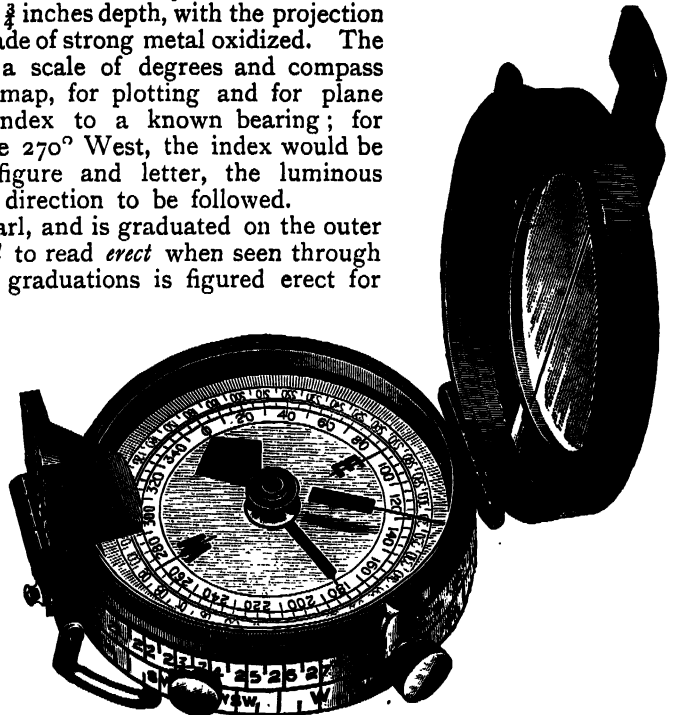
When moved to any direction required, a clamp is provided to secure it in position. This is attached to the outside of the case, and is effected by turning the milled head screw which presses or releases a small point into or from the milling on the edge of the index ring.

The magnetic needle is made of the finest steel—hardened—and magnetised to saturation, and is mounted with a finely made jewel centre to work upon its hardened steel pivot.

The compass is provided with a solid leather sling case, with loop for Sam Browne belt, also pouch and brass holder for magnesium wire.

**PRICE COMPLETE, Rs. 42-8.**

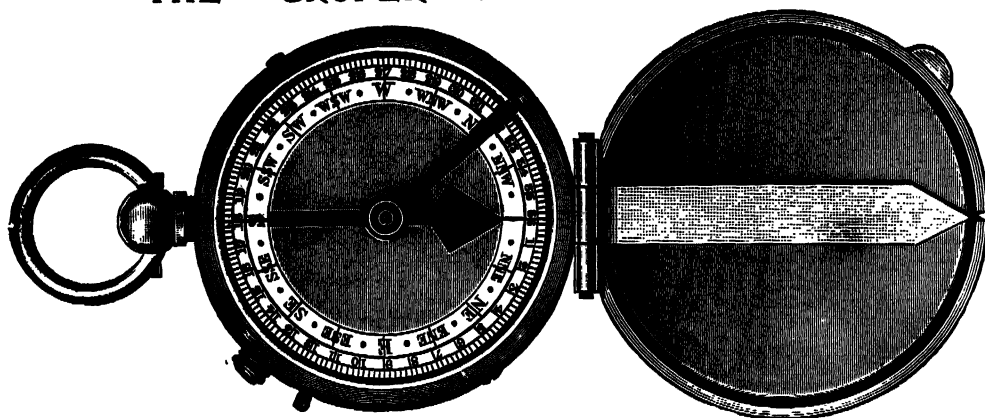
Code Word for Telegrams—"GONDOLA."



LAWRENCE & MAYO

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON**

## THE "GROPER" MILITARY COMPASS.



FOR USE AS A PLANE TABLE COMPASS.

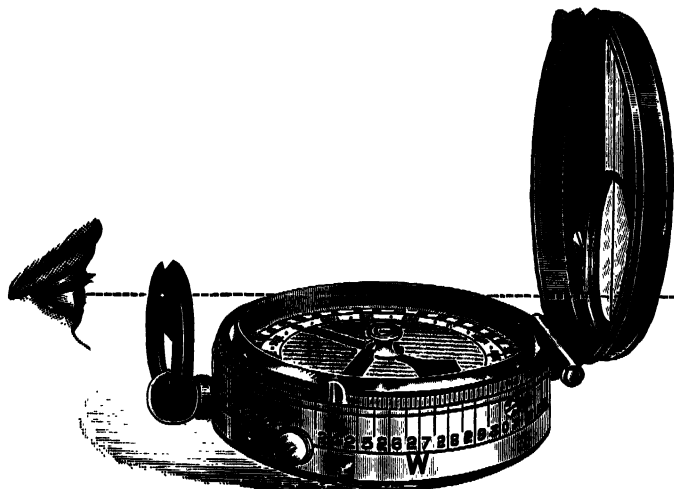


FIGURE 2. FOR USE AS A SIGHTING OR NIGHT MARCHING COMPASS.

**Price, Rs. 20**

Code Word for Telegrams, "GROPER."

Solid Leather Sling Case with loop for Sam Browne Belt, also Pouch and Brass Holder for Magnesium Wire, Rs. 3-8.

Code Word for Compass and Case, "GRAPLING."

**DIRECTIONS FOR USING THE "GROPER" COMPASS.**

**NOTE.**—In order to give large figures the 0 is omitted from both the dial and the outside of box, hence 24 is 240°, and 18 is 180°, etc. The dial of this Compass is divided to every 2°, and figured from 1 to 36, representing 10° to 360°.

**FOR NIGHT MARCHING. (1)—By Visiting the Ground.**

**For Night Operations:**—In making arrangements for leading a march by night, the best plan, when practicable, is to proceed to the point of departure by day, and, with the same Compass that is to be used in the advance by night, note the magnetic bearing of the objective point. This eliminates any possible error, due either to the Compass or ignorance of the exact variation.

with the lubber line opposite the hinge joint, and also by the small index line on the milled edge of the revolving bezel.

In any subsequent advance by night, it is only necessary to turn the Compass until the index (set as above) coincides with the North point on the card. The luminous line in lid will then point in the required direction.

It will often be impossible to visit the ground, and the Compass will then have to be set by the aid of a map.

The ordinary method of doing this is to rule a line through the point of departure, so as to mark the magnetic North and South line, and a second one from the same point to the objective, to mark the line to be followed.

Having drawn the two pencil lines on the map as above, the Compass is laid along the one showing the required line of advance, and carefully adjusted thereto by laying the sights in lid and bow ring back, and adjusting the compass so that the two nicks coincide with the pencil line. The index is then shifted until it exactly corresponds with the line showing the magnetic North and South line on the map, and the Compass is ready for use.

Should the bearing be known, all that is required to be done is to revolve the bezel until the index coincides with the exact degree on the outside of the box. For instance, if the bearing should be 240 S.W., revolve the bezel until the index coincides with that figure, viz. 24, as shown in the figure, then turn the Compass until the North point of dial is immediately under the black index line; the luminous line in lid will then point in the direction required.

The advantages of this Compass for general military purposes are many, it being—

A very clear luminous Compass.

An unmistakable night marching Compass.

A sketching Compass, for use with plane table or any board.

A sight Compass for observing bearings of any objects without a prism, with all practical accuracy for rapid field work.

A plane table Compass.

A handy "Map reading" Compass.

A Compass for recording bearings and positions by day or night.

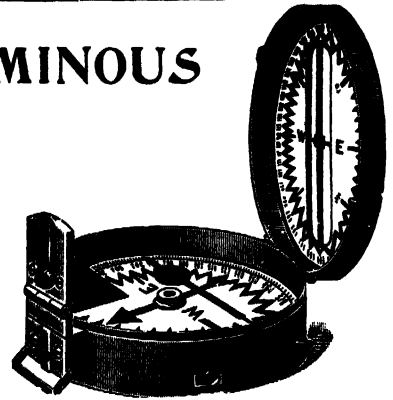
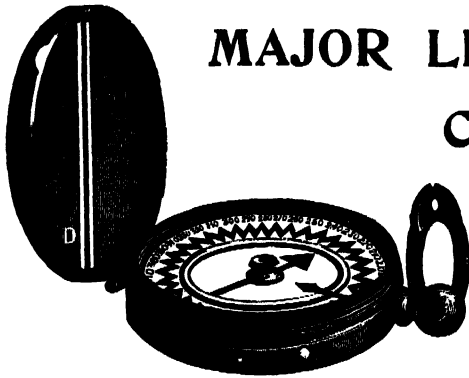
A true North Compass.

**SPECIFICATION.**—2 inch bronzed metal case, strong hinged cover with side stop, card dial with luminous centre, having a bold black painted arrow. Luminous direction line in lid, glass window with fine black sighting vane, pendant knob and ring, having a fine pin hole sight, also V-shape nick on pendant bow and a corresponding nick on top of edge of cover for obtaining an alignment and for simplicity of adjusting to a pencil line when in use as a plane table compass. Box divided on the outside to every 5 degrees, and figured 10 to 36 with 8 Compass points, N., S., E., W., etc., engraved as illustrated.

OBJECTIVE

**LAWRENCE & MAYO, Manufacturing Opticians,****67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## MAJOR LEGH'S LUMINOUS COMPASS.



This Compass has been designed by MAJOR LEGH, to give greater ease and accuracy in "setting" to a given magnetic bearing at night, and in "taking bearings" both by day and in a bad light—its advantages—which will be manifest—are due to the *form* and manner in which the circle is divided, giving, as it does, a great extension of the distance between degrees.

By this means, a small circle can be used with an equivalent of visibility to a circle of *twice* its size, thus giving great accuracy in a portable form. This is obvious when it is seen that each point on the *outer* circumference represents ten degrees, and each point on the *inner* circumference a sub-division of five degrees.

The connection between the outer and inner points thus represents the remaining four degrees, reading inwards to the five degrees and outwards to the ten degrees.

It is thus possible to show plainly by divisions on two concentric circles, ten degrees and sub-divisions which on one circumference could not be distinguished.

Summarizing the advantages claimed over other luminous compasses—they are:—

- 1.—Undoubted greater visibility by night, in that the zig-zag black lines, as shewn on the diagram, are very conspicuous on the luminous background.
- 2.—Extreme simplicity and accuracy, owing to the easy approximation to single degrees, combined with portability.

The Compasses are made in two forms—Plain and Prismatic:

- |  |                |  |
|--|----------------|--|
| No. 1.—2-inch Plain Night-Marching Compass, with sight vane in lid of case; luminous line of direction, luminous floating card dial, and central moveable setting and reading bar. . . . .   | <b>Rs. 18</b>  | Code word for Telegrams. "Planet."           |
| Solid leather sling case with loop for Sam Browne belt, also pouch and brass holder for magnesium wire . . . . .   | <b>Rs. 3-8</b> | Code word for Compass and Case. "Acropolis." |
| No. 2.—2-inch Day and Night Prismatic Compass, with graduated luminous centre to floating card dial, with central moveable setting and reading bar, sight vane in lid of case, and inside of lid fitted with a luminous graduated card for map reading and protracting purposes and night-marching . . . . . | <b>Rs. 25</b>  | Code word for Telegrams. "Moon."             |
| Solid leather sling case with loop for Sam Browne belt, also pouch and brass holder for magnesium wire . . . . .   | <b>Rs. 3-8</b> | Code word for Compass and Case. "Acrobat."   |

### DIRECTIONS FOR USING MAJOR LEGH'S LUMINOUS COMPASS.

#### TO TAKE A BEARING.

With the Prismatic Compass, the bearing is taken in the usual way.

With the Plain Compass, adjust the moveable setting bar to coincide accurately with the line of direction. Take the shot when the needle is steady, first lift the card and then stop it, and use the bar to read off the diagram on dial the value of the angle taken. This can be done equally with the Prismatic Compass even in a bad light.

#### TO SET FOR NIGHT-MARCHING.

Turn the Compass until the *given bearing* coincides with the line of direction, when steady, lift and stop the needle, turn the setting bar to coincide with the needle, then march by the line of direction.

For Map Reading and Protracting purposes, the lid of small Compass is graduated and correctly centred. The lid is here used in the same manner as the centre of the Compass would be if it were transparent.

### COPY OF LETTER FROM LORD ROBERTS, F.M.

"I have seen the Luminous Compasses, patented by Major Legh, and am much pleased with them.

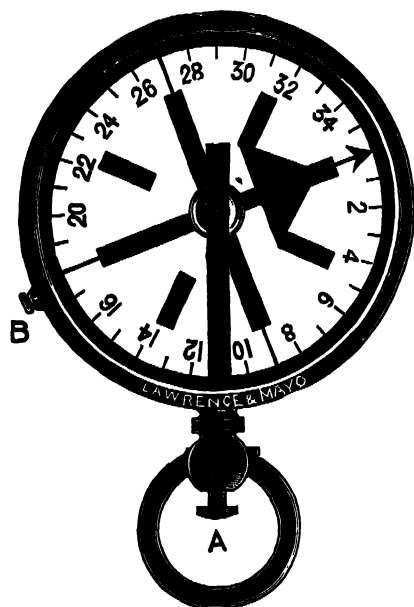
"The Prismatic Compass is an excellent one, and has been tested by my orders, both by day and by night, with very good results."



# MAJOR BRYAN'S LUMINOUS COMPASS

REGISTERED UNDER THE DESIGNS ACT

No. 323931.



"A" Check Spring. "B" Stop Action.

**T**HIS COMPASS (designed by Major T. W. G. Bryan, R.G.A.) is intended to be of the simplest possible form compatible with efficiency for reconnaissance and night marching purposes. The dial, which is  $1\frac{3}{4}$  inches diameter, is graduated to  $10^\circ$  only, as it is considered that decimals of  $10^\circ$  can be easily judged.

The needle is movable and can therefore be set, if desired, to compensate for local magnetic variation.

There is no lid, but the dial is protected by a strong glass recessed in a rim which fits inside the rim of the case. Two small slots in the latter facilitate the removal of the cover, when required, for setting the needle as above or for renewal of the dial.

A dial check spring ("A") is fitted inside the ring handle which enables a bearing to be easily taken whilst on horse-back.

## MAJOR BRYAN CLAIMS THE FOLLOWING ADVANTAGES FOR THE COMPASS

- (1) Simplicity and handiness with sufficient accuracy for reconnaissance and night marching purposes. Bearings are taken at night by means of the thick black lines on the luminous dial and glass (as explained further on). A Night March on a given bearing is thus carried out without previous "setting" of the Compass, and the direction can be changed at any time.
- (2) No luminous portion is exposed as with a line on the lid. It is much easier to give the dial the necessary exposure to the light when there is no lid.
- (3) It is considered that as great, if not greater accuracy is obtained with a direction bar on the glass as with one on the lid.
- (4) The needle can, if desired, be set to compensate for magnetic variation and thus true bearings may always be taken.

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## DIRECTIONS FOR USING MAJOR BRYAN'S COMPASS.

To render the compass luminous at night expose the dial to the light by day. For use in the early morning either expose the dial to the light the previous day, for from one to six hours, depending on the sunshine, or burn about two feet of magnesium wire close to it the previous evening. Eight inches of wire will suffice if burnt just before using the Compass.

N.B.—The dial will eventually lose its property of acquiring luminosity—after a longer or shorter period according to the dryness or dampness of the atmosphere. Spare dials should be kept in air-tight boxes until required for use.

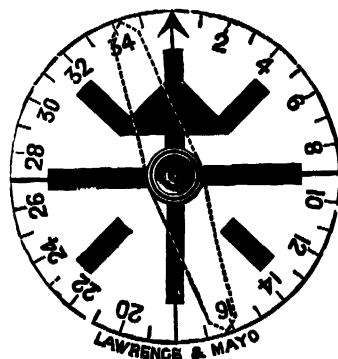
## TO TAKE A BEARING BY DAY.

Hold the compass with the black bar on the glass pointing to the object and read off the bearing at the vertical line opposite on the inside of the rim.

## TO TAKE A BEARING AT NIGHT.

Hold the compass with the black bar on the glass pointing to the object. Observe to which of the eight points of the compass (thick black lines) on dial the far end of this bar is nearest, then looking at the near ends of bar and line, estimate the exact angle they make with each other. These lines are the thickness of  $10^\circ$  on the circumference of the circle round their outer ends. The bearing of the compass point being known ( $0^\circ$   $45^\circ$   $90^\circ$  etc.) the bearing of the object is determined.

To set the compass to compensate for local magnetic variation remove the glass cover by means of the small slots under the rim, take up the dial and gently turn the needle through the angle of magnetic variation using the graduations on the front of the dial, thus:—the diagram showing the needle set for a variation of  $17\frac{1}{2}^\circ$  West. This may be tested by directing the compass on an object whose true bearing is known, or by the North Star, etc. The needle is screwed to the brass cap, and can be tightened or loosened if necessary.



**Price, Rs. 10.**

Code word for Telegrams. "Bearing."

**Solid Leather Case for Compass, with loop for Belt, Rs. 2.**

Code word for Compass with Case, "Knight."

**Extra Dial Cards Mounted on Aluminium in Air-tight Boxwood Cases, Rs. 2 each.**

**MESSRS. LAWRENCE & MAYO HAVE THE EXCLUSIVE RIGHT FOR THE  
MANUFACTURE OF MAJOR BRYAN'S COMPASS.**

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**LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## The “POLE-STAR” Military Compass.

With Luminous Dial suitable for Day or Night Marching.



The “Pole-Star” Night-Marching Compass is constructed for the use of Military Officers when on a night march, having a **luminous** floating dial made of **aluminium**, which is very light and rigid, **fully and legibly divided**, with jewel centre, revolving direction bar, side stop and check spring, circular glass sight in lid and sight hole in pendant ring. It is a very compact instrument, in bronzed gun metal case  $1\frac{1}{4}$  inches in diameter.

**Price, including solid brown leather case, with loop for belt, Rs. 17.**

Code word for Telegrams—“POLE.”

A cheaper form of Night Marching Compass, with card dial and luminous points, bronze gun metal case,  $1\frac{1}{4}$  inches in diameter. **Price, Rs. 8.8.**

Code word for Telegrams—“FILBERT.”

### DIRECTIONS FOR USING

## The “Pole-Star” Night-Marching Compass.

Align the sight hole in the pendant bow and the mark on the circular glass or the luminous line in the lid with the object to be marched on. Now turn the pointer on the glass by means of the milled rim until it exactly covers the point of the arrow head painted on the compass card. Continue the march on the line of alignment, keeping the pointer on the glass exactly over the arrow head on the compass dial.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# THE “STARLIGHT” COMPASS,

With Luminous Dial, suitable for Day and Night Marching.

DESIGNED FOR NATIVE MILITARY OFFICERS, THE DIAL BEING ENGRAVED  
IN ENGLISH, URDU AND NAGRI.



Strong bronzed metal body and cover 2 inches diameter, hinged lid, luminous line for night work, luminous floating card dial divided to 2 degrees and figured at every 20 degrees, and in Nagri and Urdu every ten degrees, line of direction on revolving glass, sight hole in pendant bow, and lined window in the lid for daylight observation.

**Price, including solid leather case with loop for belt, Rs. 12-8.**

Code word for Telegrams, “STAR.”

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## COMPASSES.

### The Popular "DOGSTAR" Military Pocket Compass.

FIG. 1.—This Compass is greatly appreciated on account of its accuracy, portability, and popular price, and is specially designed for the use of **Military Officers**.

The case is made of bronzed gun metal. The silvered metal plain open dial is  $1\frac{1}{2}$  inches in diameter, **very legibly divided to 2 degrees and figured every 20 degrees to 360**, stout bar needle, agate centre, and stop to prevent unnecessary wear when the Compass is not in use.

The "Dogstar" is a very popular pocket Compass in all parts of the world.

Rs. 5.

Code word for Telegrams, "DOGSTAR."

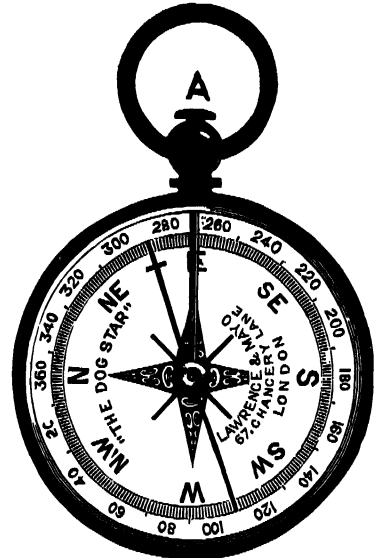


FIG. 1.

To set the Compass in motion, raise the button A under the ring handle.

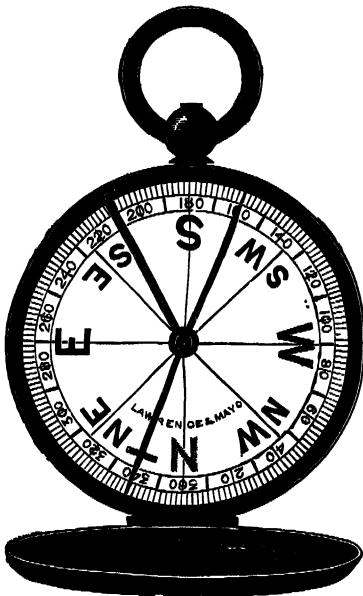


FIG. 2.

### Improved Pattern Colonial Compass.

FIG. 2.—This Compass has a strong bronzed metal snap Hunter case, 2 inches diameter metal dial with plain bold letters and figures, bar needle, agate centre and stop. Dial divided to 2 degrees and figured every 20 degrees to 360. This is in every way a good sound durable pocket Compass for Military or General use.

Rs. 12.

Code word for Telegrams, "COLONIAL."



FIG. 3.

### Hunter Case Collapsing Gimbal Compass.

FIG. 3.—This Compass is made Hunter form,  $1\frac{1}{2}$  inches diameter, of hard metal, and is no deeper than an ordinary watch. It is fitted on collapsing gimbals, causing the pearl day and night dial with luminous N. point to work very steadily, which renders it a most useful Compass for boating or use on horseback.

Rs. 18.

Code word for Telegrams, "GIMBAL."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

WATCH FORM COMPASSES.

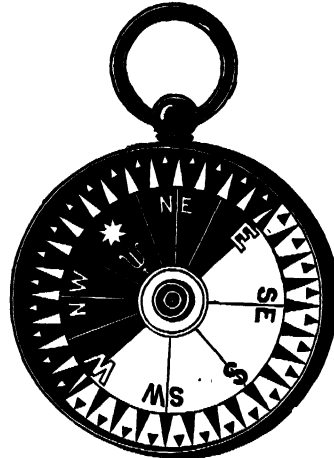


Actual Size. Fig. 4.

Bronzed Metal or Nickel Silver Case with Bar Needle, Enamel Card Dial.

Price, Rs. 3.

Code Word for Telegrams, "ENAMEL."



Actual Size, Fig. 5.

Bronzed Metal or Nickel Silver Case, with Singer's Card Dial.

Price, Rs. 3.

Code Word for Telegrams, "SINGER."

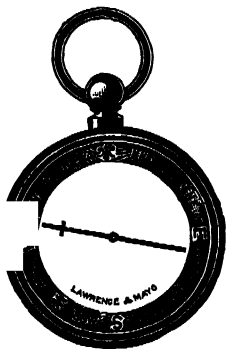


Fig. 6.

POCKET TRANSPARENT BAR NEEDLE  
PEBBLE COMPASS, MAGNIFIER, READING  
AND BURNING LENS.

INVALUABLE TO

MILITARY OR NAVAL OFFICERS, CYCLISTS, TOURISTS, YACHTSMEN,  
ELECTRICIANS, ARCHITECTS, AND OTHERS.

This Compass will be found very useful for examining Maps, Plans, Charts, etc. Being transparent, the roads on the Map are easily seen, and the distances calculated.

The Pebbles, being worked with optical precision, make it a useful magnifier of good power for reading and examining small objects.

Mounted in Silver, Rs. 25.

Code Word for Telegrams, "BURNER."

CHARM COMPASSES.



Fig. 7.

Plain Band Transparent Bar  
Needle Pebble Lens Compass.

In 15 Carat Gold, Rs. 30.

Code Word "FLOWER."

In Silver, Rs. 18.

Code Word "FERN."



Fig. 8.

Fetter Link, Charm Pebble  
Compass.

In 15 Carat Gold, Rs. 45.

Code Word "FETTER."

In Silver Rs. 20.

Code Word "FERRY."



Fig. 9.

Charm Day and Night Compass,  
Floating Dial.

In 15 Carat Gold, Rs. 31.

Code Word "FARM."

In Silver, Rs. 16-8.

Code Word "FERRET."

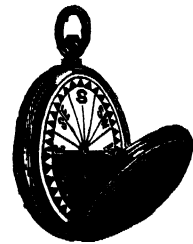


Fig. 10.

Nickel Charm Hunter  
Compass for Chain or Pocket.  
Pearl Dial with Stop.

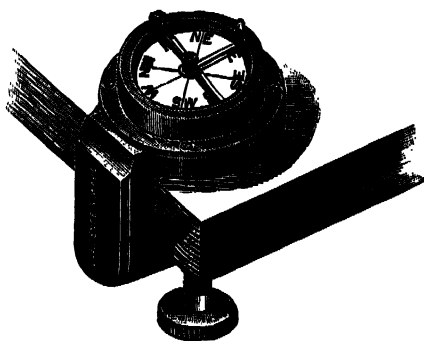
Rs. 8-8.

Code Word, "FESTOON."

## MAJOR WILKINSON'S ATTACHMENT COMPASS.

This instrument is intended to simplify the performance of rough sketches on active service, where a high degree of accuracy is not required.

The Compass is fitted with Colonel Richards' "Working Meridian," a line engraved on the glass, with which the needle must coincide when in use; its north end directed to the



index or projection at one end of the line.

The Compass Box can be turned round, so that the "Working Meridian" may be placed in such a relation to the sketch sheet that the ground to be represented may occupy its centre. When this is done, then, in order to draw the direction of a road or any object:—

1. Face the object exactly.
2. Turn the sketch sheet, to which the compass is now attached, until the "Working Meridian" corresponds with the needle, which must be level enough to play freely. This "sets" the sketch sheet in a position corresponding with the ground.
3. Take a flat ruler or straight edge (on which should be marked the scale you are using), and lay it with its edge corresponding with the point on the sketch from which the line is to be drawn; the edge being at the same time directed on the distant point towards which you are traversing—now draw a line along the edge of the ruler, in the direction of the distant point.

Fuller directions for use are given on pages 155, 156 of the Text-Book of Military Topography, by Colonel Richards, the Compass being similar in its use to that in the Cavalry Sketching Board. The advantage claimed for it is, that the Compass Box can be fixed by the clamp to any note book, sketch block, plane table, sabretache, map, etc., enabling any rough sketching to be done without a special board, while it is no larger than the pocket compass which all officers would carry on service.

Price, including leather pocket case, **Rs. 16.**

Code Word for Telegrams—"MERIDIAN."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## Wristlet Compass.

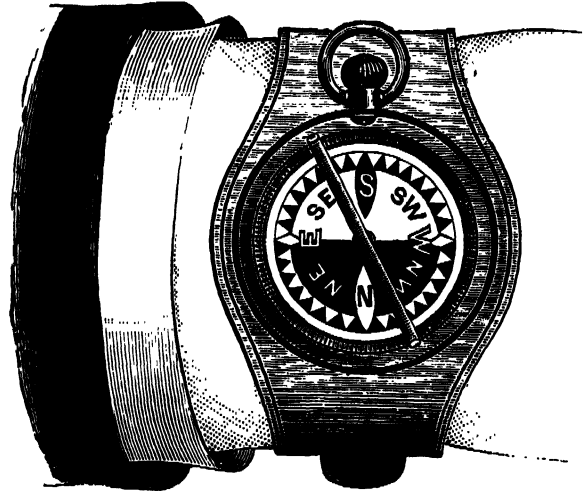
*For Use on Horseback, etc.*

This Compass has a pearl dial with agate centre, revolving luminous North and South points, direction bar and keyless stop action to prevent unnecessary wear when not in actual use. The instrument being fixed securely in a leather wristlet will be a great boon to Military Men, Travellers, Horsemen, Cyclists, Yachtsmen, etc.

To set the Compass in motion, turn the keyless button, which releases the dial.

**Price Rs. 18.**

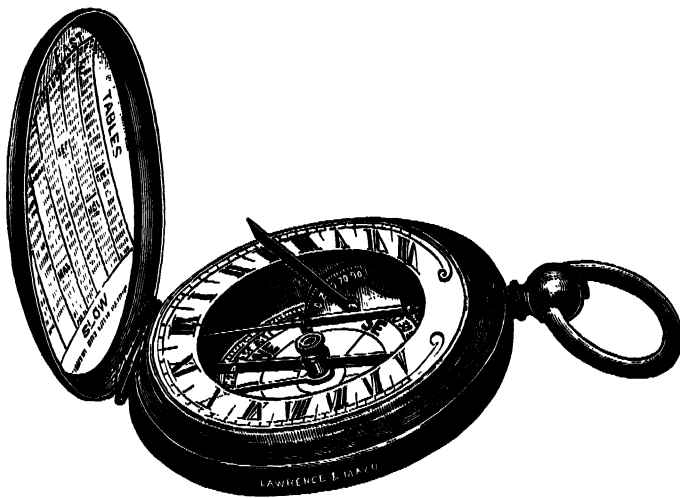
Code Word for Telegrams—"WRISTLET."



FULL SIZE.

## The Portable Pocket Compass & Sun Dial.

Registered Design No. 396957.



ACTUAL SIZE.

This compact little instrument will be of great interest and use to persons travelling, as it combines all the uses of a Magnetic Compass, as well as the Sun Dial.

The *Gnomen* is made to be adjustable to different latitudes, and the dial can be placed in the correct position towards the North point, by turning the case until the Gnomen is in a line with the North end of the compass needle, subject to the allowance for variation between *Magnetic North* and the *True North*.

(Example:—In England, turn the case until the Gnomen is in line with the North end of compass needle, then turn it further until the needle stands at  $16\frac{1}{2}^{\circ}$  West the allowance for this Country).

This position being obtained, the correct time can be taken from the shadow on the Dial, making the proper allowance shown by the equation tables supplied with each instrument.

### THE PORTABLE POCKET COMPASS & SUN DIAL.

$1\frac{3}{4}$  in., Silvered Metal Dial Compass, best hardened and tempered edge Bar Needle, jewelled cap and self-acting stop, combined with Sun Dial having adjustable Gnomen. Equation tables in lid.

**Bronze Metal Snap, Hunter Case, Secret Spring. Price Rs. 20.**

Code Word for Telegrams—"FIREFLY."





## BOAT COMPASS.

FIG. 1.

Mariners' or Boat Compass, 5 inch card dial with agate centre, mounted in brass bowl and working on gimbals, fitted in strong case with sliding lid.

PRICE, **Rs. 30.**

Code Word for Telegrams—"BOAT."

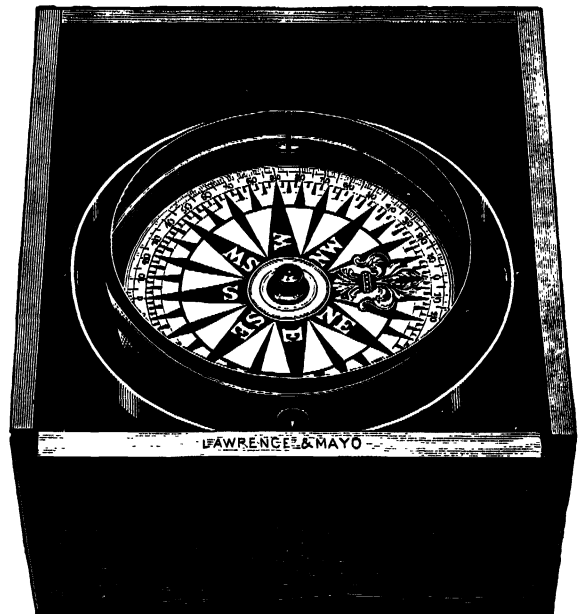


FIG. 1.

## YACHT COMPASS.

FIG. 2.

2½ inch card dial with agate centre, mounted in brass bowl and working on gimbals, fitted in strong case with hinged lid.

PRICE, **Rs. 25.**

Code Word for Telegrams—"BELT."



FIG. 2.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON

## Binnacles and Compasses for Boats and Yachts.

FIG. 3.—12 inch, medium height, moulded **Octagon Teak Binnacle**, with brass cleats and deck rings; round lamps and paraffin burners; height over all 40 inches; fitted with 8 inch "Hezzanith" Liquid compass.

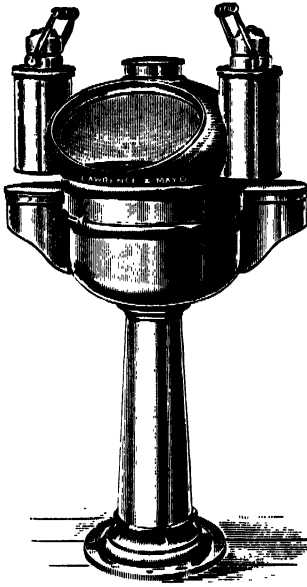


Fig. 4.

PRICE, **Rs. 225.**

Code Word for Telegrams—

"VANDAL."

FIG. 4.—12 inch Polished Brass **Pillar Binnacle**, with Chain Boxes fitted with demagnetised iron chain; height over all 36 inches; fitted with 8 inch "Hezzanith" Liquid Compass, Complete—

**Rs. 250.**

Code Word for Telegrams—"VAULT."

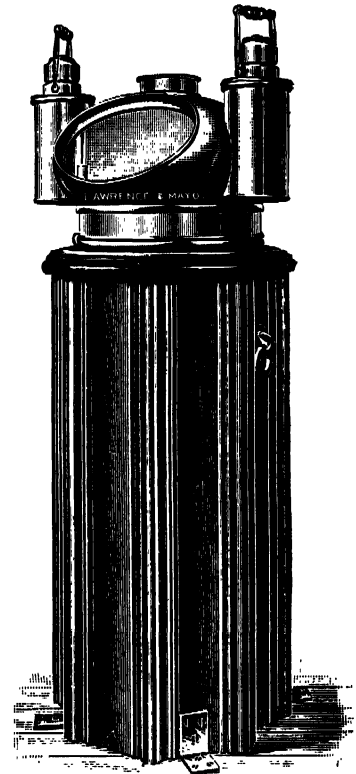


Fig. 3.

FIG. 5A.—8 inch Azimuth **Folding Sights**, on revolving Bezel, and **Reflector**, with wire across centre (as Fig. 5a), fitted to above Compasses, extra **Rs. 30.**

Code Words for Telegrams—"VELVET."

Code Word for FIG. 3 complete with FIG. 5a—

"THUNDER."

Code Word for FIG. 4 complete with FIG. 5a—

"VENDOR."

Fig. 5.—Japanese fluted brass pillar **Stand Binnacle**. With claw base 30 inches overall. With 9 inch polished brass top with two lamps fitted with patent paraffin oil burners. Chain boxes filled with demagnetized iron chains complete. With 6 inch flat card liquid compass.

PRICE, **Rs. 175.**

Code Word for Telegrams—"ZEBRA."

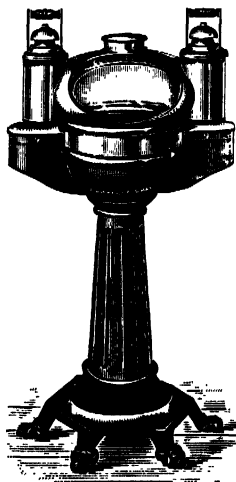


Fig. 5.

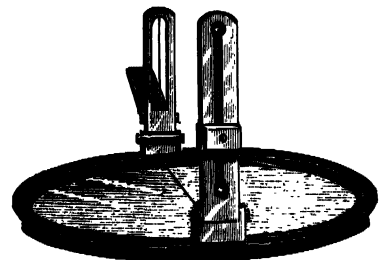


Fig. 5a.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

**8 Inch Round**  
**BRIGHT BRASS BOAT**  
**BINNACLE,**

Fig. 6.

With removeable top, one slide lamp to unship and fitted with 5 inch Hezzanith Liquid Compass.

**Price, Rs. 75.**

Code word for Telegrams—"VOLUME."

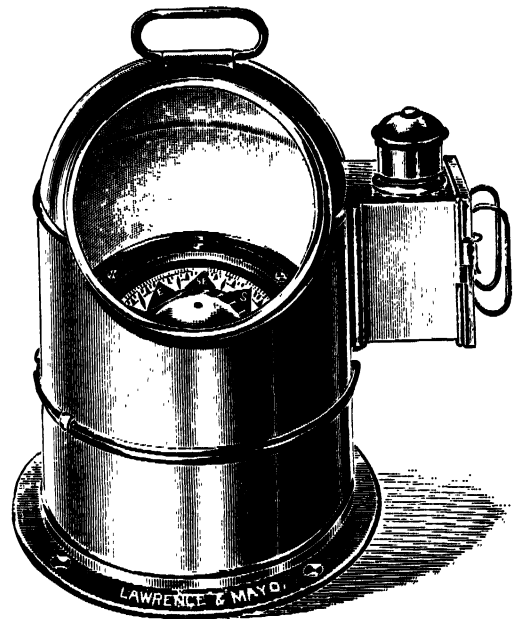


Fig 6.

**8 Inch Square**  
**BRIGHT BRASS, BOARD of TRADE**  
**Boat Binnacle,**

Fig. 7.

With one lamp to unship, and fitted with 5 inch Hezzanith Liquid Compass.

**Price, Rs. 90.**

Code word for Telegrams—"VEHICLE."

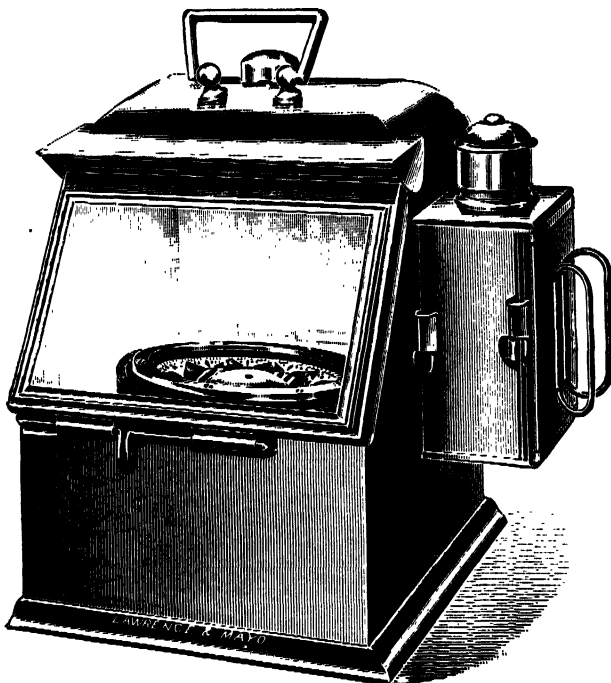
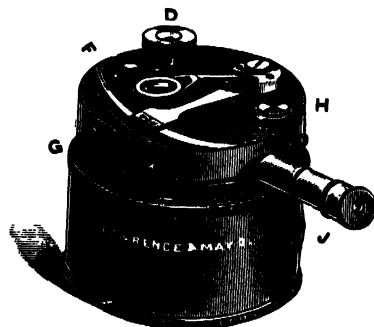


FIG. 7

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The Pocket Sextant.



**T**HIS instrument is very portable, forming, when shut up, a box of about three inches diameter. It will measure the actual angle between any two objects to a single minute. It requires no support, but simply held in the hand, is easily adjusted and, when once adjusted, seldom requires re-adjusting.

When required for use, the cover is taken off, and screwed on to the bottom where it is convenient for holding in the hand.

The Instrument — A is an index arm moveable about the centre of a graduated arc B, and having at its extremity, a vernier, which slides over the arc B, at the end of the index upon the under side, and moveable with it, is fixed a mirror C, which is called the index glass. This is firmly fixed upon the index arm so as to have its plane perpendicular to the plane in which the motion of the index arm takes place. This plane, which is called the plane of the instrument, is the same as the plane of the graduated arc B, which is graduated from  $0^{\circ}$  to  $100^{\circ}$  or  $130^{\circ}$ . The index arm is moved by means of the milled head D, the degrees on the arc are divided to 30, and by means of the vernier, angles can be read to one minute, the divisions on the arc are continued a short distance on the other side of Zero ( $0^{\circ}$ ), forming what is called the arc of excess. E is a fixed plane glass, called the horizon glass, the upper half of which is silvered, and the lower half left clear. It must be so adjusted that its plane may be perpendicular to the plane of the instrument and parallel to the plane of the index glass, when the index points to Zero ( $0^{\circ}$ ) on the arc, it is adjusted by means of the square-headed screws F and G, which are turned by the key H. I is a magnifying glass for reading the vernier, it should always be placed directly over the vernier when reading off the angles. J is a Telescope, which for portability is made to slide in and out, a dark glass cap is provided to the telescope for use when looking at the Sun, two levers are attached, carrying dark glasses to be interposed between the Mirror for the same purpose, these can be moved up or down as required.

To measure the angle between two objects, hold the instrument in the left hand, and look through the Telescope J, at the left-hand object. Turn D until the right-hand object, reflected from the index glass, appears in the horizon glass E, and coincides with the left-hand object, then read the angle.

A certain amount of practice is required to bring the two images into contact in the Sextant, and the beginner should practise at first with two objects which are near each other. Should the right-hand object appear indistinct and difficult to see after reflection from the two mirrors, the sextant may be held upside down and the left-hand object brought to the right.

**Index Error.** — Before or after measuring angles with the Sextant its "index error" must be ascertained. — Index error means, that owing to incorrect adjustment of the horizon glass, the point of the graduation on the arc, from which angles are measured, is not Zero.

To find the index error, select a well defined line, such as the edge of a chimney, 150 yards or more distant. By means of the milled-head D move the vernier so as to place the index near 0 of the arc, now look through the Telescope as explained, and bring the direct and reflected images of the object into exact coincidence, if the vernier now reads 0, there is no index error, otherwise note the reading, to be applied to all observations as follows.

It is seen that the graduations of the arc are continued some distance to the left of the 0, this is called the arc of excess. If the index points to this point, it is evident that all angles measured from this starting point, will be read by the vernier as too small, if the index points to the right of 0, the angles will be read as too large. The former is called the index error "OFF" the arc and is therefore to be added in correction of observation, the latter index error "ON" is to be subtracted.

## Adjustment of the Sextant.

If the index error be considerable it may be removed by adjustment thus: set the index exactly at 0 on the arc, select a well defined point such as a chimney top at some distance. First, observe whether the direct and reflected images are on the same level, if not, apply the key H, to the square headed screw F, and turn until they are so, the effect of this correction is to set the horizon glass truly perpendicular to the plane of the instrument. Next, if the reflected image overlaps that seen directly, or does not exactly cover it, apply the key to the square-headed screw G, and turn it slowly until they coincide. The effect of this is to set the horizon glass parallel to the index mirror.

It is generally safer to apply the index error in correction of observations, than to alter the adjustments.

**Pocket Sextant, best make, divided on Silver, with Telescope, complete in leather sling case, Rs. 90.** Code word for Telegrams—"SEXTANT."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# GOLD MEDAL MARINE SEXTANTS AND ARTIFICIAL HORIZONS.

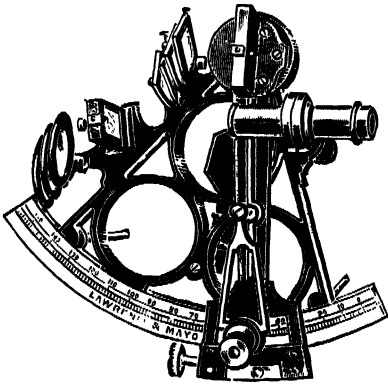


FIG. 1.

FIG. 1.—Admiralty Pattern 7 inch Three Circle Edge Bar Sextant, divided on silver to 10 seconds, seven coloured shades, blank prospect and inverting telescopes and Dark Head, fixed Horizon and refractor, in Mahogany case, with "B" Kew certificate.

**Price, Rs. 145.**

Code word for Telegrams,  
"CIRCULAR."

6½ inch Britannia Sextant, divided on silver to 10 seconds, seven neutral tinted shades, fixed Horizon with Capped Adjustment, Blank and Inverting Telescope with extra power and star Telescope, two Dark Heads and refractor to Vernier, in Mahogany case, with Kew "A" certificate.

**Price, Rs. 160.**

Code word for Telegrams,  
"CERTIFIED."

FIG. 3.—6 inch Admiralty Pattern Sounding Sextant, with solid limb, and latest and Improved Pattern Horizon, arc divided to 30 seconds, two Telescopes, one with extra large object glass, in Mahogany case, with "B" Kew certificate.

**Price, Rs. 150.**

Code word for Telegrams,  
"SEXTAMETER."

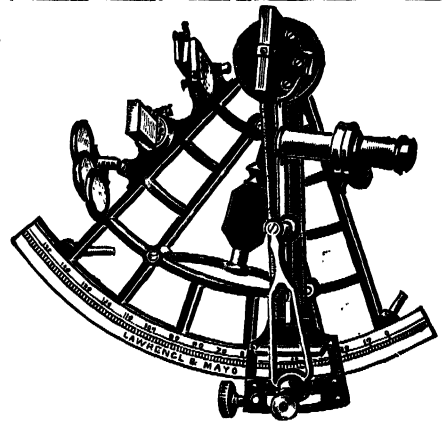


FIG. 2.

FIG. 2.—8 inch Bridge Handle Sextant, divided on Silver to 10 seconds, best large fixed Horizon with Capped Adjustment seven neutral shades, Blank, Prospect and Inverting Telescopes, with extra power; also Star Telescope, two Dark Heads, Telescopes fitted with outside object cells, with refractor to Vernier in Mahogany case, with Kew "A" certificate.

**Price Rs. 185.**

Code word for Telegrams,  
"SILVER."

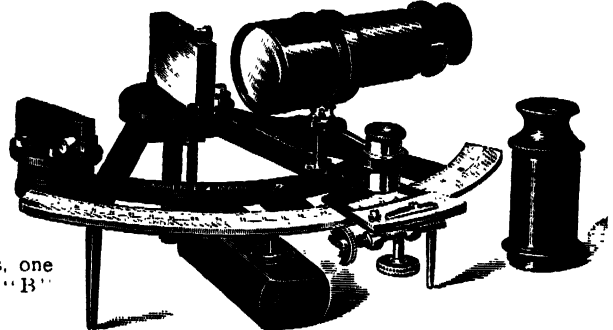


FIG. 3.

## ARTIFICIAL HORIZONS.

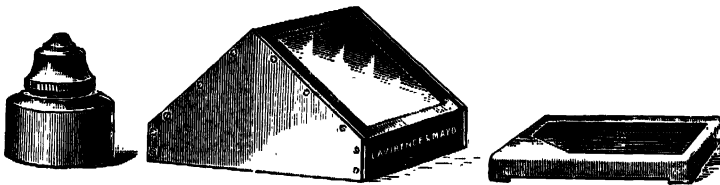


FIG. 4.

FIG. 4.—Mercurial Horizon, Ordnance Pattern, with Turned Iron Mercury Bottle, Iron Trough, etc., complete in Mahogany Case.

**Rs. 65.**

Code word for Telegrams, "MERCURIAL"

FIG. 5.—Captain George's Artificial Horizon, Cast Iron Frame with Cover Glasses Kew certified, adjusting screws and mercury. This Horizon is so constructed that the mercury falls back into the iron container, and is not exposed to the air.

Price, including Kew National Laboratory Certificate and leather case,

**Rs. 80.**

Code word for Telegrams, "DEFINABLE."

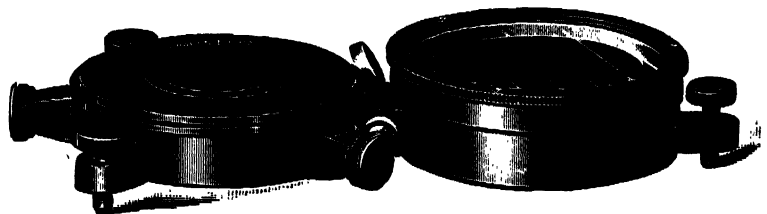


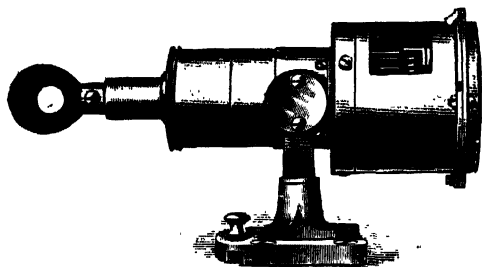
FIG. 5.

Messrs. LAWRENCE & MAYO were awarded the Gold Medal for Marine Sextants, &c., at the Naval Exhibition, London, 1905.

# Walker's Patent "CHERUB" MARK II SHIP-LOG.

(Formerly called "Cherubal.")

In this new pattern "Cherub" Log, illustration of which is given below, Messrs. Walker have aimed to produce an instrument that will work with greater accuracy and regularity, at varying speeds, than the old pattern. The good features of the original, which have been proved by long use, have been retained, and improvements introduced which experience has shewn to be advisable. The most important changes are the use of ball-bearings instead of conical rollers, the introduction of a sliding case to allow of the movement being oiled while the Log is at work, and strengthening of the eye (M) by the insertion of a hardened steel bush.

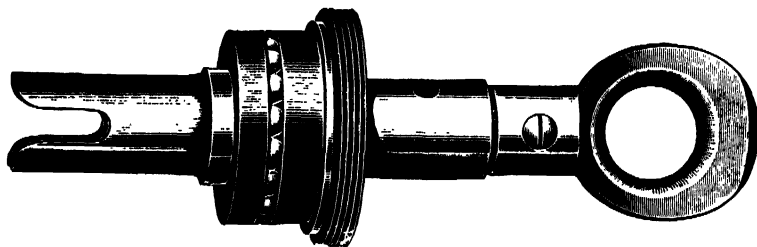


REGISTER, CASE OPEN.

have unanimously reported that they consider it a steady, reliable instrument and an improvement upon the old pattern. Considering the great success of the "Cherub" Log, we think this high praise. We recommend it for speeds up to 18 knots.

The ordinary "Cherub" Rotators are suitable for the "Cherub" Mark II Log.

The Log complete consists of: Register, 2 Rotators and Shells, 2 Shoes, 1 Hook and 3 Glasses.



BALL-BEARING AND SPINDLE.

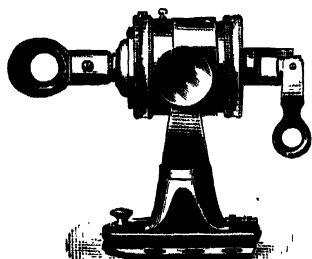
Price of Walker's Patent "Cherub" Mark II Ship-Log, as above - **Rs. 80**

Code Word for Telegrams—"CHERUBAL."

Extra Rotators for the above, **Rs. 15.**

Code Word for Telegrams "ROTATOR."

## Walker's Ship-Log Connector. With Ball-bearings.



The Connector shown above will be found useful when it is desired to fix the Log Register on the Captain's bridge.

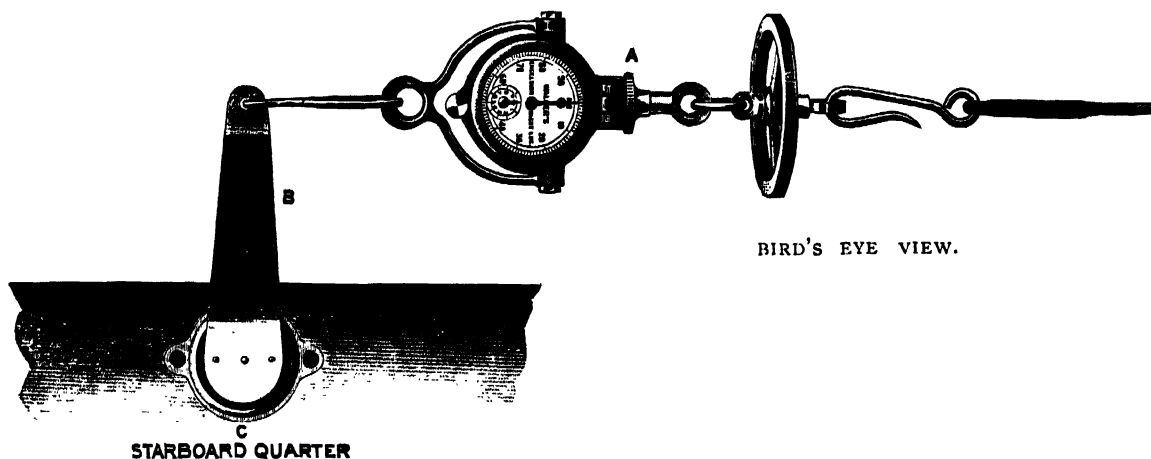
When in use, the Connector is mounted on the end of a spar boomed out, the Rotator line being attached to the eye M and the Register line to the eye N of the universal joint. The illustration shows the Connector complete.

PRICE, **Rs. 55.**

Code Word for Telegrams—"CONNECTOR."

# WALKER'S PATENT "EXCELSIOR" YACHT-LOG (TAFFRAIL).

REGISTER



BIRD'S EYE VIEW.

STARBOARD QUARTER

The "Excelsior" Yacht-Log is not a toy, but a well constructed nautical instrument made with the same care and attention that are given to the larger and more expensive patterns. With a little experience in the use of patent Logs and careful attention to the instructions we give, it will register accurately the distance and speed travelled by the vessel through the water. In the above quarter full size illustration the Log Register is shewn attached to the outrigger, as when in use, the Rotator being towed astern and connected to the Log by a tow line of 20 feet or more in length, depending upon the maximum speed of the vessel. To reduce the friction to a minimum patent ball-bearings are used. These are so designed that they can readily be removed from the Register for the purpose of cleaning, or replacement. The hands, which can be set at will, are covered by a strong hinged screw-down lid with an inserted India-rubber ring, thus making the Register watertight and protecting the wheelwork and bearings from corrosion and rust. After use, the outrigger is detached from the deck plate or shoe, by a quarter turn forward. If it is not convenient to use the outrigger form of attachment on a sailing vessel, owing to the danger of its being fouled by any tackle, it can be unhooked from the Register and a short length of rope used in its place.

The motor boat "Napier Major," in her non-stop trip "London to the Shetlands," used an "Excelsior" Yacht-Log. The following is an extract from the Report:—

"We take this opportunity of expressing our satisfaction of the Log, which proved itself to be as accurate as is possible, and is compact and altogether satisfactory for a small vessel. It was of great service to the yacht in her voyage."

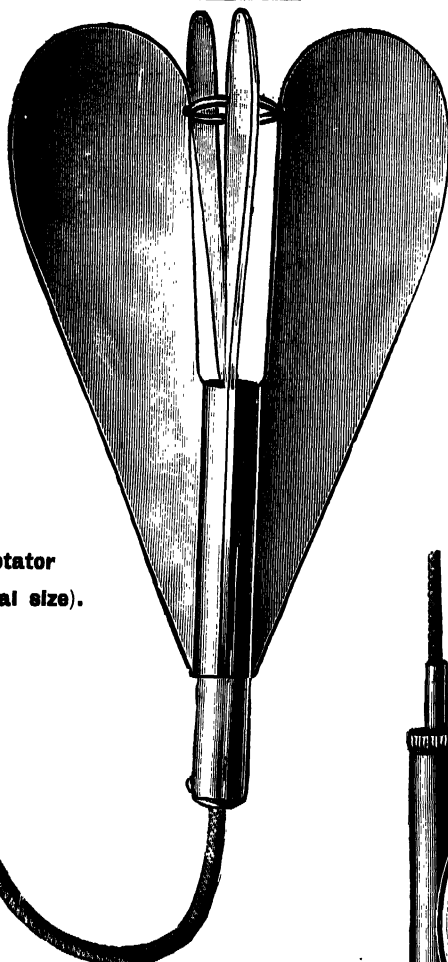
The Log, complete in box, consists of Register (with Outrigger and Governor), 1 Rotator, 1 hook, 1 shoe, 100 feet of line, and sinker. Weight, in box complete, 8 lbs. PRICE, Rs. 55.

Code word for Telegrams—"YESTRAL."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



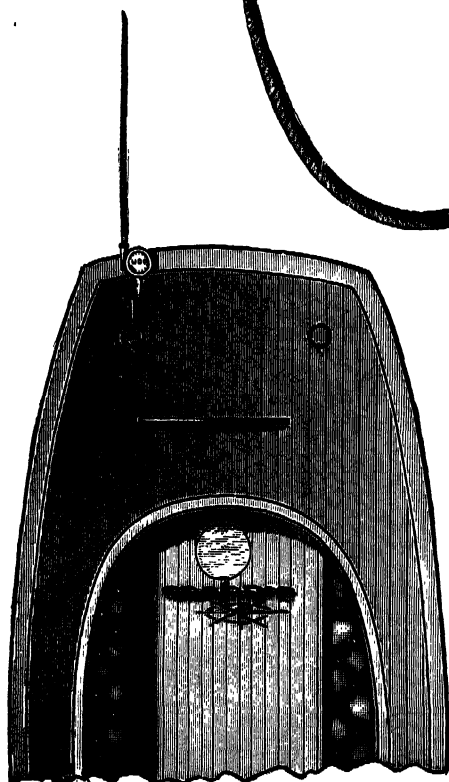
# THE "KAY" YACHT LOG.



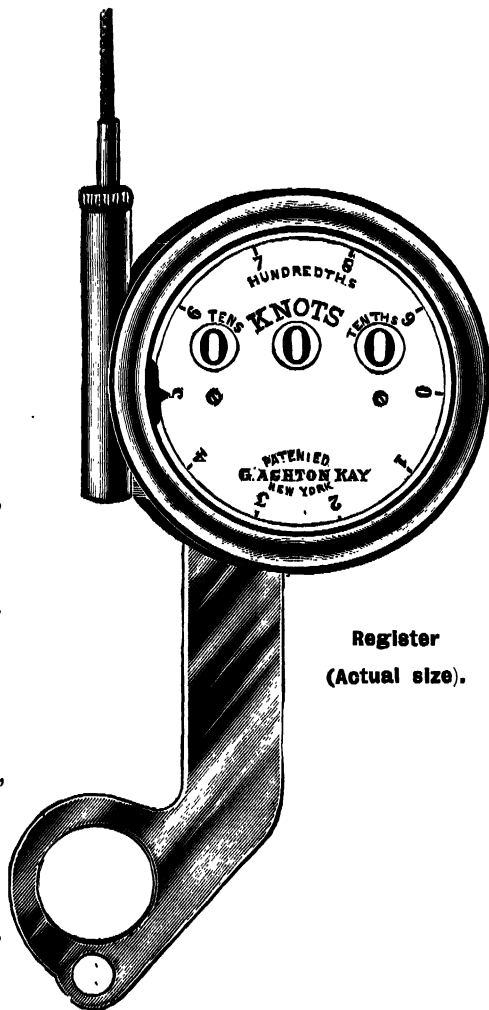
**Rotator**  
(Actual size).

The "Kay" Yacht Log is in every way suitable for Yachts and Sailing Boats. It is packed in a small box and can be carried in the pocket.

The Line is so fine that there is no strain on the boat when the Log is in use, and the results are as reliable as those given by the larger Logs.



"Kay" Log fixed on Yacht.



**Register**  
(Actual size).

Price complete,  
**Rs. 35.**

Code word for  
Telegrams:  
KANIKLE."

Spare Rotators,  
**Rs. 6** each.

Spare Lines,  
**Rs. 3-8** each.

## Walker's "HARPOON" Sounding Machine.

This is a thoroughly reliable mechanical Sounder, giving as good results in deep water as the atmospheric Sounder, and far better in shoal water.

It is best used with the ordinary sounding winch and wire line, as described in the unsolicited testimonial given below.

The Rotator C revolves while the machine is descending and the lock E is kept out of the way by the pressure of the water on the underside. On reaching the bottom the lock falls between the vanes of the Rotator, and prevents it from registering while being drawn up.

PRICE ... .. **Rs. 42.**

Code Word for Telegrams—"UNDER."

## WALKER'S "HARPOON" SOUNDING MACHINE.

### UNSOLICITED TESTIMONIAL.

S.S. "NELSON,"  
PORT OF MARYPORT,  
March 9th, 1903.

GENTLEMEN,

I should like to say a word in favour of your Sounding Machine. I have used three of the most prominent Sounders in the market, and still have two on board, but use yours in preference, as it gives equally good results in deep water, and *far better in shoal water*. With atmospheric Sounders, the Soundings are, as far as my experience goes, most unreliable, whilst yours gives the depth as true as if measured with a three-foot rule.

The method of my using it is to attach it to a sinker and wire line, worked by the usual sounding winch. The ship's speed is reduced to about three or four knots. I find with this speed, and a heavy sinker, the machine is carried so rapidly down with a slack line, that little or no angle is made, therefore a correct sounding is given, particularly in shoal water, when the lead is down, to use a seaman's expression, "in quarter less than no time."

Some men may object to the slowing down to get soundings, but this I consider necessary with any lead, not to do so is a mistake where there are only two spare hands in a watch to heave in.

Now, gentlemen, don't let this instrument be pushed out of the market by others, costing twice the money and not nearly so good.

—Yours faithfully,

(Signed) R. H. HARRISON, Master S.S. "Nelson."

## WALKER & SON'S LOG LINES.

	Code Words.
No. 6, "Neptune" Log Line, 65 fathoms	<b>Rs. 16.</b> "DESOLENT."
No. 8, Best Flax Log Line, 40 fathoms, suitable for the "Cherub" and "Cherubal" Ship-logs ... ..	<b>Rs. 18.</b> "OVERMAST."
100 feet of line for the "Excelsior" Yacht Log ... ..	<b>Rs. 3-8.</b> "OVERSEER."
35 fathom line for "Rocket" Log ... ..	<b>Rs. 6.</b> "DEDUCTER."

## LOG GLASSES.

Board of Trade Pattern, large size ( $4\frac{1}{4} \times 1\frac{1}{2}$ ), 14 and 28 seconds, Black Sand.

PRICE, **Rs. 3** each.

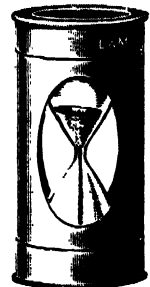
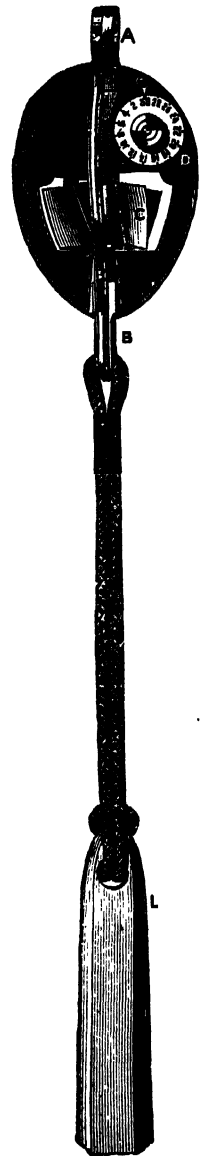
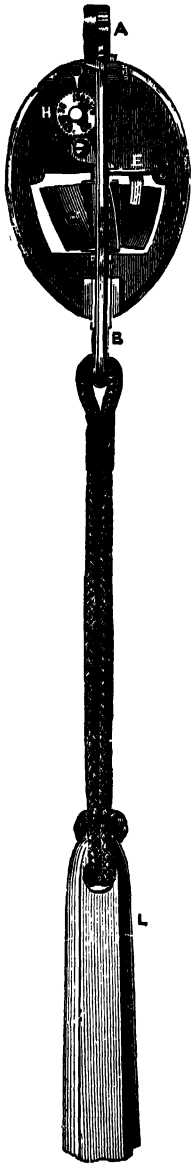
Code word for telegrams for 14 second Log Glass, "LOGITE."

" " 28 " " " " "IMBARGO."

## PREPARED GLASS TUBES FOR THOMSON'S SOUNDING MACHINE.

PRICE, per Set of 10 in Tin Case, **Rs. 10.**

Code word for one Set, "INTERCEDER."



# Course-Correcting Instruments.

The "HA-HY" (BAIN & AINSLEY)

## COURSE CORRECTOR

With new "PATENT" Folding Sight Tube.

Fig. 1.

Trade Mark, "HA-HY" on all GENUINE Correctors.

New Patent Dial with INNER VARIATION DEGREES on the circle.

New Patent CONICAL SIGHT TUBE and VANE, and necessary pointers.

New Patent FOLDING SIGHT TUBE. Used with BURDWOOD TABLES.

PRICE **Rs. 75.**

Code word for Telegrams—"NECROMANCER."

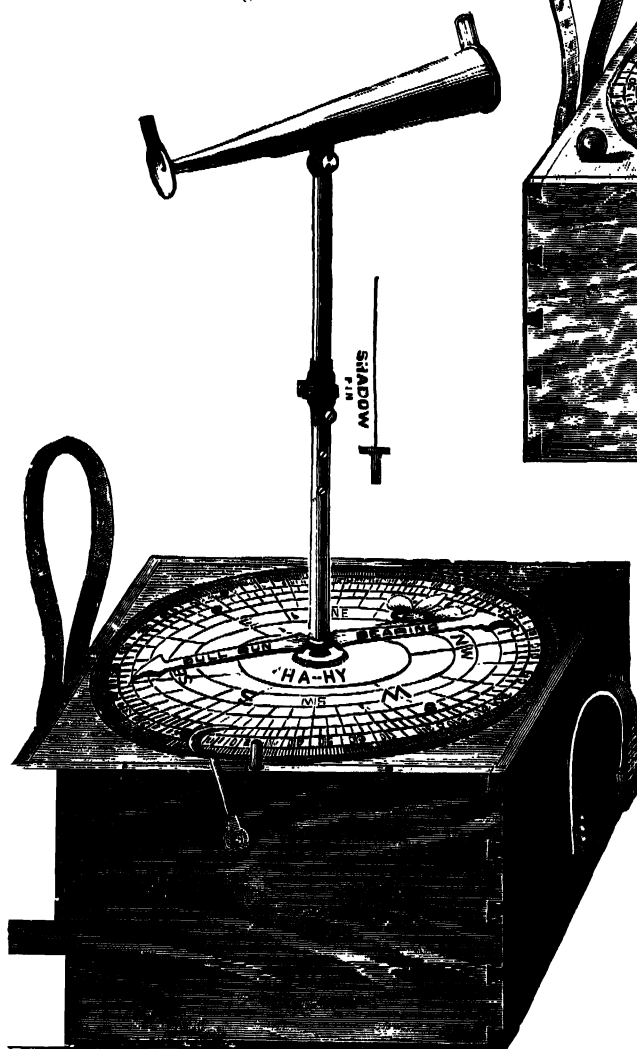


FIG. 1.

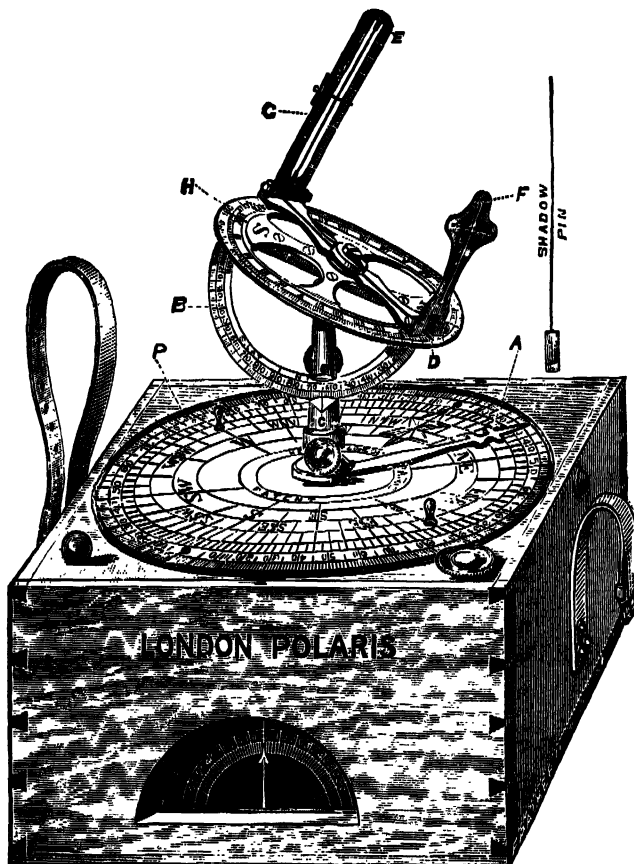


FIG. 2.

## COURSE CORRECTOR.

Fig. 2.

Patent "LONDON POLARIS," fitted in mahogany case ; used with local time, declination, no tables required. Correct at any altitude. An instrument complete in itself.

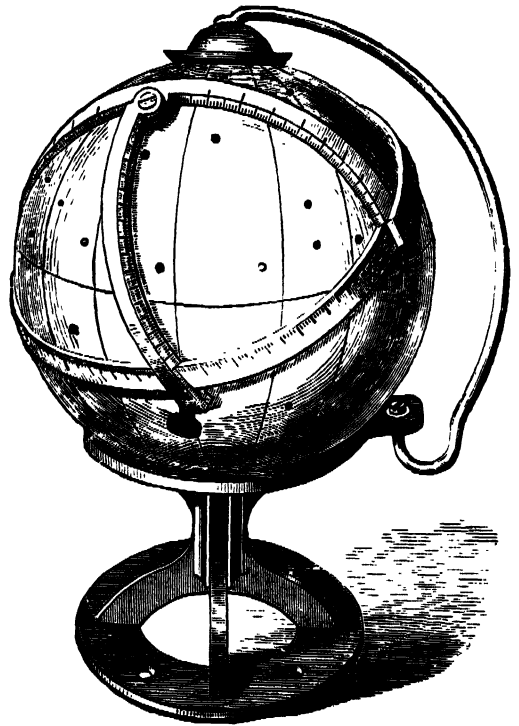
PRICE **Rs. 110.**

Code word for Telegrams—"POLARIS."

# THE "NAVISPHERE."

The "NAVISPHERE" is a simple instrument which gives without computation within two or three minutes :—

- 1st.—The names of the stars which are above the horizon at a given moment.
- 2nd.—It gives any star's altitude and azimuth within one degree.
- 3rd.—It furnishes the means of determining instantly (within one degree), the course to be shaped from place to place on the arc of a great circle, and the distance between them within 15 miles.
- 4th.—Without a knowledge of the constellations the ship's position is easily determined, and the variation combined with the deviation discovered.
- 5th.—With it the arcs, angles, etc., connected with spherical triangles are solved, and the labour attached to Problems in Navigation dispensed with.



Lord Kelvin (Sir William Thomson, F.R.S.), of Glasgow University, after using the "NAVISPHERE" on his yacht with excellent results, says:—

"The advantages of the "Navisphere" for some or all the problems of spherical trigonometry is to my mind not merely valuable in saving labour, but is also valuable in promoting intelligence of the principles involved, and so promoting security of navigation by preventing mistakes and misrepresentations. It is an instrument of great practical utility."

Dr. Hirst, of the Royal Naval College, Greenwich, and many others have spoken most highly of the utility of this simple instrument.

---

Price, with Full Instructions and Examples of the Workings, **Rs. 60.**

Code word for telegrams, "NAVISPHERE."

Spare Globes **Rs. 10** each.

Code word for one spare Globe, "GARGUNET."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# NEW MORSE CODE MARINE SIGNALLING LAMP.

(PATENT).

DAVEY & Co.'s Oil Flashing Lantern, specially designed for the Admiralty Committee on Signalling at Sea, is the only lamp of its kind of all those submitted that was finally approved and recommended by the Committee (see copy of Report below).

It is strongly made, simple and effective, with nothing to get out of order, and it will burn all night without attention in any weather. It is complete in itself and is independent of electric light, or it can be fitted for electric light interchangeable with the oil vessel.

**Report of the Committee appointed by the Admiralty to consider the Question of Signal Communication between His Majesty's Ships and British Merchant Vessels.**

(Report dated 15th February, 1906.)

Messrs. Davey & Co. have constructed an oil Flashing Lantern, with a view to the requirements of the British Mercantile Marine, which only weighs 14½ lbs.

They state that the Lantern is wind-proof, and that it will burn all night without retrimming. It has a dioptric lens, which enables the light to be seen in clear weather at a distance of five miles. The shade is simple and effective, and is worked by a convenient thumb key. There is a handle on each side, so that the Lantern can easily be held in any required position while flashing with it.

The Committee consider this Lantern to be very superior to any other oil Flashing Lantern that they have seen, and they recommend its adoption on board those British Merchant Vessels which are not fitted with the Electric Light.

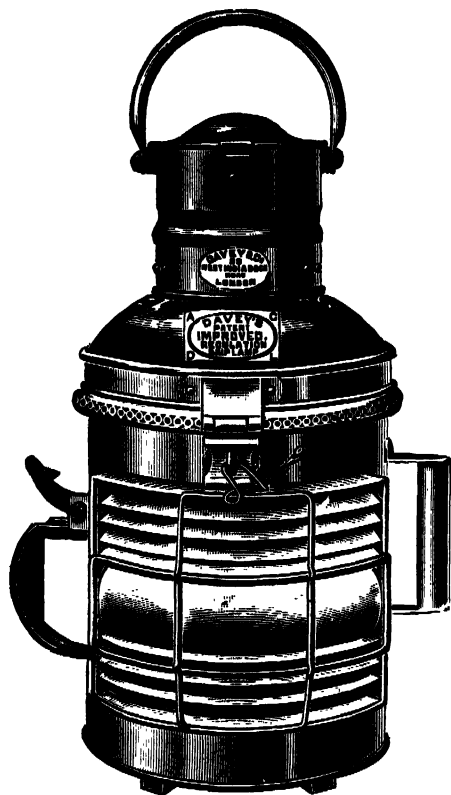
PRICES.

**Strong Copper, with Brass Mounts ... Rs. 70 each.**

Code Word for Telegrams—"BEACON."

Spare Glass Cones, **Rs. 5** per dozen.

Code word for Telegrams for one dozen—"BRITONIAN."



## Davey & Co.'s Patent "Not Under Command," or Distress Signal Lamp.

EXTRACT FROM BOARD OF TRADE REGULATIONS FOR PREVENTING COLLISIONS AT SEA.

ART. 4 (a) A vessel which from any accident is not under command, shall carry at the same height as the white light mentioned in Article 2 (a), where they can best be seen, and, if a steam vessel, in lieu of that light, *TWO RED LIGHTS* in a vertical line one over the other, not less than six feet apart, and *OF SUCH A CHARACTER AS TO BE VISIBLE ALL ROUND THE HORIZON AT A DISTANCE OF AT LEAST 2 MILES.* (The italics are ours.)

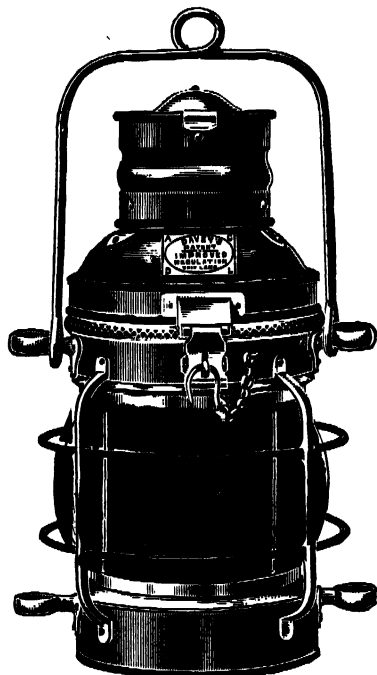
**IMPORTANT NOTICE.**—Messrs. Davey & Co.'s Patent Lamp (as per illustration) will show the required distance of two miles. At the experiments at Shoeburyness (1902/3) it was conclusively proved that the only kind of those tested that were clearly visible at two miles were Messrs. Davey's lamps having inner lamps with glass cones. The ordinary lamp was proved physically incapable of showing anything like the distance; the light was feeble at all times, and owing to the smoke from burner falling on the globe, the lamp soon became almost invisible at half-a-mile.

Price complete (as illustrated) in copper 9 in. Globe .. .. **Rs. 45.**

Code word for Telegrams—"DISTRESSER."

Spare Glass Cones .. .. **Rs. 5** per dozen.

Code word for Telegrams for one dozen—"DERELICT."



**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## MECHANICAL FOGHORNS &amp; MEGAPHONES.

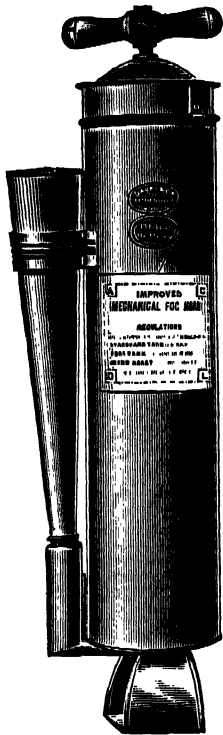


FIG. 1.

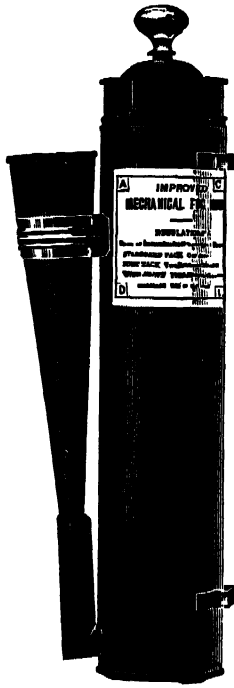


FIG. 2.



FIG. 3.



FIG. 4.



Section Commander giving his orders through a Megaphone.

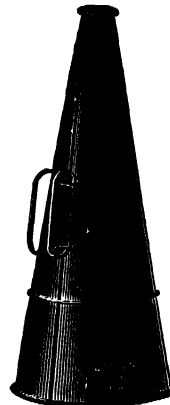


FIG. 5.



FIG. 6.

Code Word  
for Telegrams.

Fig. 1.—The "Great Bull" FOGHORN, capable of full 6 seconds blast, Double Case, strong Zinc, with Leather Plunger, Brass Rod, Knob and Mounts, and Foot Stirrup. Length, 30 in. by  $5\frac{1}{2}$  in. diameter, in wood box, with spare reed and mouth-piece .. .. .

Fig. 2.—The "Little Bull" Foghorn, capable of blast of fully 4 seconds, double case. Polished Brass Body with Leather Plunger. Length 24 in. by  $4\frac{1}{2}$  in. diameter, in wood box, with spare reed and leather strap .. .. .

Fig. 3.—The "Great Buffalo" Box Foghorn, with continuous and powerful blast. Each Horn tested and guaranteed. Reed and Copper Horn are inside Box and therefore free from injury. Size  $19\frac{1}{2}$  in. long by 9 in. wide by  $13\frac{1}{2}$  in. high .. .. .

Fig. 4.—Mouth Foghorn, for use on small Boats or Yachts. Polished Brass,  $18\frac{1}{2}$  in. long, fitted with the same quality reeds as Foghorns, Figs. 1 and 2 .. .. .

Fig. 5.—Naval Hand Megaphone, 20 inches long, Japanned, with folding handle, .. .. .

Fig. 6.—Military Hand Megaphone, 20 inches long, Japanned, painted khaki colour, with folding handle and shoulder straps .. .. .

Rs. 35 "FETISH."

Rs. 30 "FEUDALIST."

Rs. 55 "FIBRIFORM."

Rs. 6 "MAJESTIC."

Rs. 6 "MEGAPHONE."

Rs. 7-8 "MANDERATOR."

LAWRENCE &amp; MAYO, Manufacturing Opticians,

67 &amp; 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## NAUTICAL WORKS.

### Indian Ports.

**From Calcutta to Bombay Coasting**, being the Second Edition of the Handbook to the Ports on the Coast of India between Calcutta and Bombay, including Ceylon and the Maldiva and Laccadive Islands, with 11 Charts and 12 Photographs. By LIEUT. H. S. BROWN, R.N.R., Port Officer, Marine Department, Madras Presidency. **Rs. 8-8.**

### International Code of Signals.

*Published under the Authority of the Board of Trade.*

**The use of the new Code is now compulsory**, and the volume should, therefore, be on board every sea-going ship and at every Signal Station at Home and Abroad. **Price Rs. 16.**

### Signalling.

**How to Learn the New International Code** Having information as to all kinds of Signal's, Flags, Semaphores, etc. 5th Ed. With Wireless Telegraphy Explained. **Price Rs. 1.**

### The British Signal Manual.

Published by the Admiralty, 1906. **Rs. 1-4.**

### Signal Manual.

For the Use of the Mercantile Marine. By CAPTAIN RUGG. A useful aid to learning and remembering Code Signals, Distant Signals, and the different Flag Hoists. **Price Rs. 1.**

### The Signalman's Guide.

A Treatise on the Method of Signalling at Sea, fully explaining Flags, Semaphores, Morse, etc. A Study of this Guide enables a Signalman to make and receive Signals at **Top Speed**. **Rs. 1-8.**

### The Signalman's Note Book.

For Receiving and Recording Messages. **Rs. 1.**

### Flags of all Nations.

**The Largest and Most Complete Sheet in the Market.** Published since 1870. Thoroughly up-to-date. With Descriptive Letterpress. **Price Rs. 1 in cover.**

### The British Code List.

A list of Royal Mercantile Vessels with Signal Letters allotted to each for the Use of Ships at Sea, and for Signal Stations. **Price Rs. 4.**

### What Star is It?

Tables for the Identification of Unknown Stars. By HERBERT W. HARVEY. **Price Rs. 1-2.**

### Aids to Stability.

Designed to meet the growing demand among Officers in the Merchant Service, for a concise and simple method of instruction in the several principles of stability as applied to ships. With Curves and Illustrations. By G. H. OWEN. 2nd Ed. **Price Rs. 3.**

### Answers to the Questions on the Deviation of the Compass and Law of Storms.

Required for B.O.T. Exams. By CAPTAIN A. E. NICHOLLS, Extra Master, London. **Price Rs. 1.**

### Knots and Splices.

A very complete work, with Coloured Illustrations showing the different Knots. By CAPTAIN N. JUTSUM. Full cloth, price **Rs. 2.**

### Ships' Position Books.

**Rs. 3 per dozen.**

### The Pocket Mariner's Compass Corrector.

**Rs. 2.**

## The "WYNKA" Series of SIGNAL CARDS

ADAPTED BY THE

## Leading Shipowners and Lighthouse Commissioners.

- No. 1. International Code.
- " 2. Towing and Urgent Signals.
- " 3. Pilot Jack, H.M. Navy and M.M. Signals.
- " 4. Morse Code.
- " 5. Key to Morse Code.

The above Signal Cards will prove useful, and should be in every Chart Room. Nos. 1, 2, 3, and 9 are Printed in Brilliant Colours Mounted on Stout Cardboard, and Varnished. Size **16 in.** by **10 in.**

- No 6. Semaphore Signalling.
- " 7. Semaphore by Hand Flags.
- " 8. Sound Signals for Fog Steering, etc.
- " 9. Ship's Lights at a Glance.

**Rs. ONE EACH.**

## Capt. Jutsum's "RULE OF THE ROAD" CARDS

### For SELF-EXAMINATION.

They afford the Student every possible advantage that he could derive from undergoing as often as he could wish a severe examination by a Nautical Expert using models and lights.

EXTRACT FROM *Nautical Magazine*.

"This packet of nearly sixty cards, inclosed in a neat box with instructions, puts the 'Rule of the Road at Sea' in a most attractive way. Apparently every possible case is illustrated, and Captain Jutsum is to be congratulated upon the result. Captain P. Thomson, Head Examiner, London; Captain D. Wilson-Barker, R.N.R., of H.M.S. *Worcester*; Captain Cross, R.N., of the *Briannia*; and the following well-known Teachers of Navigation, among others, Captains Wood, Bateman, Williamson, Cleaver, Cogle, Tait, Baxter, Mence, Nicholls, Sinclair, Forbes, Watson and Dixon, are unanimously in favour of this system inaugurated by Captain Jutsum. On the face of each card are given the coloured lights, and white lights when necessary, of two or more ships; the student decides for himself what steps should be taken, and the conclusion he arrives at is justified or otherwise, by referring to the back of the card, where the correct action is indicated. These cards may be obtained at most of the Nautical Schools of the United Kingdom or direct from Captain J. Netherclift Jutsum, F.R.A.S., Cardiff Nautical Academy, 47, Fitzhamon Embankment, Cardiff."

Every apprentice or young seaman should make a point of obtaining a pack.

**Price complete (packed in neat box with instructions) Rs. 2.**

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# SIGHT COMPASSES.

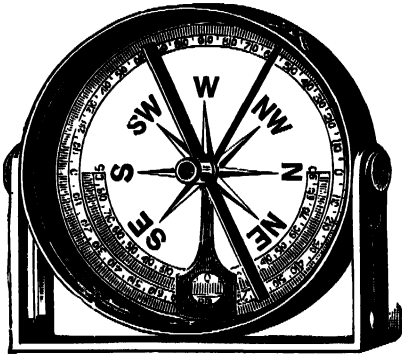


FIG. 1.—When in use as a Clinometer.



FIG. 1.—When in use as a Sight Compass.

## THE CLINOMETER COMPASS.

FIG 1.

This useful form of Compass is now much in request, as it really comprises three different instruments in one, *i.e.* :—

- (1)—An ordinary Magnetic Compass used horizontally for ascertaining magnetic direction.
- (2)—A Sight Compass when the Bridge is opened to the upright, by which an alignment can be made on distant points, and the angular distance between the different points be measured, and,
- (3)—When the Bridge is folded down, it forms a flat base for the compass to be placed upon, vertically, when it acts as a Clinometer, and the angle of slope and gradient is seen.

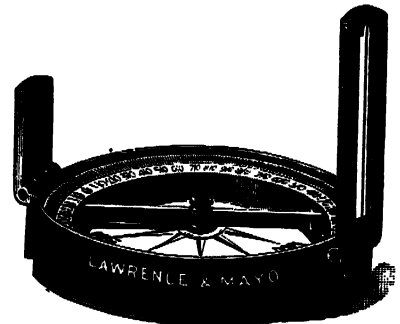
Code word for  
Telegrams.

- Fig. 1. 2½ inch Clinometer Compass, silvered dial edge bar needle,  
jointed sights, in morocco case ... .. **Rs. 16** "Bridge."
- Fig. 1. 3 inch Clinometer Compass, silvered dial edge bar needle,  
jointed sights, in morocco case ... .. **Rs. 21** "Clinograph."

## THE SIGHT COMPASS.

FIG. 2.

This form of pocket Compass can be used as a simple compass, to take any magnetic direction, or by use of the sights can be aligned upon any object and its magnetic direction measured from the North point of the Needle; a second object in another direction can be aligned in the same way, and the horizontal angle of the two is known.

FIG. 2. Code word for  
Telegrams.

- Fig. 2. 2½ inch Sight Compass—silvered dial—metal case ... .. **Rs. 15** "Sight."
- ig. 2. 3½ inch ditto ditto ditto ... .. **Rs. 20** "Sighter."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



# PRISMATIC COMPASSES.

## The Prismatic Compass.

WITH this Instrument, horizontal angles can be observed very readily and when used with a tripod stand, with a considerable degree of accuracy. It is consequently very valuable to the Military Surveyor who can make his observations, while holding it in his hand, with the accuracy necessary for a military sketch. It is also a useful instrument for filling in the detail of an extensive survey after the principal points have been laid down by means of observations made with a Theodolite, and for any purpose in which portability and rapidity of execution are of more importance than extreme accuracy.

The dial, or card, of the compass is usually divided to every 20' or, third part of a degree, and has, attached to its underside, a magnetic needle which is balanced and turns upon an agate centre.

To prevent extreme oscillations of the card, a check spring is attached to the inside of the metal case having a knob projecting through the case, this can be pressed by the finger and the dial brought to rest quickly when an observation is being made.

The Prism is mounted in a triangular metal box having a hinged joint, to give it greater portability when not in use, the jointed piece has also a sliding motion to adjust the height of the Prism to the exact focus of the divisions upon the card.

Above the sight hole of the Prism is a narrow slit, through which the sight can be directed simultaneously with reading the degrees upon the card.

The long sight vane is also made with a hinged joint for portability. It has a fine thread of horse-hair or wire, or a fine metal bar, fixed the entire length of its frame, which forms the sight-line to coincide with the distant object to be observed.

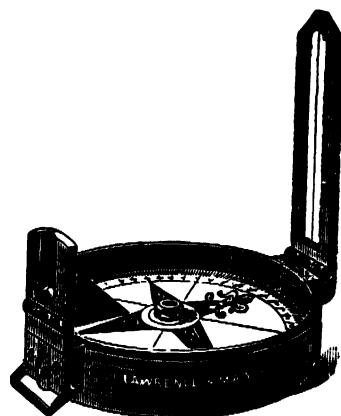


FIG.

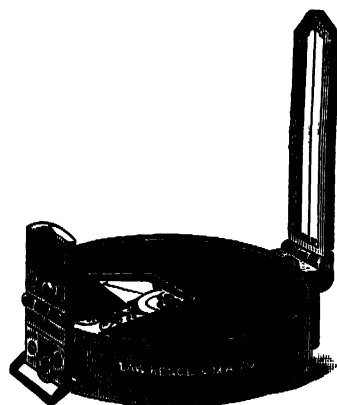


FIG. 2.

# PRISMATIC COMPASSES.

## Instructions for using the Prismatic Compass.

The Prism and sight vane should be turned up on their respective hinge joints until they are quite upright, and the instrument held horizontally in the hand, or, if used on a stand, set as near level as possible, so that the dial will swing freely upon its point of suspension.

Direct the eye through the sight hole of the prism, and move the slide up or down until the graduations upon the card are quite distinct, then direct the sight line to the object to be observed. When the card is perfectly at rest, and the sight taken through the prism, it will be seen through the slit, that the line in the long sight vane coincides with a division upon the card, giving the magnetic azimuth of the object observed, or, the angle, which a straight line drawn from the eye to the object makes with the magnetic meridian.\*

The magnetic azimuth of a second object being obtained in the same manner the difference between these two azimuths is the angle subtended by the objects at the place of eye.

For the purpose of taking the bearing of objects much above or below the level of the observer, a mirror is supplied to the compass, as shown in the illustration, which slides upon the long sight vane to any position required; to reflect the object, it can be placed upon the vane, either with its face upwards or downwards to reflect the object if it be above or below the observer; it is also supplied with dark glass shades if required to obtain the magnetic azimuth of the Sun. The cover of the metal case is made to fit on the bottom of the case which forms a better holding for the compass when in use, a sliding stop action is fixed on the side of the case, which being moved raises a lever, throwing the card and needle off its centre, preventing the wearing of the suspension point when not in use.

\* The magnetic meridian makes an angle of about  $16^{\circ}$  with the true meridian of London, the north point of the compass being now West of the true North. This angle is called the *variation* of the compass, and is different at different places, but the angles subtended by any two of the objects observed, being the *difference* of their azimuths, will not be affected by the variation.

### CODE WORD FOR TELEGRAMS.

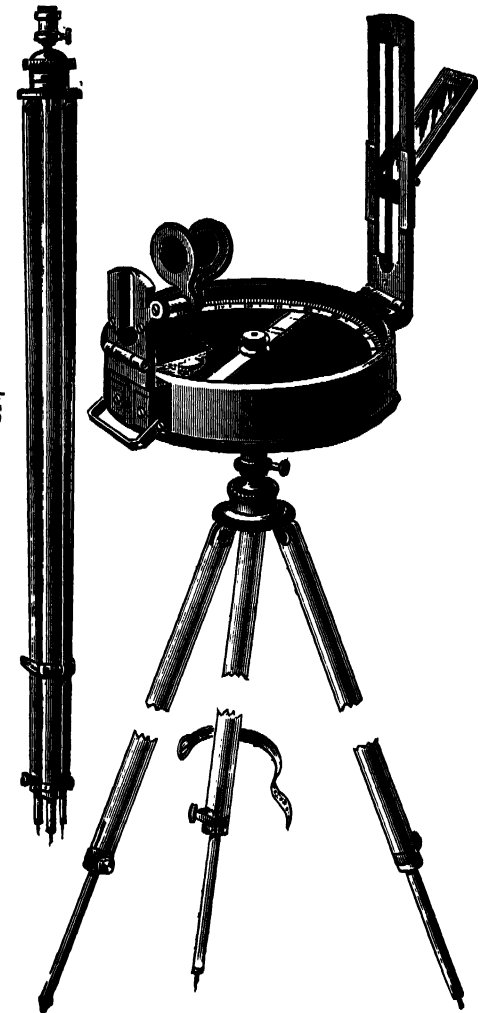


FIG. 3.

FIG. 1.	3 inch Prismatic Compass, card dial, jewelled centre, leather sling case .. .. .	Rs. 33
	4 inch do. do. do. do. do. .. .. .	" 37
	4 inch do. with aluminium divided ring do. .. .. .	" 55
	4½ inch do. do. do. do. do. .. .. .	" 65
2.	3 inch do. Hutchinson's form, with opening in cover .. .. .	" 33
	3 inch do. do. with tripod stand (as fig. 4) .. .. .	" 55
3.	3½ inch do. with aluminium divided ring, shades, mirror and tripod stand (fig. 4) complete as fig. 3 .. .. .	" 85
	4 inch Prismatic Compass with aluminium divided ring rectangular bubbles, shades, mirror, and tripod stand (fig. 4) complete as fig. 3 .. .. .	" 105
	5 inch do. do. do. do. do. .. .. .	" 125

"Prismatic."  
 "Prison."  
 "Prisoner."  
 "Printer."  
 "Printing."  
 "Picture."  
 "Pioneer."  
 "Bubble."  
 "Boiler."

**Book on Surveying and Astronomical Instruments** by J. F. HEATHER, M.A.  
 This book fully describes the use of Surveying and Astronomical Instruments, and will be found most handy for reference.

PRICE **Rs. 1-8.**

Code Word for Telegrams—"INSTRUCTION."

# THE ALTITUDE AND PRISMATIC COMPASS COMBINED.

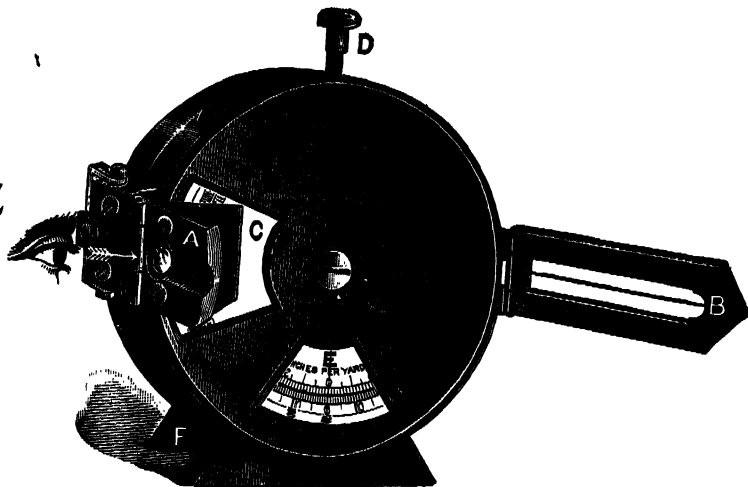


FIG 1.

THIS Instrument combines the uses of the Prismatic Compass in taking magnetic horizontal angles, and those of Measuring Altitudes, Levels and Gradients, giving the rise and fall of an incline in degrees or inches per yard.

In form it is similar to the ordinary Prismatic Compass, and of the same diameter, but, having in addition, the altitude circle for use as Clinometer, it is necessarily a trifle deeper in the case. It can also be had fitted with azimuth glasses, so that the sun's altitude and bearings can be ascertained.

To use the compass for taking altitudes of levels, it should be held in the vertical position, as shewn in illustration. The sliding stop D should be fully drawn out, this releases the pendulum which carries the altitude circle C, slide the prism A up until the graduation on the circle is in perfect focus, open fully the sight vane B, and with the eye at A, direct the cross wire of B upon the object to be measured. The reading of elevation seen through the prism then, is correct, unless the reading is at zero; in that case, the object is level with the observer.

To measure horizontal angles, it should be used as a Prismatic Compass, and the position changed to the horizontal. Let the section E of the card swing round until next to the sight vane B, then push in the sliding stop D, which secures the pendulum and exposes the graduated card to be read by the prism. The stop D should always be pressed in when not in use, to prevent any wearing of the pendulum.

**Fig. 1.—3 inch Prismatic Compass and Altitude Combined Card Dial and Disc, in sling case,**

**Rs. 62.**

Code word for Telegrams, "PAINTING."

**Fig 2.—First Quality 3 inch Prismatic Compass and Altitude Combined, with Aluminium divided ring and Silvered metal Clinometer disc, complete with metal telescopic Tripod stand. Leather sling case for Compass, and canvas case for Tripod, Rs. 95.**

Code word for Telegrams, "GORLIN."



FIG 2.

**LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## CLINOMETER RULES.

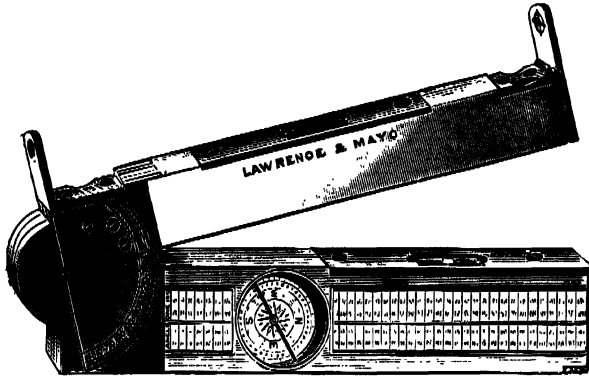


FIG. 1.

FIG. 1—  
**POCKET CLINOMETER,**  
Boxwood, with 2 Levels, Compass  
and 2 Sights, in Case,

**Rs. 27.**

Code Word for Telegrams—"POCKET"

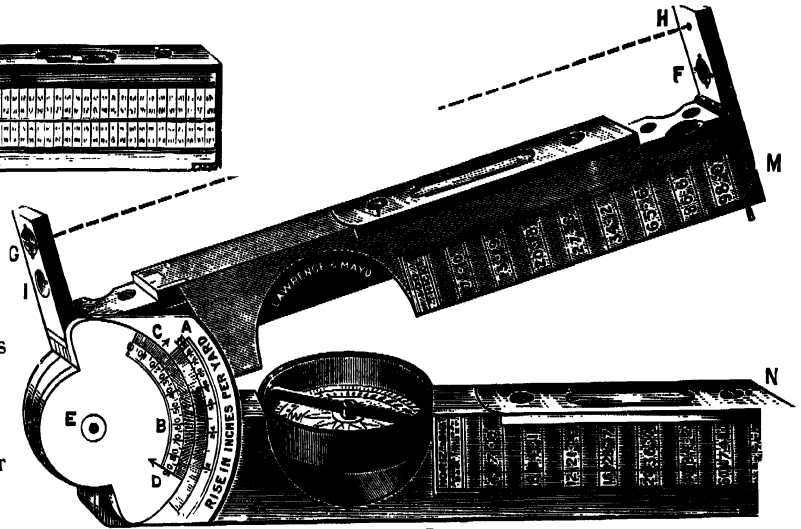
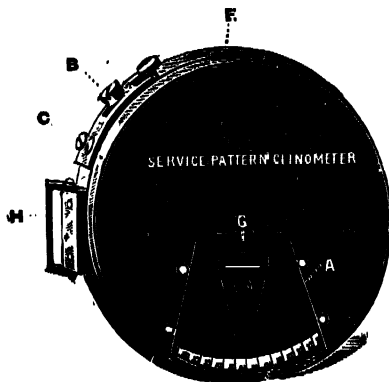


FIG. 2.

FIG. 2—**POCKET CLINOMETER,** Boxwood, with 2 Levels, flush vernier  
swing Compass, Jewelled Centre and Stop, as illustrated Fig. 2  
Code Word for Telegrams—"SWING."

**Rs. 38.**

## The "Service" Pattern Mirror Clinometer.



The Illustration shows the Instrument in its  
Complete Form.

In bronzed metal case, with glass in the front opening. The inside circle is pivoted at its centre, and is held firmly by a spring clamp until an observation is to be made. The inner rim of circle is fitted with an ivory scale, reading degrees, and showing  $45^\circ$  for elevation, marked in **Red**, and  $45^\circ$  for depression, marked in **Black**; a mirror reflects a magnified image of this scale to the eye placed at the sight-hole C, and at the same time a reflection of an index line is seen pointing to the edge of scale.

**To obtain the inclination of an object**—First, slide back the bolt shown at A, which releases the spring clamp, then press the knob B, which releases the inner circle and allows it to swing upon its pivots; the Eye should then be placed at the sight-hole C and directed right through the instrument, and the window at D, to the object to be measured. When the pendulum circle is at rest, the index will be seen pointing to the angle indicated by the elevation or depression.

In observing a slope with the Clinometer, the line of sight must be directed parallel to the surface of the ground; when no object presents itself of the same height as the observer's eye, he should stoop or kneel so as to reduce the height for which allowance has to be made.

When the observation is made at a distance of more than 300 yards or so, the observer's height is so small in comparison with the distance that it is hardly worth while to make any allowance for it. The clinometer can also be used to measure slopes in profile.

PRICE, complete in solid leather case, with shoulder straps, **Rs. 28.**

Code Word for Telegrams—"CLINOMETER."

# ABNEY AND LOCKE'S LEVELS.

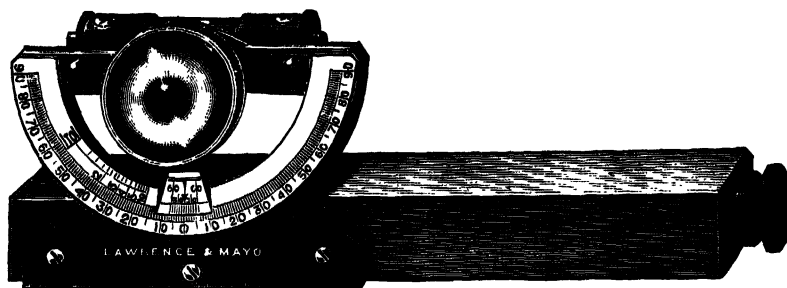


FIG. 1.

**Fig. 1.**—Abney's Pocket Reflecting Level with graduated arc for the measurement of vertical angles.

**Rs. 25.**

Code Word for Telegrams—  
"ABNEY."

**Fig. 2.**—Improved Abney Level arranged to show HORIZONTAL and VERTICAL angles.

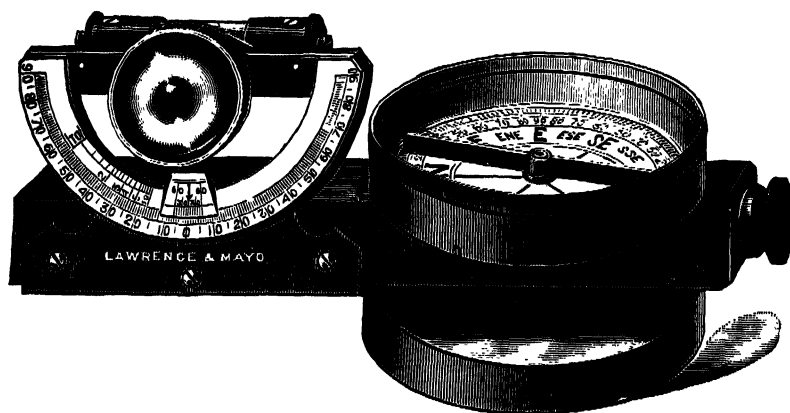


FIG. 2.

It is supported upon a circular base within which is a CENTRE upon which the instrument can be turned, the horizontal angle is then measured by the needle upon the graduation of the compass ring. To measure the VERTICAL angle the telescopic tube should be directed upon the object to be measured, which should be brought in line with the cross wire within the tube. While kept in this position the axis of the arc carrying the spirit level should be turned until the air bubble is seen IN THE MIRROR within the tube, and when brought to rest level with the cross wire, the angle (vertical) is determined, and can be read off the arc by the vernier. This can be done after the sight has been taken.

The value of the divisions of the compass is single degrees. The arc for vertical angles is divided to single degrees, but sub-divided by the vernier to 10 minutes.

**Complete in case with staff socket, Rs. 40,**

Code Word for Telegrams—"MAGNET."

**Tripod Stand, with Ball and Socket motion for the above, Rs. 20.**

Code Word for Telegrams—"SOCKET."

Code Word for Abney Level Fig. 2, with Tripod Stand complete—"BANGLE."

## LOCKE'S IMPROVED REFLECTING LEVELS.

**Fig. 3.**—This simple and portable level is a most useful instrument. it consists of a tube about 6 inches long, having attached at one end a saddle piece containing a glass spirit level; which being transparent and fixed over an opening in the tube, the light will carry the reflection of the air-bubble upon the surface of a polished reflector, or, preferably, a rectangular prism. At the further end of the tube is a sliding eyepiece in which is fixed the half of a circle of magnifying lens, and by the slide, the reflected air-bubble can be perfectly focussed, the remainder of the field of view being quite clear for the eye to see the distant object required. A cross wire is also placed in the tube, the level being elevated or depressed until the air bubble is seen coincident with the cross wire; the correct level is then attained. A protecting glass to exclude dust is fixed at the open end. The level requires no adjustment, can be carried in the pocket, and is always ready for use.

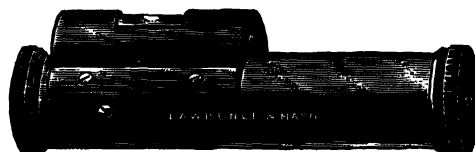


FIG. 3.

**Fig. 3.**—Locke's Pocket Reflecting Level, with prism, in case, **Rs. 15.**

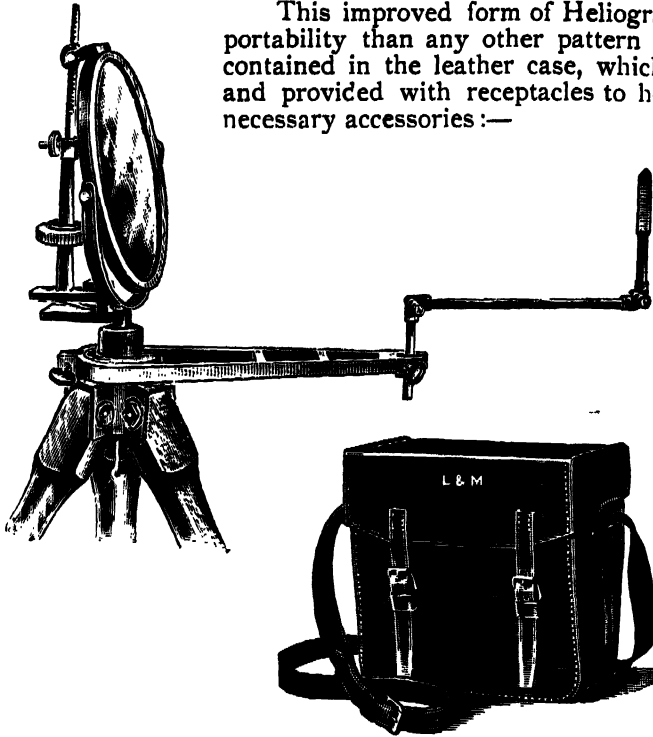
Code Word for Telegrams—"LOCKE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The "FLASH-LIGHT" Heliograph.

Of Improved Construction, for Signalling Stations and Communication.

This improved form of Heliograph possesses the advantage of greater portability than any other pattern in use. The whole of the instrument is contained in the leather case, which is lined throughout with green cloth, and provided with receptacles to hold the various parts, and the following necessary accessories:—



Spare Mirror.  
Screw Driver.  
Sighting Rod and Vane.  
Steel Lever for Capstan Screws.  
Oil Bottle.  
Twelve Paper Vanes.

The tripod stand is light and easy to carry, but very rigid when set up. The base of the Heliograph is permanently fixed to the legs, and therefore cannot be lost. The instrument is easily and rapidly set up for use. Diameter of mirror, 5 inches.

PRICE, complete, **Rs. 165;**  
per pair, **Rs. 330.**

*Quotations given for larger sizes on application.*

Code Word for Telegrams—  
Single, "HELIOGRAPH." Pair, "SIGNALLER."

## TO USE THE HELIOGRAPH.

### **SIGHTING WITH SUN IN FRONT OF SIGNALLER.**

The usual method of directing the flash to the required point has been to look through the mirror from the back and move the sighting vane until the sighting point is exactly in line, but a simpler and very accurate way is to stand in front of but a little on one side of mirror, and looking into it bring the mirror, by means of horizontal and vertical screws, into such a position that the spot in centre of mirror cuts off the reflection of distant station; then move the sighting rod until the reflected image of sighting vane comes into an exact line with the sighting vane and distant station. The flash is then thrown on to the vane (which must be firmly clamped and not shifted), and is rightly aligned when the dark shadow spot from centre of mirror is thrown on vane. The mirror must be moved up and down to the right or left until the spot falls on the vane; it is then ready for use.

### **SIGHTING WITH SUN BEHIND THE SIGNALLER.**

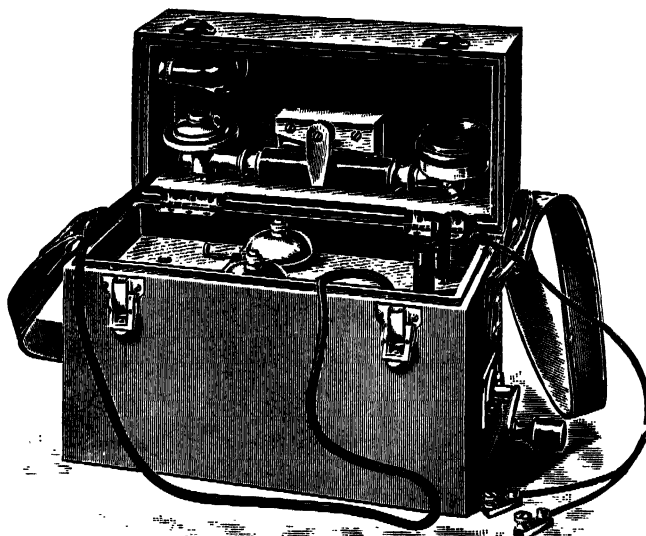
When it is necessary to use both mirrors place the signalling mirror facing the sun and the auxiliary mirror inclining to the distant station, stand in front of the Heliograph and looking into the mirror, so that the whole of the auxiliary mirror can be seen reflected. Move the latter horizontally or vertically until the distant station, the spot on the auxiliary mirror, and the unsilvered spot on the signalling mirror are in the same line; the auxiliary mirror can then be firmly fixed in its socket, and the mirror clamped with the nut at the side.

In signalling the left hand is kept on milled head and the right on the signalling key, the necessary adjustments to suit the motion of the earth, and keep the shadow spot on the sighting vane can then be made while in the act of signalling without interruption or delay.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## PORTABLE TELEPHONES

FOR MILITARY OR FIELD USE, ENGINEER'S, SURVEYOR'S & GENERAL TESTING PURPOSES.



### PORTABLE TELEPHONE SET.

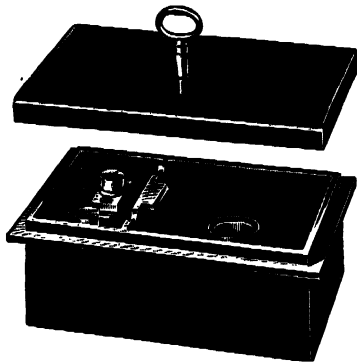
COMPRISING—Standard Hand Combination, with Switch in the Handle, Induction Coil, Triple Magnet Generator, Polarised Call Bell and Dry Battery in solid Teak Case, with Sling Strap.

PRICE **Rs. 90** each; per pair, **Rs. 180.**

Code word for one, "RAMICORN."

Code word for one pair, "RAMOLESK."

### ACCESSORIES FOR PORTABLE TELEPHONES.



#### CAST IRON GROUND BOX

with Lock and Key, substantial connecting jack and leading in tube for underground cable. This Box is for fixing at the firing points, and used in conjunction with the Plug Connector enables the Telephone to be quickly and efficiently connected.

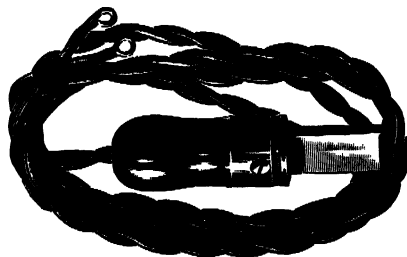
PRICE, **Rs. 15** each; per pair, **Rs. 30.**

Code word for one, "RAMULUS."

Code word for one pair, "RANSACK."

Battery Renewals for above Portable Telephones (2 cells), each **Rs. 3.**

Code word, "REALIST."



#### PLUG CONNECTOR.

Substantial Double Line Plug, with two yards of Flexible Waterproof Conductor. To be attached to the Line Terminals of Rifle Range Telephone and used in conjunction with Cast Iron Ground Box.

PRICE, **Rs. 9** each; per pair, **Rs. 18.**

Code word for one, "RAPTORIAL."

Code word for one pair, "RATTLECAP."

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## Portable Rifle Range Telephones.

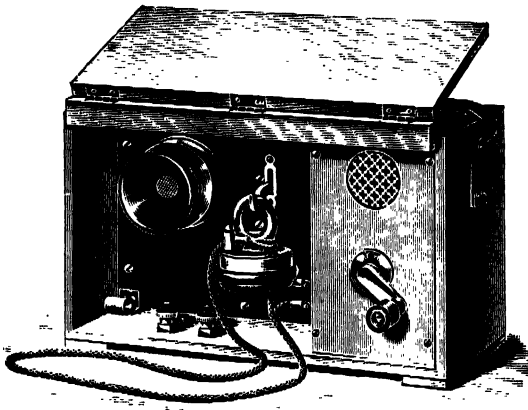


Fig. 1.

### Fig. 1.—Portable Rifle Range Telephone.

Comprising Patent "Sterling" Shot Carbon Transmitter, Double Pole "Ader" Type Receiver, Triple Magnet Generator, Polarised Call Bell, Automatic Switch Hook and Microphone Battery. The whole of the interior parts are constructed with a view to accessibility. The woodwork is of solid, well-seasoned Teak, polished and provided with leather hand strap.

Price complete (as Fig. 2) with strong adjustable ash tripod stand with metal top and stout wing screw for holding telephone in position, stand adjustable to any height.

Single, **Rs. 120**; per pair, **Rs. 240**.

Code word for telegrams, for one, "RAFTSMAN"; for a pair, "RADIOLITE."

### Cables for Rifle Range and Field Telephones.

#### Special Quality Field Cable.

Specification: Conductors No. 18, insulated with impregnated paper covered with thick lead and tarred yarn overall. This Cable can be laid direct in the soil if carefully laid and provided there is very little traffic above it.

Prices, for single Conductor, per roll of 110 yards, **Rs. 75**.

Code word for roll, "RAGSTONE."

#### Twin Flexible Cable for Temporary Use.

Specification: Conductors 70/40 stranded, lapped with cotton, covered with Pure Para Rubber, Vulcanised Rubber, Cotton Braided and Compounded.

Price, per roll of 144 yards, **Rs. 50**.

Code word for one roll, "RAINDEER."

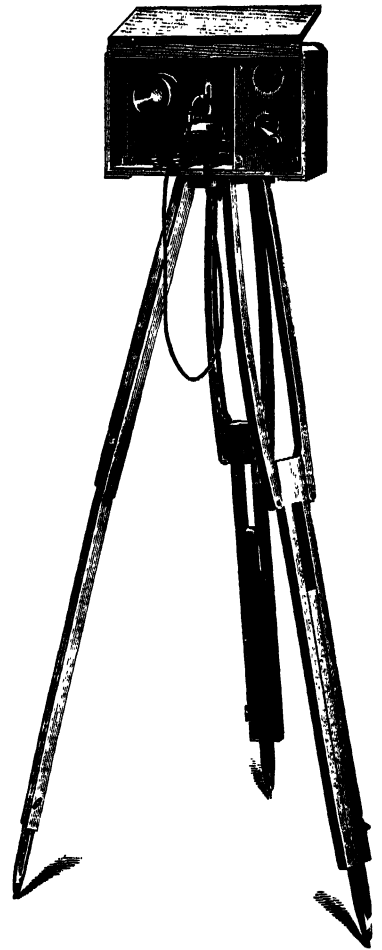


Fig. 2.

**Battery Renewals for above Portable Rifle Range Telephone, (one cell) Rs. 2.** Code word, "RAYONITE."

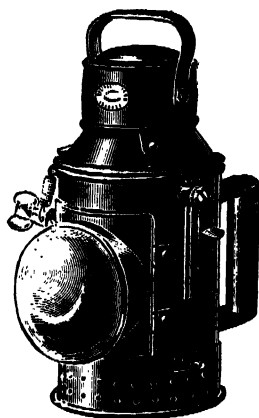
**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**



# “ MARTIN'S ”

## Patent Morse Code Army Signalling LAMP,

with Improved Rapid Double-Action Flashing Apparatus.



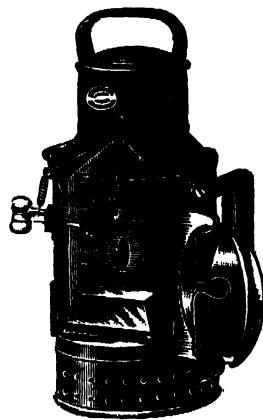
**T**HIS action has been introduced as an improvement upon the form of shutter at present in use, and the following advantages which render greater efficiency and accuracy in reading over long distances more easily attainable are claimed for it.

The **Flashes are fuller, brighter and more incisive**, and the **greater definition** obtained between the exposure and non-exposure of the light makes the Morse Signals **easier to read**.

As, at a given distance, it is easier to read from the new Lamp than from the old, it follows that the new Lamp **can be read at a greater distance**.

Directly the key is depressed, a flash coming from the first, from the brightest portion of the flame, is instantly emitted through the centre of the hole in the screen, and thence through the centre of the bull's-eye.

With the single-action obscuring disc, hitherto in use, the dullest portion of the flame is first exposed through a crescent-shaped aperture formed by the raising of the disc at the bottom of the hole in the screen, and the brightest



part of the flame is practically only to be seen after the complete traverse of the key. The effect of this is that the flashes are by no means so bright or cleanly-cut as those obtained with the new Double-action Shutter, with which the **brightest rays of light are available during the whole time the shutter is open**. In addition, the latter with a uniform rate of sending gives a readable exposure for a comparatively longer period (owing to its quick action) which, combined with the greater definition obtained, renders the lamp **much easier and more certain to read**.

The motion of the Shutter being lateral, there is an entire absence of flicker in the flame, and the wick cannot be shaken out of position. Thus a frequent cause of delay and difficulty to a Reading Station is removed.

The Screen and entire action can be raised and will remain in position, thus leaving both hands free to deal with the Oil Reservoir, Burner, &c.

Even though the Key be insufficiently removed from any cause in course of sending a letter or numeral in the Morse Code, the signal is not thereby spoilt (as frequently happens with the Single-Action Shutter, necessitating repetition and delay), since a **very small movement of the Key is sufficient to give a clear and readable exposure of the light**.

No new instruction or knowledge is needed to use it, as the key-motion remains the same, while (except as regards the obscuring arrangement) no departure has been made from the accustomed form of lamp, which experience has proved to be most serviceable. A very small movement of the key is required to work the Shutter, and thus the Lamp is very easy to operate.

The Double-action Shutter, though effective, is of very simple construction, and there is **nothing to get out of order**.

Though shewing many advantages, the Lamp is **no more expensive** than the old pattern of Signalling Lamp.

These Lamps are turned out in the best style and workmanship, and are fitted with Cut and Polished Lens, Side Light for reading, Powerful Oil Container, Ivory Thumb Key Silencing Buffers, Regulation Bayonet Slot Attachment for fixing Tripod Stand when required, &c., &c.; combining every necessary to render them the most efficient and practical signalling Lamp obtainable.

**Price, Rs. 22.**

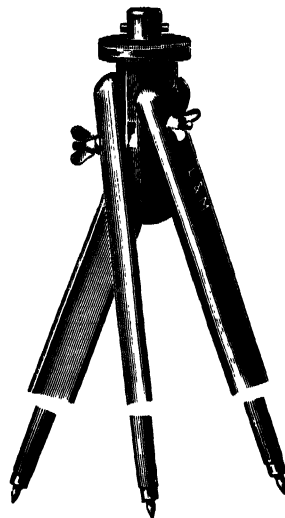
Code word for Telegrams, “ MARSETIC.”

Tripod Stand with Fly Nuts to lock legs in position, Revolving Top and Clamp to keep Lamp in position after finding distant Station.

**Price, Rs. 10.**

Code word for Telegrams, “ TRIPODIAN.”

Code Word for Lamp, complete with tripod stand, “ VINDICATOR.”

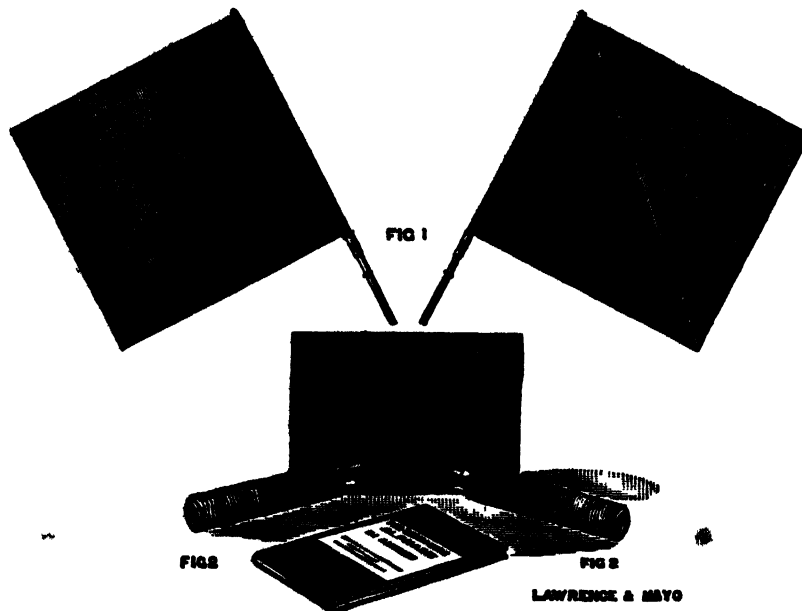


**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON**

# Semaphore Signalling

## POCKET SET.



The invention is illustrated in Fig. 1, which is a view of the flag and staff in condition for use.

Fig. 2 is a view showing the flag and staff collapsed and folded with the flag wrapped round the same.

The flag staff is composed of a number of metal tubes, which are capable of telescoping as shown at Fig. 2. These tubes when extended fit each other at their adjacent ends and form a rigid tapering rod or staff. The handle is made in the form of a whistle for audible signalling. To open the flag for use (which is only the work of a moment), move the two parts of the staff in a line with one another, raise the sliding tube until it covers the double joint, then screw it on to the screw thread situated just above the joint; the flag may now be opened out by drawing out the end of the telescopic staff, until the tubes are extended to their full length.

By reversing the above operations the staff can be closed up for inserting in the case

The Semaphore Signalling Set is extremely portable, each flag with metal pocket staff, folding to 6½ inches and weighing only 7 ounces.

The complete outfit (which takes up no more room than a pocket pouch case), consists of Two Semaphore Flags with metal pocket staff, Book of Semaphore Alphabet and Leather Case, weighs under 18 ounces, and measures only 7 x 4 x 2 inches.

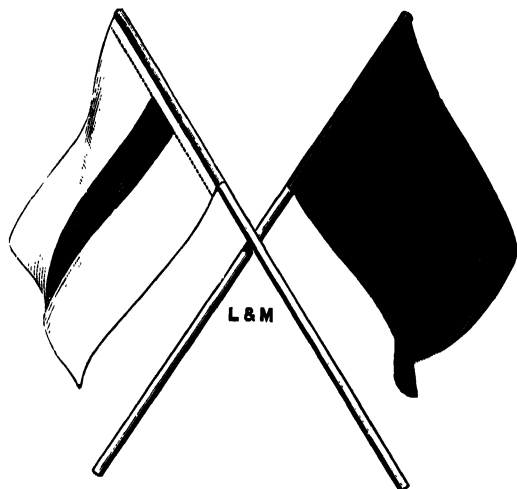
Price of the Semaphore Signalling Pocket Set, consisting of Two Semaphore Flags with metal pocket staff, Book of Semaphore Alphabet and leather pouch case, which is fitted with loops for attaching to Sam Browns Belt,

**No. 21.**

Code word for Telegrams, "LEANDER."

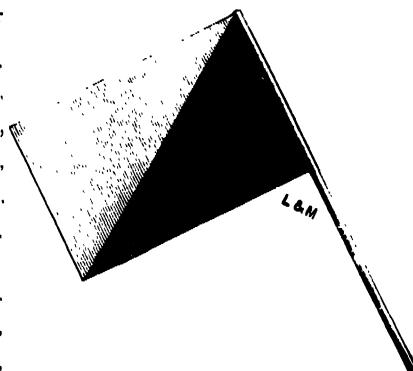


## ARMY SIGNALLING FLAGS, POLES, &amp;c.

REGULATION ARMY  
SIGNALLING FLAGS.

Made of the best and lightest material, with  
loop for staff and fastening tapes.

White, with blue stripe ..	2 ft. square each	<b>Rs. 1</b>	Code Word for Telegrams.
Blue .. .. .	2 ft. square ..	<b>Rs. 1-8</b>	"ABACTOR."
White, with blue stripe ..	3 ft. square ..	<b>Rs. 1</b>	"ABLFASY."
Blue .. .. .	3 ft. square ..	<b>Rs. 1-8</b>	"ABLUENT."
Tapered Ash Staffs, for above	3 ft. 6 in. ..	<b>0-3-0</b>	"ABSENTE."
" .. .. .	5 ft. 6 in. ..	<b>Rs. 1</b>	"ARCADIAN."
Instructor's Flag, white, with blue stripe 20 in. square, with stick to suit ..	.. ..	<b>Rs. 1</b>	"ACANTHIS."
Regulation Pattern Semaphore Flags ..	per pair	<b>Rs. 1-8</b>	"ABSYMAL."
Light Canes for ditto .. .. .	.. ..	<b>Rs. 1</b>	"ACCENTAR."
			"ACTINOID."



## SIGNALLING APPARATUS &amp; ACCESSORIES.



FIG. 1.

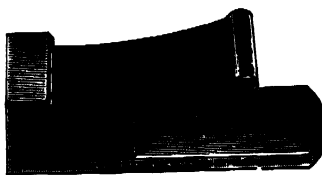


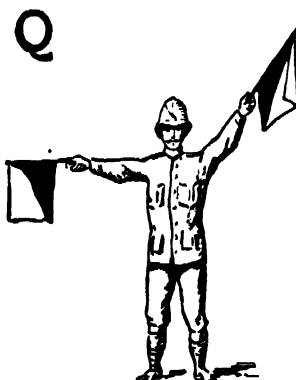
FIG. 2.

Fig. 1. Sounding Board or Dummy Telegraph Key, best make, on mahogany board, with adjusting screw, spring, &c. .. .. .

Fig. 2. Pocket Sounder or Castanet, for teaching the Morse Code, aluminium Signalling Message Book, Regulation Pattern .. .. .  
Scribbling Book for Practice .. .. .  
Semaphore Pocket Chart, with Alphabet Signs, &c. .. .. .

Code Word for Telegrams.

<b>Rs. 6</b>	"SOUNDER."
<b>Rs. 1</b>	"CASTANET."
<b>Rs. 1-4</b>	"AMAZON."
<b>0-8-0</b>	"ALEMBIC."
<b>0-12-0</b>	"ACARONIC."



**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**



## Lawrence & Mayo's Patent.

FIG. 1.—This Board is made of well-seasoned Spanish Mahogany, and is so constructed that it will stand severe climate and usage. The rollers for the reception of the sketching paper are of an improved form, being solid, with a thin slit only to allow the threading of the paper; thus the small loose section, which was so liable to be lost or broken, is dispensed with. A further improvement (Patented) has been added to the sketch-board, by substituting leather straps with nickel-plated spiral springs, for the rubber bands usually supplied, which soon become useless in tropical climates, these spring straps sustain a firm hold of the ruler, keeping it in any position required. A pair of pencil clips are provided for the reception of a pencil, so that it may always be at hand. The compass is well made, with agate centre, and thoroughly reliable.

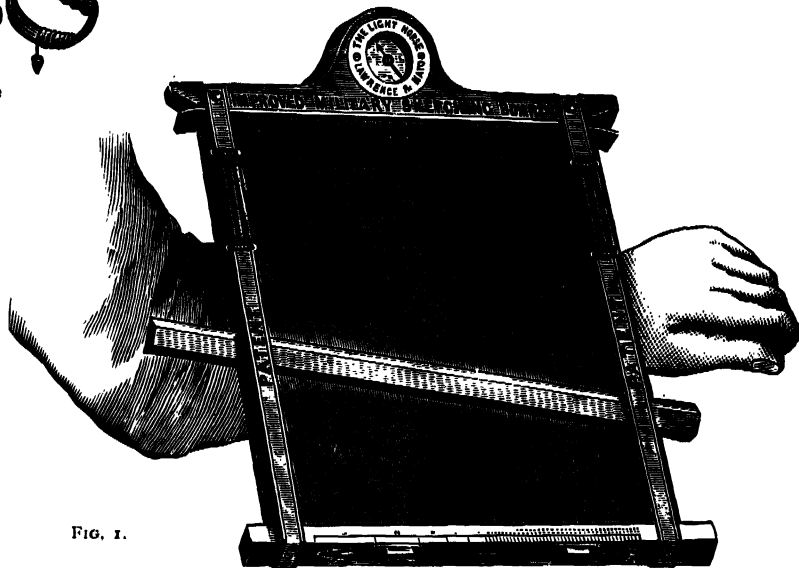


FIG. 1.

**Price, including canvas case with leather bound seams, Rs. 16.**

Code Word for Telegrams—"SKETCHING."

**Solid leather regulation case (for attaching to saddle), Rs. 8-8.**

Code Word for Sketching Board with solid leather regulation case—"KINDLE."



FIG. 2.

FIG. 2.—Boxwood Rule for sketching board, scaled 2 inches and 4 inches to a mile, **Rs. 1-8.**

Code Word for Telegrams—"GYPSUM."

Code Word for Sketch Board with canvas case and boxwood rule—"GOURD."

Code word for Sketch Board with solid leather case and boxwood rule, "GUARDIAN."

FIG. 3.—Sandhurst Sketching Case, size 10 x 10 with metal frame for keeping paper taut when in use, waterproof cover to protect the sketch, shoulder strap and small strap with button hole to attach to tunic to give a firm support whilst sketching, **Rs. 9.**

Code Word for Telegrams, "WELDABLE."

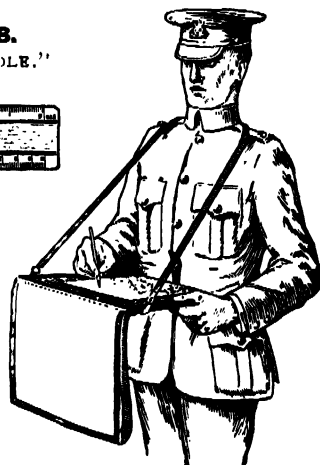


FIG.

## Tropical Umbrella for Sketching and Field Work.

Best quality Sketching Umbrella, brown Holland, lined green, with wind ventilator, fan joint, brass socket adjustable to any height and with top joint to set at an angle to the stick, spike ferrule and cloth cover.

To adjust the umbrella to the required angle raise the brass tube to which the ribs are fitted as high as it will go, the joint will then be free for adjustment to any angle.

**Price, Rs. 35.**

Code Word for Telegrams—"RIOTER."

## HIGH-CLASS PLANE TABLES.

FIG 1.—Government Pattern Plane Tables made of best American white wood, battened with mahogany battens, fitted with brass slots to allow boards to shrink or swell according to the humidity of the atmosphere, American cloth cover and birch wood crutch tripod stand.

Size 30 × 24, **Rs. 60.**

Code Word for Telegrams—"TABLE."

Size 24 × 18, **Rs. 55.**

Code Word for Telegrams—"TABLOID."



FIG. 1.

## Military Students' Plane Table.

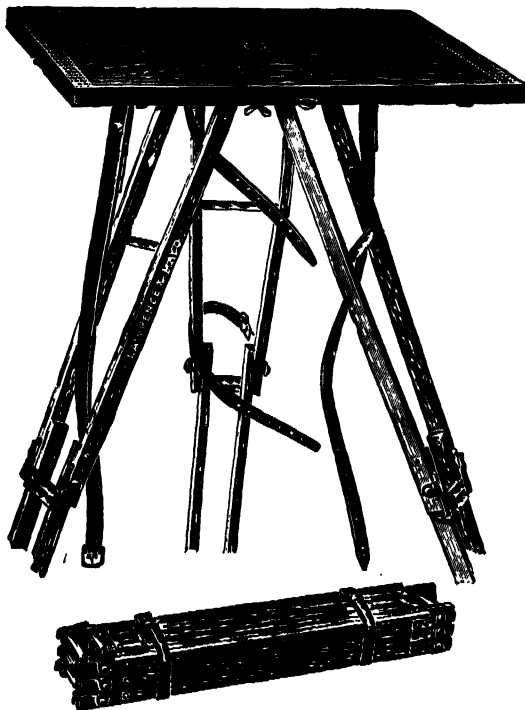


FIG. 2.

FIG. 2.—Military Students' Plane Table, best quality mahogany board, size, 14 × 12, fitted with mahogany clamps and metal clips to hold paper securely in position when in use, complete with American cloth cover and ash wood four-fold tripod stand, very strong, and portable, and fitted with improved pattern self-locking plates, enabling it to be erected or closed with the greatest rapidity. This pattern plane table, on account of its strength and portability, is much in demand by military students.

Price, complete, **Rs. 45.**

Code word for Telegrams—"RECTIFIER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## HIGH-CLASS PLANE TABLES.

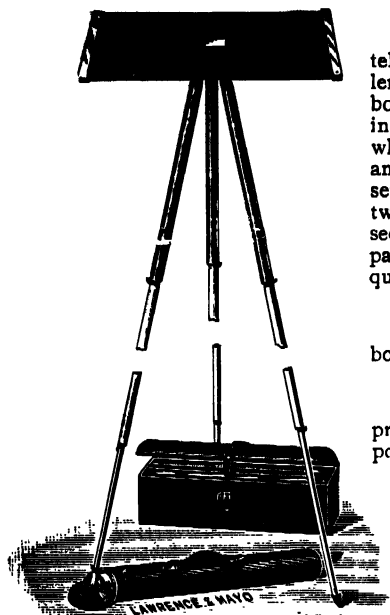


FIG. 3.

**Lawrence & Mayo's Improved Folding Plane Table (FIG. 3)** with metal telescopic tripod stand, which can be set up at full height or any convenient length, and ball and socket attachment for adjusting table to any angle. The board is made of mahogany strips arranged to fold up flat to  $12 \times 4\frac{1}{2} \times 1\frac{1}{2}$  inches, size when open for use  $12 \times 12 \times \frac{3}{8}$  inches. The mahogany strips, which are covered with canvas on the underside, fold quite closely together and are secured in position by two metal clamping bands, which, in addition, serve to hold both ends of the paper. The board being square permits of the two clamping bands being turned back on their pivots to fit on to the outside sections of the board when folded, thus doing away with any detachable parts; a metal fitting is attached to the board for securing the stand quickly and firmly.

Canvas covers, with leather bound seams and handles, are supplied for board when folded and stand when closed.

This folding plane table, on account of its extreme portability, will prove of great utility for military cyclists use, and to all where portability in a plane table is the first consideration.

PRICE, **Rs. 32.**

Code word for Telegrams—"PREMIER."

### Lawrence & Mayo's Improved Pattern Topographer's Plane Table.

Best quality mahogany board, size  $24 \text{ in.} \times 18 \text{ in.}$ , fitted with brass rollers for the carrying of a length of paper with clamping screws, for keeping paper taut. The paper as used is wound on to the receiving roller. Over each roller and level with the surface of board is fitted an ebony straight edge.

Tripod stand (made of selected ash) with sliding legs for quickly levelling the board.

Length of stand when extended ... 58 inches.

" " " closed " ...  $23\frac{1}{2}$  inches.

18 in. boxwood sighted rule, 3 in. sights, scaled 4 in. and 6 in. to a mile, back and front gun metal sights.

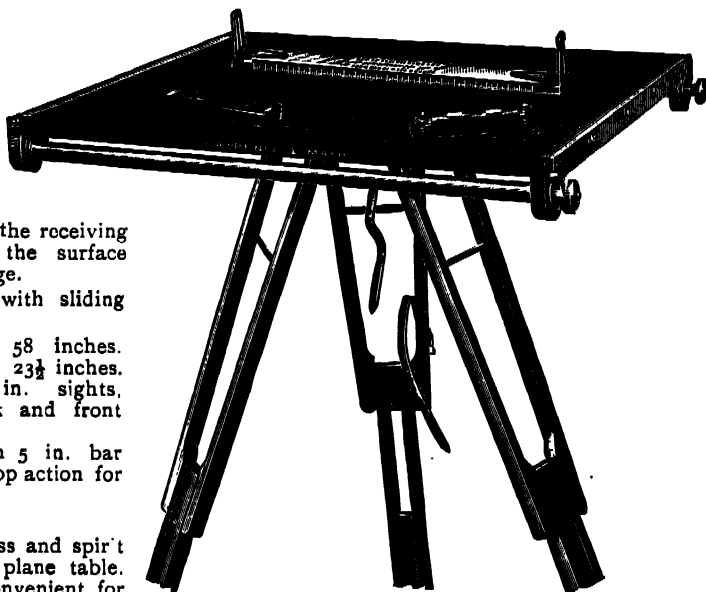
Superior metal trough compass with 5 in. bar needle, and agate centre, with automatic stop action for needle, and arc of degrees.

Metal-mounted spirit level.

The cases to hold sight rule, compass and spirit level, are permanently secured under the plane table. This arrangement will be found most convenient for retaining the instruments at hand until required, and for portability in packing.

Price complete, with canvas case with leather bound seams and handle, to hold board, sight rule, compass and spirit level, **Rs. 175.**

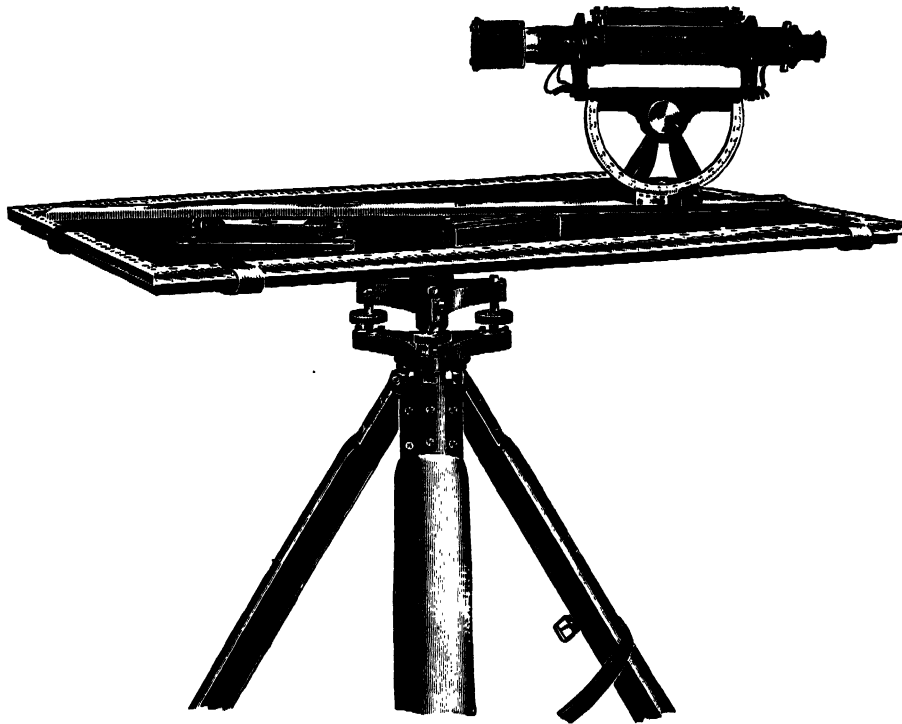
Code word for Telegrams—"ARTIFICER."



**LAWRENCE & MAYO, Manufacturing Opticians,**

67 & 69. CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## LAWRENCE & MAYO'S COMPLETE PLANE TABLE OUTFIT.



*Lawrence & Mayo's Complete Plane Table Outfit consists of :*

Plane table board, 24 in.  $\times$  18 in., fitted with detachable boxwood frame for clamping paper on table with metal clips, and divided and figured on both sides to show degrees of angles, with rule divided into inches and multiples of inches.

25 inch alidade with telescope in Y's and level attached, arc reading to one minute, trough compass, and adjustable level for table. Tripod stand fitted with three screw-locking plates.

Strong case with handle, fitted to hold plane table and all accessories except tripod stand.

Complete Plane Table Outfit as per above description and illustration,

**Rs. 300.**

Code word for Te'legrams — "ANODYNE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA MADRAS and RANGOON.



## COMPASSES, LEVELS, AND SIGHTED RULES FOR PLANE TABLES.



FIG. 1.

12 inch sighted rule for plane table, 3 inch sights mounted on boxwood, rule scaled 4 in. and 6 in. to a mile ... **Rs. 12.**  
Code Word for Telegrams—"WILLOW."

18 inch sighted rule for plane table, 3 inch sights mounted on boxwood, rule scaled 4 in. and 6 in. to a mile ... **Rs. 18.**  
Code Word for Telegrams—"WINDOW."

24 inch sighted rule for plane table, 4 inch sights mounted on boxwood, rule scaled 4 in. and 6 in. to a mile ... **Rs. 24.**  
Code Word for Telegrams—"WICKER."

## PLANE TABLE COMPASSES.

FIG. 2.—Plane Table Compass, with two inch bar needle, jewel centre, in bronzed oblong trough, with spring clip fastening.

PRICE, including leather pocket case, **Rs. 7.**

Code Word for Telegrams—"PLANE."

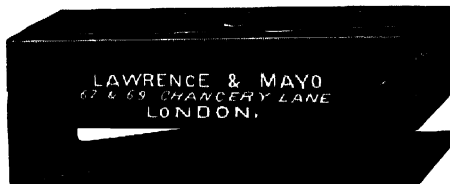


FIG. 2



FIG. 3

FIG. 3.—Full Size Military Service Pattern Compass for plane table use. Superior metal trough compass with 5 inch bar needle and agate centre, with automatic stop action for needle, fitted in mahogany case with sliding lid. PRICE, **Rs. 25.** Code Word for Telegrams—"MILITANT."



FIG. 4

## CAMERA LUCIDA.

FIG. 4.—For sketching objects from nature by reflection. Fitted with dark glass for toning light, and two lenses for enlarging and reducing, guide rods and clamp to outer tubes.

Complete, in leather case,

**Rs. 45.**

Code Word for Telegrams, "FLOUNCE."



FIG. 5.

## LEVEL FOR PLANE TABLE.

FIG. 5.—Best quality Brass Level, with graduated bulb for adjusting plane table boards. In mahogany case, with sliding lid, **Rs. 8-8.** Code Word for Telegrams, "KNUCKLE."

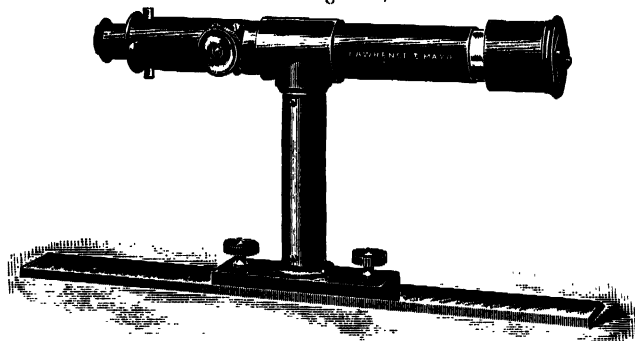


FIG. 6.

FIG. 6.—15in. ALIDADE, with superior Telescope, having rack and pinion focussing adjustment for use with plane table.

Price, including mahogany case, **Rs. 85.**

Code Word for Telegrams—"ASSAILANT."

# The MEKOMETER.

## “GENERAL SERVICE” PATTERN=====

(As supplied to His Majesty's Government).

The “GENERAL SERVICE” Pattern MEKOMETER, as used by both Infantry and Artillery, each set consisting of right and left Instrument, with high and low power Telescopes and two 25 yard cords wound on reels.

PRICE of the Two Instruments, complete in Leather Case, highest class workmanship throughout—

**Rs. 275.**



Code Word for Telegrams—“MEKOMETER.”

HANDBOOK of the MEKOMETER (official copy), **Annas 6.**

Code Word for Telegrams—“ALBATROSS.”

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The WELDON IMPROVED FORM COMPASS OR SURVEYING RANGE-FINDER.

## LATEST MODEL.

**T**HERE are several forms of the WELDON RANGE-FINDER, but the methods of using the prisms, or of finding the range with them, is the same for all.

The latest improved pattern Compass or Surveying Range-Finder has the three prisms fixed one above the other (Fig. 1). By this arrangement, when the instrument is opened out, and the protecting cover used as a handle, the three prisms can be brought into position before the eye of the observer, and any one of them used without having to take the eye off the object observed, as would be necessary in the original pattern. Also, without removing the range-finder from the eye, objects to the left of the observer can be viewed by simply turning the instrument so that the apex of each prism shall point to the object to be reflected.

The metal cover which forms the handle has four notches cut in it; these serve to support a pencil in such a position that when the needle points due north, the pencil will point E. and W., N.E. and S.W., N.W. and S.E., as it is laid either transversely or diagonally in the notches.

The level fixed below the third prism is used to assist the observer to keep the instrument upright when range-finding, and will be found useful for setting the instrument so that the right angle prism (90°) can be used as a Dipleidoscope for indicating the passage of the Sun or a Star over the Meridian so as to correct a watch, &c.

*Extract from Lecture delivered at The Royal Institution on the Weldon Range-Finder, by COLONEL J. B. RICHARDSON, Royal Artillery.*

The present Weldon Range-Finder combines all the advantages of Colonel Weldon's early inventions, whilst it is free from their defects, and possesses many merits peculiar to itself. Short of getting crushed it cannot get out of adjustment, and you can see from the full-sized representations of the Instrument in various positions that it is very portable and very simple.

Colonel Weldon had extreme difficulty in getting the prisms made with accuracy. Their present perfection is the result of patience, perseverance, and costly experiment. Optician after optician, both in England and on the Continent, undertook to make them accurately, but their attempts resulted in constant failure. The method now adopted is a secret.

The chief points urged in favour of the Weldon Range-Finder in the various official reports are :—

- 1st.—That it is easy to learn and teach its use.
- 2nd.—Not liable to get out of order.
- 3rd.—Practically accurate.
- 4th.—Compact.
- 5th.—Portable.
- 6th.—Light.
- 7th.—Cannot get out of adjustment.
- 8th.—Serviceable on the field.

In some of the Indian trials the average time taken in obtaining measurements of ordinary ranges is given as 1½ minutes. I have myself seen many correct ranges taken in less than one minute each, and the distance of moving objects very approximately given in from 35 to 50 seconds by well-trained observers.

**PRICE** of the "Weldon Improved Form Compass or Surveying Range-Finder," as above, in German Silver Mount and Leather case with loop for belt, **Rs. 65.**

Code Word for Telegrams—"WONDERFUL."

Handbook for the Weldon Range-Finder, with full instructions for use, supplied free with each Instrument.

**A Twenty Yards specially-marked Measuring Tape** for the Weldon Range-Finder, to facilitate taking of Ranges and ensuring the accuracy thereof, in leather case with folding handle, **Rs. 7.**

Code Word for Telegrams—"WYVERN."

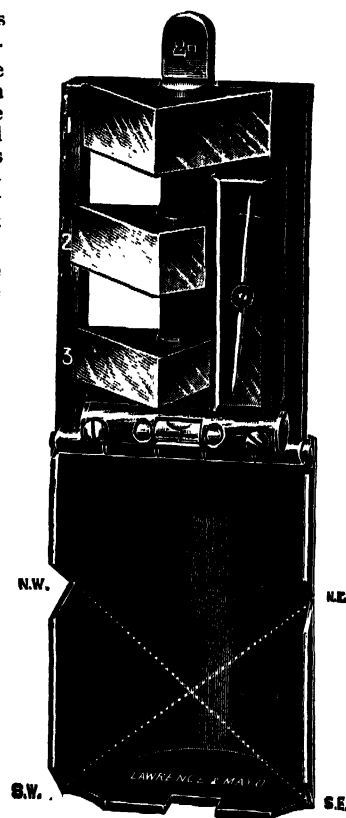


FIG. 1. Open for use



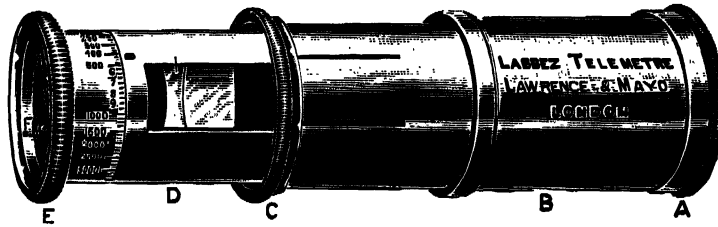
FIG. 2. Closed.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON ; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The Labbez Mirror Telemeter

## Or Pocket Surveying Instrument and Range Finder, with Telescopic Power.

(Adopted by the French Government for use of the Infantry.)



The Labbez Mirror Telemeter, or Pocket Surveying Instrument and Range Finder, with telescopic power, will give, without any multiplication of base or calculation, the distance of objects from 250 to 3,000 yards; the simplicity of its construction, combined with the rapidity and ease with which it can be used (one person can accurately get a distance in 30 seconds), and its utility as a surveying instrument, has made the "Labbez" a popular range finder in Military circles.

The advantage of the Labbez Telemeter with telescopic power over that of the simple instrument is that smaller objects at greater distances can be observed, and the range obtained with greater accuracy.

If it is desired to use the Telemeter without the telescopic power, the Telescope can be detached by holding the tube **C** and turning tube **D** to the left, and then drawing out the tube.

The eye piece of telescope is at **A**, and the object glass at **C**. The mirror **D** slides into tube **C**.

The focus is obtained by sliding in the tube attached to fitting **C**. The milled head **E** revolves and shows the range opposite the zero point. The button **F** is to compensate for the object used as a mark not being at right angles.

PRICE of the **Labbez Telescopic Telemeter, or Pocket Surveying Instrument and Range Finder**, as above, with 30 metres of base line on brass bobbin, and full instructions for use,

**Rs. 60.**

Code Word for Telegrams—"LABBEZ."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

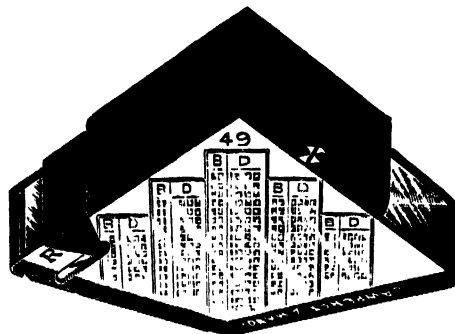
# The "Souchier" Telemeter, or POCKET PRISM RANGE-FINDER.

This very portable Range-Finder, which is at present in use in the French, Russian, Japanese and Bulgarian armies, can be easily carried in the waistcoat pocket. It weighs less than  $1\frac{1}{2}$  ozs., and is not larger than a watch. Distances can be measured by it within a mean error of  $2\frac{1}{2}$  per cent.



## INSTRUCTIONS.

Hold the instrument in the left hand as shown in the illustration. The thumb should cover the part where the factor is printed on the scale.



Range to be measured.

## METHOD No. 1.

The operator placed at O with the object, the distance of which has to be measured, on his right, the instrument held in the left hand. Leave a cap or stick or some object at the point O. Look at the distant object through the aperture in the Range-Finder marked R, holding the instrument so that the image of the distant object is in the centre of the field. Then move the little shutter so that the letter A is uncovered. Walk backwards in the direction at right angles to the object, until the distant object seen is again in the centre of the field. Measure the distance between the 2nd position B and the 1st position O. Then from the table on the instrument read off the range. For instance, if the distance from O to B is 14 yards, then the distance of the range is 686 yards.

S1

Distance to be read on table marked B.

Range.

O

## METHOD No. 2.

C

Look at the distant object through the aperture marked A, the shutter covering R. Then after moving the shutter walk in a straight line at right angles to the distant object until the latter again appears in the centre of the field. From the distance walked in yards the range can be read off on the scales on the instrument as in the first method.

## NOTES.

If the base should happen to be a length not included within the numbers in the column B of the instrument, the tables on the latter may still be used as follows: If the base measured is 7 yards, refer to the number 14 in column B, and take half the distance given in column D, i.e., 343. If, on the other hand, the base is 80 yards, take double the distance marked against number 40 in column B, i.e., 4,080. If at any time the image given is not perfectly clear, take out the three screws, clean the surfaces of the prism and replace it.

The figure 49 in illustration is the factor which, if multiplied by the distance between two positions, gives the distance. For instance, if the distance O B or S O were 10 yards, the range would be 490 yards. The factor slightly varies with different instruments, according to the density of the Prism, and is distinctly marked on each instrument just above the centre scale.

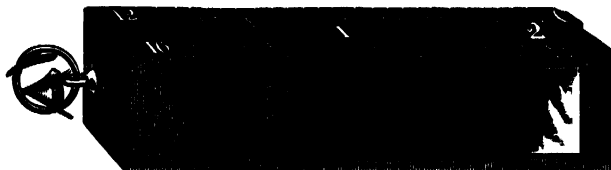
PRICE of the "Souchier" Range-Finder, with Leather Pocket Case, **Rs. 22.**

Code Word for Telegrams—"SOUCHIER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The "Simplex" Range-Finder and Surveying Instrument

(PATENT No. 3535.)



(Actual Size.)

**T**HIS very convenient little instrument consists of a short metal tube with one end half closed by a reflector set at an angle of  $45^\circ$ ; and at the other end are two small peep holes, numbered I and II, placed at a distance apart of one-twentieth the length of the axis of the tube. This instrument will be found to provide for a long-felt want, possessing as it does the following great advantages over other instruments designed for a like purpose:—

- 1.—It is extremely *portable and light*, measuring only  $2\frac{1}{2}$  inches long by half-an-inch by half-an-inch, so that it can be carried in the waistcoat pocket.
- 2.—Its construction is absolutely *simple*, with no adjustable parts or anything to get out of order.
- 3.—Its *manipulation* is easily acquired.
- 4.—The *accuracy* of its measurements compares most favourably with the more elaborate and expensive instruments.
- 5.—There is practically no limit to the range it can measure; distances from ten yards to ten miles can be ascertained.
- 6.—It can be used with *one hand*, and distances measured while on horseback.
- 7.—Its price is so cheap, that its wide distribution amongst N.C.O.'s, and even private soldiers, will be possible.

In addition to measuring ranges this instrument proves most useful in many other ways whilst scouting, map-drawing and surveying. On the sides of the instrument various useful scales are engraved.

## DIRECTIONS FOR USE.

### TO FIND RANGE OF A DISTANT OBJECT.

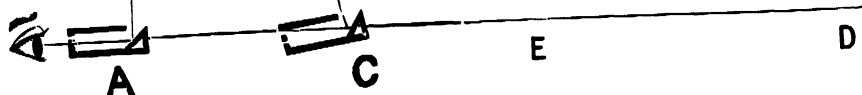
The action is based on the principle that, knowing the length of the base and two angles of a triangle the length of the other sides can be determined.

In the figure, A is the position of the observer, B the distant point the range of which is required. Standing at A, face in a direction at about right angles to the object B, either to the right or the left. Hold the instrument to the eye looking through the peep-hole marked I, with the aperture in the side of the instrument towards the distant object.

Two views will be visible, one reflected at right angles in the reflector, the other seen direct through the end of the instrument. Move the instrument until the distant object B is reflected on the central edge of the reflector, and note any conspicuous mark (such as a tree on the horizon) in the direction D, seen direct, which coincides as nearly as possible with the reflection of B on the central line.

Everything depends on this mark D being clearly defined and unmistakable. The further off it is the more accurate is the reading likely to be. Should no very conspicuous mark be visible, it will be best to move about until a good object is found. For practice a man may be posted to represent it. These two objects, B and D, are at right angles. Now pace off in the direction A D (It is not necessary, as with many other range-finders, to mark the spot where the first observation is made) Noting an intermediate object on the ground at E, seen exactly under D, may facilitate keeping the true alignment. Roughly estimate one-tenth the range A B, and, having paced that distance, stop, and make the second observation. Now look through the peep-hole marked II in the same direction, getting the object D as near the central line as possible. If the range point B cannot be seen in the reflector, move *forward* pace by pace until it appears at the edge. If it be visible, but away from the edge of the reflector, move pace by pace *backwards*, until it is seen to coincide with D. The distance of the base thus measured is one-tenth the range required. Thus, if this base be 63 paces, the range is 630 paces.

If, through the irregularity of the ground, exposure to fire, or great length of base, it is not convenient to *pace* the base, it can be measured with the Range-finder, using a short supplementary base. For greater accuracy, a tape or other measure may be used.



### TO CLEAN THE GLASSES.

Draw out the prism holder from the end of the tube, and after cleaning push well home again.

**Price complete, with leather case, Rs. 15.**

Code word for Telegrams—"ANTELOPE."

## JEFFERY'S NEW 200 YARD SCALE ELEVATOR. BURBIDGE'S PATENT.

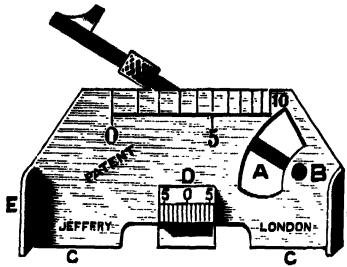


FIG. 1.

the hand guard. It is only necessary to use the above elevator to at once find out its superiority over those previously in use. A wind gauge scale is also cut at D, and Fig. 2 shows how the instrument should be used for marking or checking wind allowances.

PRICE, **Rs. 2.8.** Code Word for Telegrams—"GLOBE."

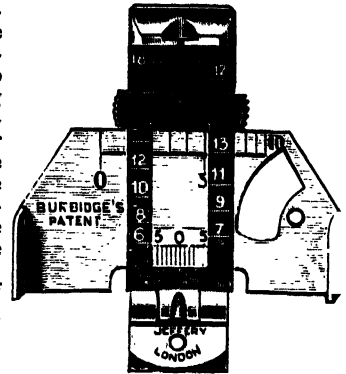


FIG. 2.

## JEFFERY'S IMPROVED FORESIGHT PROTECTOR.

### Locking Pattern Protector for Lee-Metfords and Lee-Enfields.

This Protector locks on the Foresight and protects the paint from damage. It is provided with an improved screw top.

Jeffery's Improved Locking Foresight Protector is admitted by the leading Riflemen to be the best form and most easily fixed and detached, protector obtainable.

Every Volunteer should possess one of these Protectors, as it effectually shields the foresight from damage.

PRICE, **Rs. 2.8.**

Code Word for Telegrams—"GLIMMER."

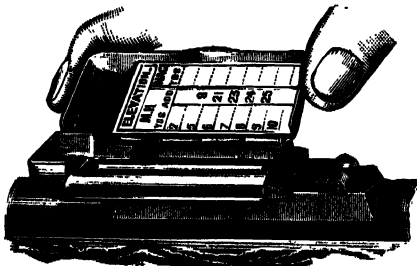


FIG. 4.

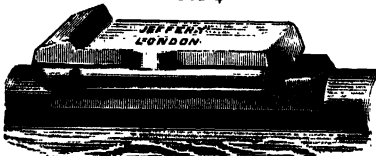


FIG. 5.

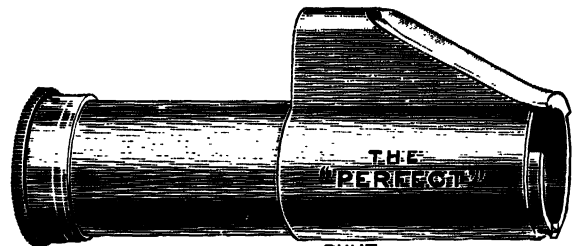


FIG. 3. SHUT

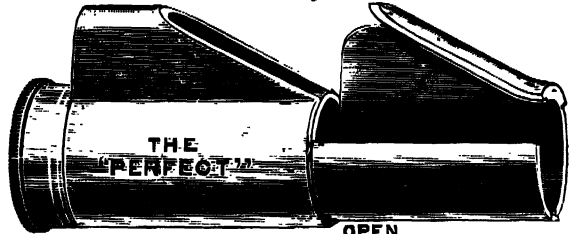


FIG. 3. OPEN

## THE NEW HINGED PATTERN BACKSIGHT PROTECTOR

For Martini-Henry, Lee-Metford or Lee-Enfield.

This Protector admits of the sight being painted without taking it off the Rifle.

Inside the lid is a scale showing the differences in elevation between the different Ranges.

It is a neat and handy pattern Protector, and is not likely to shake off or be pulled off when taking a Rifle out of its cover.

PRICE, **Rs. 1.8.**

Code Word for Telegrams—"GLOBULAR."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# JEFFERY'S PATENT COMBINATION SIGHT ELEVATOR AND WIND GAUGE. (HANGING PATTERN).

Specially designed for use with Lee-Metford or Lee-Enfield Rifles.

(Can also be used with Martinis.)

Fig. 1 shows a side view of the Elevator, showing the scale for reading the Elevations.

This Elevator is divided so as to read to 150ths of an inch. Each division on the side represents 10-150ths. One complete turn of the knob raises the sight-bar 10-150ths. The circumference of the knob at the bottom is divided into ten spaces, so that the turning of the knob one-tenth raises the bar 1-150th of an inch. One degree (1-150th of an inch) gives 1 inch elevation in every 100 yards—thus at 500 yards it would be 5 in., at 600 yards 6 in., and so on. Supposing the marksman finds he is hitting the top of the target at say 500 yards, he would have to lower the bar 7 degrees, which would cause the bullets to strike 35 inches lower. To find out the number of degrees of alteration required, take the number of inches the bullet strikes from the centre of the bull's eye and divide that number by the number of 100 yards the target is distant:—thus 500 yards divide by 5, 600 yards by 6, etc., and the product is the number of degrees on the elevator that the sight should be altered by.

TABLE FOR ELEVATION AND WIND ALLOWANCE.  
Lee-Metford and Lee-Enfield Rifles.

RANGE. Yards.	ELEVATION.		WIND ALLOWANCE.	
	Minimum.	Each Rise.	2-150ths.	4-150ths.
500	8	—	10 in.	20 in.
600	18	9	12 "	24 "
700	28	10	14 "	28 "
800	36	11	16 "	32 "
900	48	12	18 "	36 "
1000	61	13	20 "	40 "

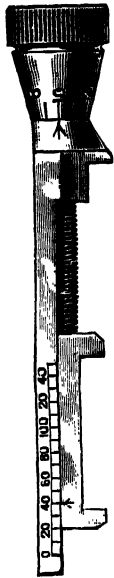


FIG. 1.  
Side view.

One of the spaces on the knob represents 1-150th of an inch, and one complete turn of the knob 10-150ths.  
Each division on the scale on the body represents 10-150ths of an inch.

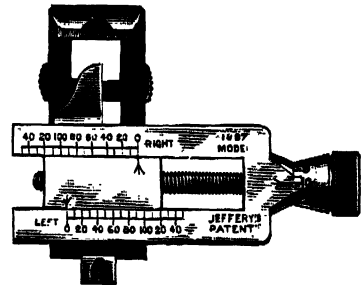


FIG. 2.

Fig. 2 represents the Elevator in use for Wind-gauging purposes.

Fig. 2 shows the Instrument attached, by means of the four studs on the slide, to the Standard of the Backsight.

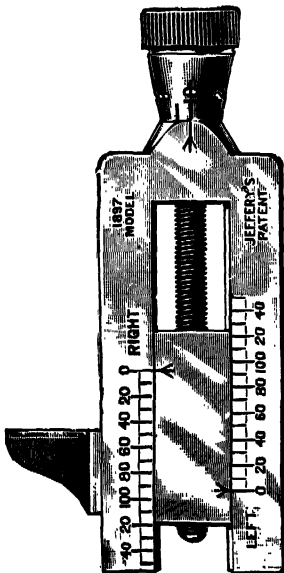
## INSTRUCTIONS.

**First—as an Elevator.**—Hang it on the Sight at the back of the flap; allow the bar to rest on the two projecting studs at the bottom of the slide; then raise the bar to the required elevation by means of the regulating screw. In detaching the Elevator from the Sight, it is advisable to give the knob a turn backwards so as to force the hooks from the bar. When elevating, read from the arrow at the side of the frame at the top.

**Secondly—as a Wind Gauge.**—Blacken the sliding bar and place it at either the top or bottom of the sight leaf; then fit on the gauge across the leaf, attaching it by the four studs, as shown in fig. 2. Bring the arrows to zero as shown on the illustration; the 0 or 10 on the knob will then be opposite the arrow on the back of the frame at the top. If the wind is blowing from the right, screw the knife edge so that it moves to the right, or *vice-versa* for an opposite wind. Having found the correct adjustment a line may be drawn by pencil or brush along the Wind-Gauge on the bar, allowing about two degrees for the set-off of the pencil from the edge of the bar. As the width of the Backsights varies slightly, the Elevators will sometimes require fitting on, as we make them so that they are small enough to fit the narrowest leaves. The fitting on can be done by the nearest mechanic or watchmaker. It is of the utmost importance that the studs on the slide should fit or clip on the sides of the leaf tightly, as the least oscillation or play would affect the accuracy of the wind allowance.

PRICE ... .. Rs. 8-8.

Code Word for Telegrams—"GATE."

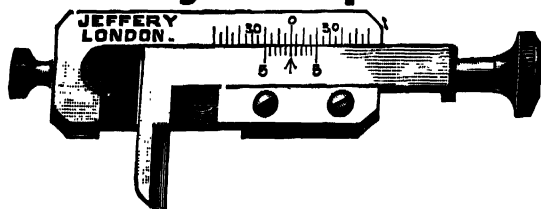


FULL SIZE ILLUSTRATION.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



## Jeffery's Improved Pattern Ventometer,



For Martini, Lee-Metford, or  
Lee-Enfield Rifles.

PRICE, Rs. 6.

Code word for Telegrams—"GAZETTE."

## JEFFERY'S NEW SLIDING WIND-GAUGE BACKSIGHT,

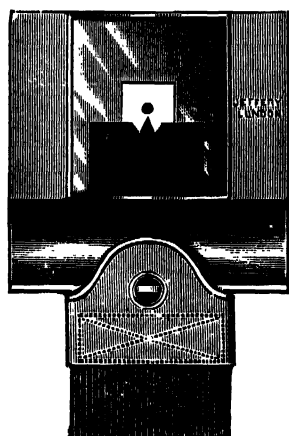
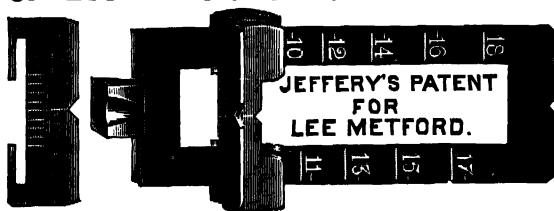
For the Lee-Metford or Lee-Enfield Rifle.

This Sight can be used, with the Leaf raised,  
for the 500 yards range.

These Sights are not allowed in competitions  
in England.

PRICE, Rs. 9.

Code word for Telegrams—"GIRDLE."



## JEFFERY'S IMPROVED AIM CORRECTOR.

Showing by Reflection the exact aim taken.

FOR THE USE OF MUSKETRY INSTRUCTORS.

ADOPTED BY NEARLY ALL THE METROPOLITAN REGIMENTS AND MANY OF  
THE COUNTRY BATTALIONS.

### TESTIMONIAL.

79, FARRINGTON STREET.

19th June, 1889.

DEAR SIR,  
I have thoroughly tested the "Aim Reflector," and am very much pleased with the same.  
It is of the greatest value when fixed on the rifle of an indifferent shot, as it enables the  
Instructor to detect at once any error in the man's aim.

I also find it of great use at aiming drill, as the Instructor can give instruction, &c., whilst  
the man is looking through the sights.

Its simplicity is a great recommendation, as it cannot get out of order, and can be attached  
to the rifle in an instant.

It is the best instrument of its kind I have seen for years, and no Instructor of Volunteers  
should be without one.

Yours truly,

W. CHAMBERS, SERGT.-MAJOR, 3rd London Rifles.

PRICE, Rs. 4. Code word for Telegrams—"MUSKETEER."

## JEFFERY'S NEW SCORING BOOK,

Fifth Edition, 1906.

Sizes of Targets according to the 1905 Bisley Regulations.

Jeffery's New Scoring Book, or Rifle Score Register, is undoubtedly the best book  
published.

It costs about twice as much to print as any of the 1s. 6d. Books, and has more Scoring  
Sheets. It also has a far better quality Binding, the Cover being made of Waterproof Pegamoid  
Imitation Leather.

The Wind Allowance Tables given in this book, which Messrs. Jeffery's introduced some two  
or three years since, have met with general approval, as the Marksman can find the necessary  
allowance by referring to a single page, whereas previously he had to search through some  
twenty pages to find what was required.

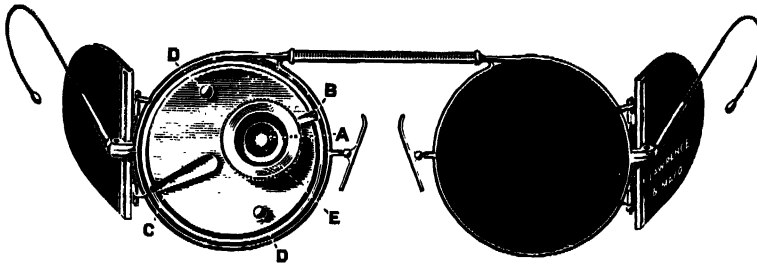
That the method of showing the wind allowance is a successful one is proved by the fact that  
various modifications of it have since appeared in several of the rival publications.

This book contains much useful information about Rifle Shooting, Cleaning of Rifles, Tables  
of Elevation, Windage, &c., and Directions for Variations in Weather, Atmosphere, &c.

PRICE, Rs. 1.

Code word for Telegrams—"SCORER."

# The "Dead-Shot" Iris Orthoptic Shooting Spectacle, WITH LAWRENCE AND MAYO'S PATENT FRAME.



THE "Dead Shot" shooting spectacle is the most up-to-date scientific device produced for Target shooting purposes, and will be found to supply a long felt want by Marksmen and all who strive to obtain efficiency at the range. It is a far handier and more efficient instrument than anything at present in use for Target practice, and indications—from its present popularity with Marksmen—point to its becoming the shooting spectacle of the future.

The frame is made after the manner of our usual pattern rigid bar spiral spring Pince-Nez, and is consequently self-adjustable to the width of the wearer's face.

Light curled arms are attached to the rims to give increased steadiness, and our Patent adjustable side clips are also fitted, which grip the temples, thereby relieving all pressure of the frame on the bridge of the nose; and at the same time prevents any movement of the orthoptic whilst in use. These patent side clips also serve the purpose of effectually excluding all side light and giving perfect concentration of vision on the object aimed at.

The orthoptic, which is fitted to the right or left eye, according to the needs of the wearer, consists of a small Iris diaphragm "A," adjustable in the usual manner by means of a lever "B." Under the mount of the diaphragm is fitted a small moveable semi-circular plate, carrying a blue and yellow tinted glass, the blue to modify the light when excessive, and the yellow glass to clear or sharpen the object in a dull light, either of which can be turned in position by simply moving the lever "C." The disc upon which the diaphragm and lens holder are fitted is made to revolve in the frame for the purpose of adjusting the diaphragm to the required position. Knobs attached to the disc "DD" enables this being easily done by the thumb and forefinger.

Defective refraction may also be corrected by the addition of a lens of the necessary focal power fitted in the cap or cell "E" over the iris orthoptic.

PRICE of the "DEAD SHOT" Iris Orthoptic Shooting Spectacle, in non-corrosive metal frame and leather case, **Rs. 22.**

Code word for telegrams, "BARBARIAN."

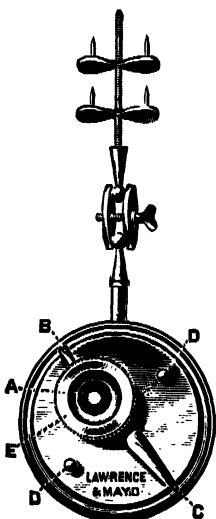
When ordering please mention if the orthoptic will be used for right or left eye.

## The "Dead-Shot" Iris Orthoptic,

Fitted in a single frame, with ball and socket joint and screw attachment for fixing to helmet.

PRICE, **Rs. 15.**

Code word for telegrams, "BASILISK."



**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# Military Regulation Whistles.

AS ADOPTED BY H.M. GOVERNMENT.



Fig. 2.

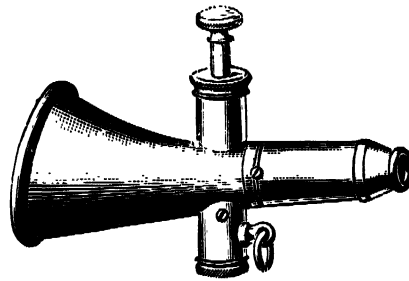


Fig. 1.

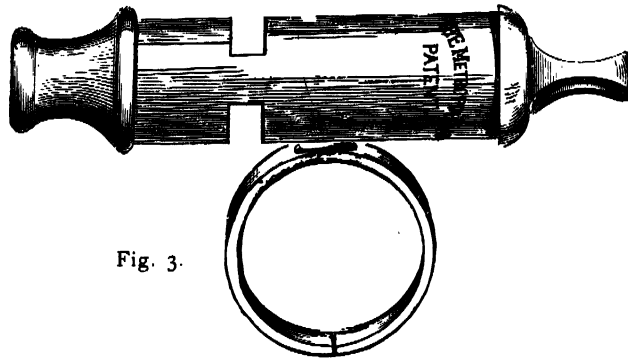


Fig. 3.

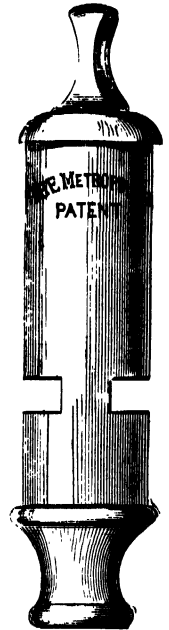


Fig. 6.

Fig.

Code Word  
for Telegrams.

- |   |                               |
|---|-------------------------------|
| 1—Military Signaller's Double Note Reed Horn, length 4½ in., best quality nickel plated       | <b>Rs. 3-8.</b> "PALMISTIC."  |
| 2—The "Thunderer" Regulation Artillery Whistle, best quality German Silver with leather strap | <b>Rs. 1-8.</b> "PANDEMIC."   |
| 3—Cavalry Whistle with thumb ring, best quality German Silver                                 | <b>Rs. 1-4.</b> "PACIFIER."   |
| 4—Flat, Officer's Whistle, best quality German Silver   | <b>Rs. 1.</b> "PAGANIST."     |
| 5—Officer's Whistle with ornamental head, best quality silver plated                          | <b>Rs. 1-12.</b> "PALFREY."   |
| 6—Infantry Officer's Whistle, best quality German Silver with leather strap                   | <b>Rs. 1-8.</b> "PALESTRIAN." |

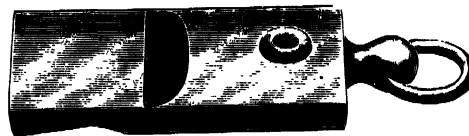


Fig. 4.

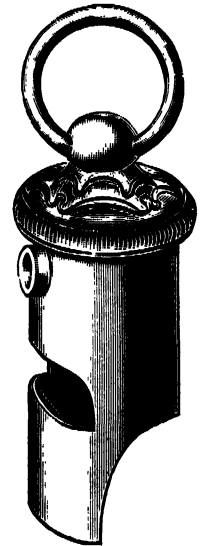


Fig. 5.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## MILITARY &amp; NAVAL REGULATION WHISTLES.

As adopted by H.M. Government.



FIG. 1.

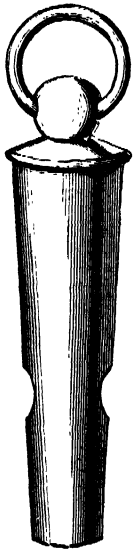
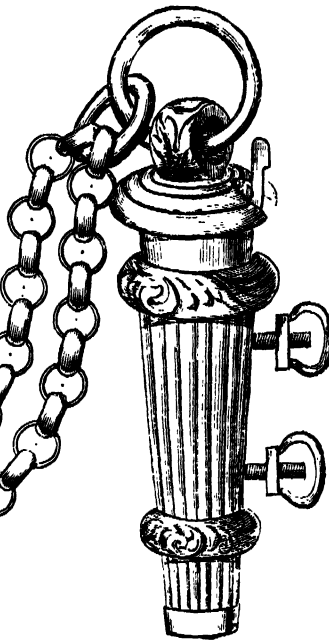


FIG. 2.



FIG. 3.

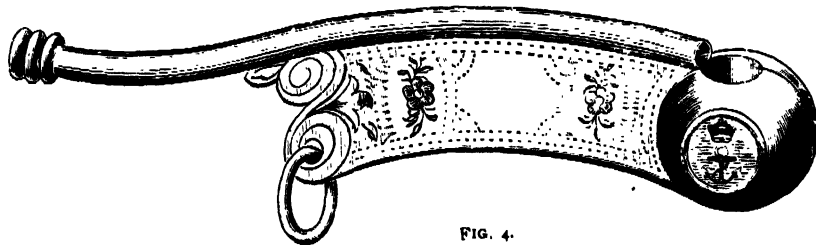


FIG. 4.

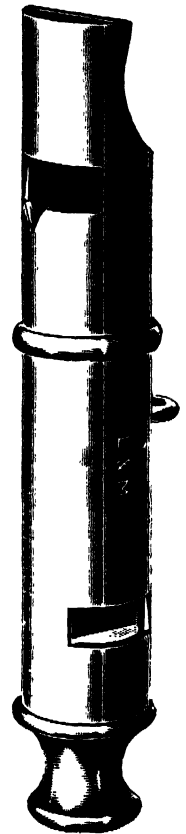


FIG. 5.

- Fig. 1. Volunteer Officer's Regulation Whistle and case complete, with Lion's Head, and 18 in. double chain and fittings (as illustration), silver plated ... .. **Rs. 12**
- Fig. 2. Regulation Pattern Volunteer's Whistle, best quality, German silver, with leather strap 6½ in. long ... .. **Rs. 1-8**
- Fig. 3. The Acme Siren Whistle, or Pocket Naval Fog Horn, best quality, nickel plated ... .. **Rs. 1-8**
- Fig. 4. Boatswain Whistle, best quality, silver plated ... .. **Rs. 3-8**
- Fig. 5. Torpedo Whistle (as used in H.M. Torpedo Service), best quality, German silver ... .. **Rs. 2**

Code words for  
Telegrams.  
"OBLIVION."  
"OBTRUDER."  
"ONTOLOGIST."  
"OPPONENT."  
"OPPRESSOR."

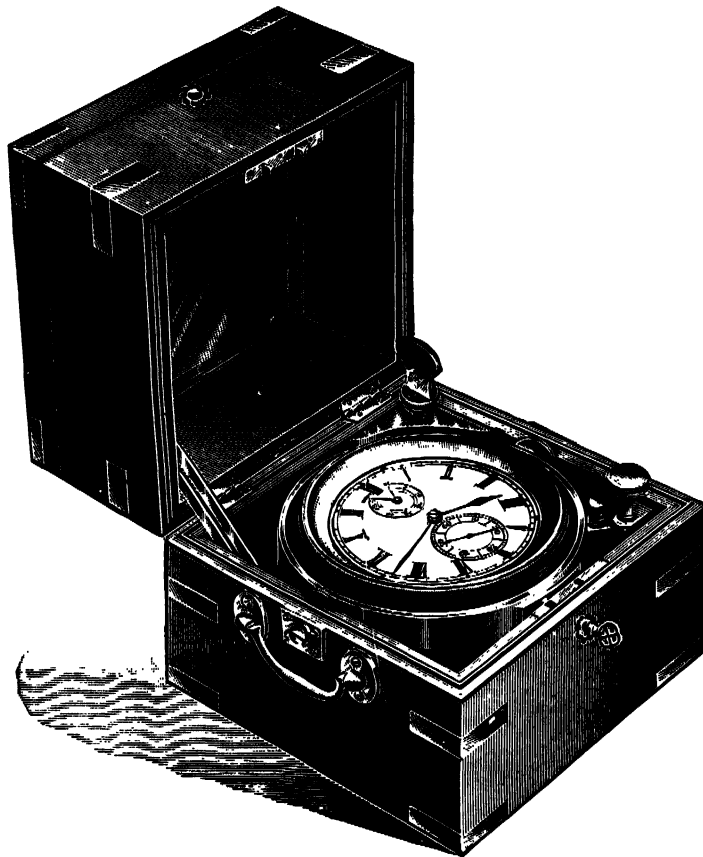
**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

LAWRENCE & MAYO.

## TWO-DAY MARINE CHRONOMETER.

Fitted with Auxiliary Compensation Balance and adjusted for extremes of temperature.

*(Same as supplied to the Admiralty, the Indian Government, the Crown Colonies, and Foreign Governments.)*



The Auxiliary Balance of this Chronometer compensates for extremes of temperature from the most tropical heat to the lowest temperature of the Arctic Regions. The dial is made of brass, most accurately engraved and divided for seconds, minutes, and hours, with indication showing how many hours the chronometer has gone, the divisions being filled in with black, and the dial silvered to make it easily readable. The Chronometer is mounted on gimbals, so that it always remains level at sea, and is fitted in a superior finished mahogany brass bound case, which is enclosed in an outer mahogany case padded and lined, also leather strap for carrying.

**This Chronometer is supplied with a Kew Observatory Certificate, Class A. (the highest award). This is a Government Guarantee that the instrument has successfully passed the severe tests necessary to certify it as being an accurate time measurer.**

**PRICE Rs. 750.**

Code Word for Telegrams—"VEXILLARY."

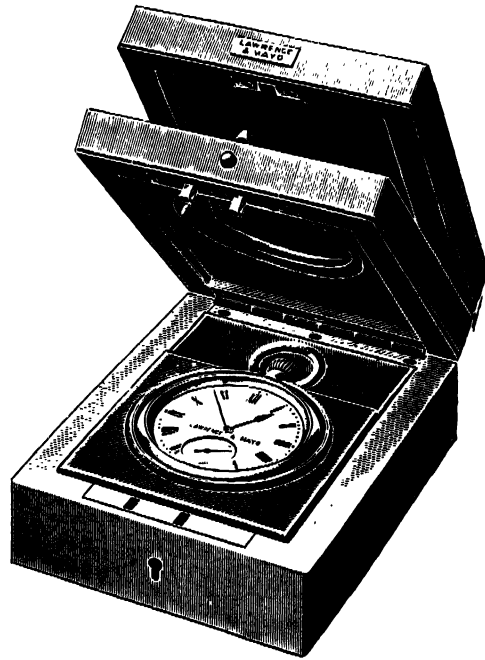
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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# DECK OR EXPLORER'S WATCH.

(As supplied to the Admiralty, Indian Government, and several eminent explorers.)

With Kew Observatory  
Certificate,  
Class "A"  
(Highest Award).



With Kew Observatory  
Certificate,  
Class "A"  
(Highest Award).

**T**HIS Watch has a  $\frac{1}{2}$  plate movement, jewelled with best rubies in 10 holes, the escapement on ruby end stones and balance staff on diamond, chronometer compensation balance, the pendulum spring is overcoil Breguet free spring, and most carefully adjusted for temperature and positions.

The dial is enamelled and most accurately divided for seconds, minutes and hours, and the hands are of steel. The silver case is of special construction, double back with crystal glass; and the keyless button and shaft is of the best and most improved kind.

The watch is undeniably far better for exploring, surveying and general scientific purposes than the full chronometer, and the adjustments and tests both for temperature and positions which it undergoes at the Kew Observatory to secure the highest award (Class A certificate), is a guarantee of its accurate time-keeping qualities.

PRICE, with Mahogany Case ... .. **Rs. 450**

Code Word for telegrams, "TRUNNION."

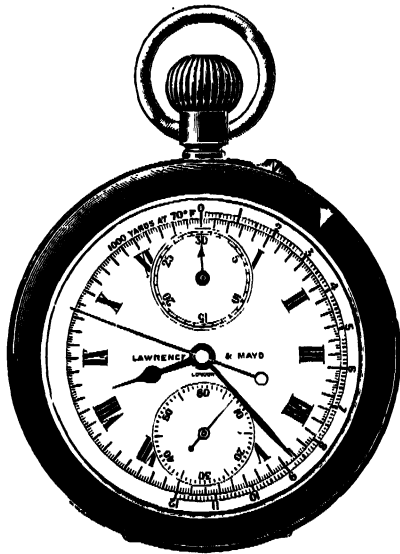
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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON: also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The "Belfry" Military Watch and Chronograph.

With Range-Finder Dial.

For Recording Intervals of Flash and Sound ; Calculating Distances of a Firing Party ; Flag Signalling, and general Military purposes.



The "BELFRY" is a Keyless Lever Watch and Chronograph with 30-minute recorder dial. The dial divided to 5ths of a second and also engraved with degrees for range finding. Marked in yards at 70° Fahrenheit, thick black hands, heavy Roman figures. Start, stop and fly back independent action, acting from the winder. Stout metal case 2 inches diameter and thick crystal glass.

PRICE, **Rs. 85.**

Code Word for Telegrams—"BELFRY."

Best quality leather wristlet to take the above,

PRICE, **Rs. 3-8.**

Code Word for Telegrams—"LEATHER."

Code Word for "Belfry" Watch and Wristlet—"GLADIATOR."

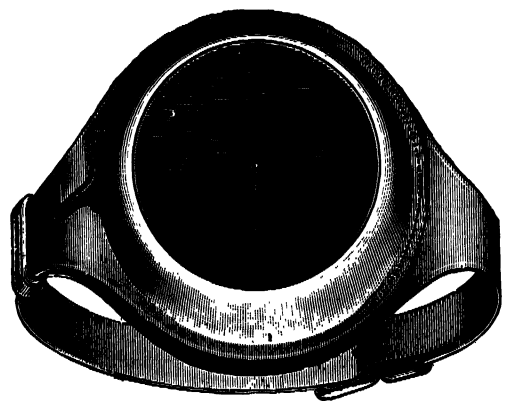
## EXPLANATION.

The Speed of Sound is 1086 feet per second when the temperature of the air is 32° Fahrenheit. This speed is increased by about  $13\frac{1}{2}$  inches for each degree Fahrenheit rise in temperature. For instance, at a temperature of 50° F the speed is 1106 feet, and at 70° F 1129 feet or 376 yards per second.

## INSTRUCTIONS FOR USE.

Each division of the outer circle represents 100 yards' distance when the temperature is 70° F. The red figures give the number of thousand yards' distance. If greater accuracy is required it would be advisable to take into account any variation of the temperature from 70°.

For example, if the hand points to 6 on the red scale and temperature is 90°, we first take reading in the ordinary, *i.e.*, 6000 yards, and then add  $20 \times 13\frac{1}{2}$  inches = 22 feet = 6022 feet.




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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

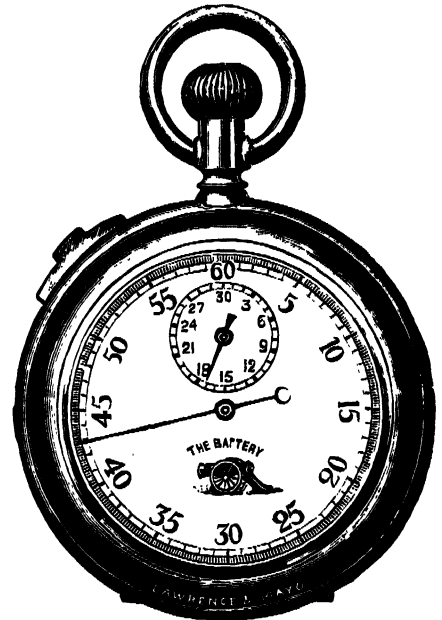
# The "Battery" Military Watch.

As supplied to His Majesty's War Office.

This watch has a Start, Stop, and Continue movement, but the hand can also be brought to zero by the pendant. It is fitted with a recorder to 30 minutes. This watch is of use where the total length of time necessary to carry out any work has to be ascertained, and interruptions, etc., have to be deducted. The watch is wound up by the pendant, but is released and stopped by the sliding catch at the side. The hand can be brought back to zero by the pendant, and kept there by the catch.

PRICE, **Rs. 25.**

Code word for Telegrams—"COCKADE."



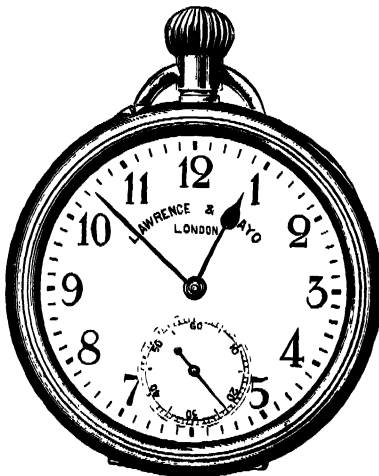
# The "Semaphore" Watch

Is a Keyless Silver Lever, rated in two positions, compensated balance, Ruby jewelled and Ruby Palets, stout air and dust proof case  $1\frac{1}{2}$  inches diameter, hard enamelled dial  $1\frac{1}{2}$  inches diameter, with sunk seconds and bold Arabic figures, stout flat crystal glass.

The "SEMAPHORE" Watch has been specially manufactured to meet the requirements of Military Officers and others seeking an inexpensive time-keeper that can be relied on for accuracy, and to stand rough usage. With reasonable care the "SEMAPHORE" will give a good account of itself for many years. We guarantee its correct performance, and can strongly recommend it to all requiring a reliable Silver Keyless Watch at a moderate price.

PRICE, including a Morocco case, with extra main spring and two spare glasses, **Rs. 45.**

Code word for Telegrams—"MELODY."



FULL SIZE.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



## CHRONOGRAPH

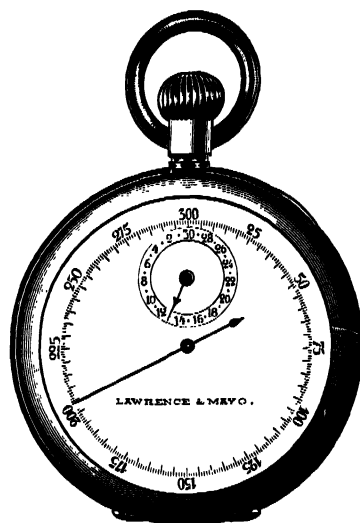
It is always preferable—where the use of a Chronograph is essential—to use only a separate Chronograph Watch, than an ordinary watch fitted with a Chronograph movement. It is impossible, even in the most expensive watches, to get good results as regards time-keeping with a watch serving both purposes. Moreover, both the first cost, and that of all subsequent cleaning and repairs, is less in the case of separate watches.

### Chronograph 30-Minute Recorder.

This watch records minutes and seconds. The dial is divided to fifths of a second. The button is pressed when starting an observation, and pressed again at the end of same. A further pressure brings the two hands back to zero. These Chronographs are useful for medical men and nurses, also for measuring photographic exposures, timing races, speed of trains, etc., etc.

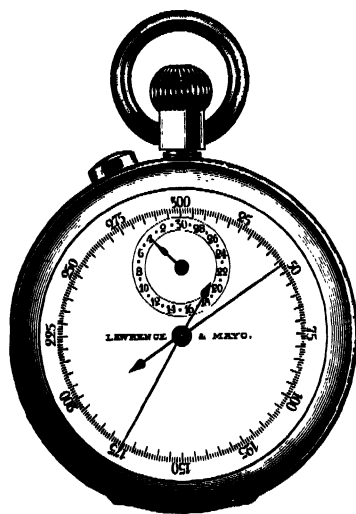
PRICE, in Silver Case, **Rs. 42.**

Code word for Telegrams—"BAYONET."



### Split-Seconds Chronograph.

*For timing races, &c., &c.*



This Chronograph is similar to the 30-Minute Recorder, but has two second hands, one under the other and starting together as one. At the commencement of a race the button should be pressed; this starts both seconds hands. When the first horse arrives press the side push piece, when one hand will stop and remain. When the second horse arrives press the button, which will stop the other hand. To bring both hands back to zero press both pendant and side push-piece.

We can very strongly recommend these Split-Seconds Chronograph Watches. They are much liked by surveyors, and are most suitable for comparing watches or chronometers with time-signals, measuring speeds of trains, motors, races, etc., etc.

PRICE, in Silver Case, **Rs. 75.** Code word for Telegrams—"BLOCKADE."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## The "Comet" Watch and Mileage or Speed Recorder.

*INDISPENSABLE FOR MOTORISTS, CYCLISTS, SPORTSMEN, &c.*

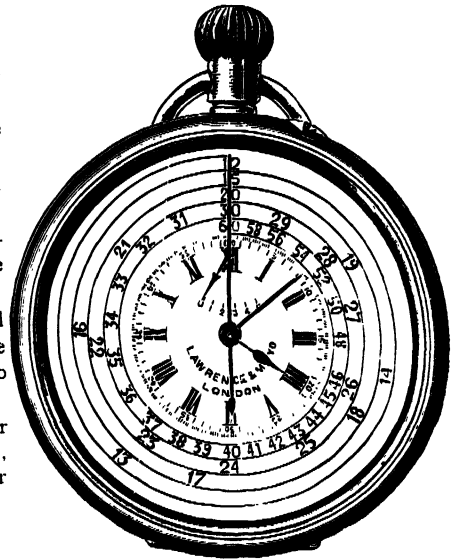
The "COMET" is a Silver Keyless Lever Watch and Chronograph, with compensation balance and speed indicator movement specially constructed to stand the vibration of a motor-car. Dial specially graduated and marked to show the exact rate of speed per hour between the starting and stopping points on a measured distance, mile, kilometre, etc. Taking, for instance, the milestone on an English road, the "Comet" would be used as follows:

When passing a milestone start the Chronograph hand in the usual way—by pressing the button.

At the next milestone press the button again to stop the Chronograph hand. The minute-recording hand will then indicate the circle or division in which to read the speed per hour in miles.

Thus, if it takes, say, 3 minutes to travel the mile, the speed will be 20 miles per hour, indicated on the third circle; or if 1 minute and 30 seconds are taken to cover the distance, the speed will be 40 miles per hour, indicated on the fifth circle, and so on.

The dial plainly indicates any speed between 12 and 60 miles per hour, every mile between these speeds having its position on the dial, the scope of which answers practically every purpose for either Motor-car or Bicycle.

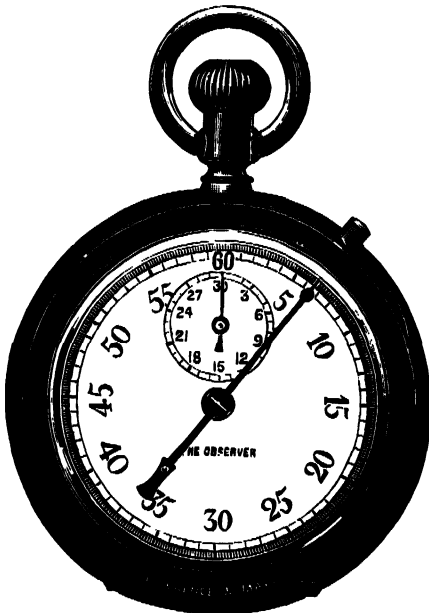


FULL SIZE.

PRICE, **Rs. 120.**

Code word for Telegram—"PARACHUTE."

## The "Observer" Chronograph Watch.



This watch is similar to the ordinary Start, Stop and Flyback pattern, but has the valuable addition of a small pen at the end of the second hand. The Chronograph is started by pressing the pendant and each successive observation can be recorded on the dial by pressing the pushpiece at the side. Each time the latter is pressed a small dot of ink is shown on the dial.

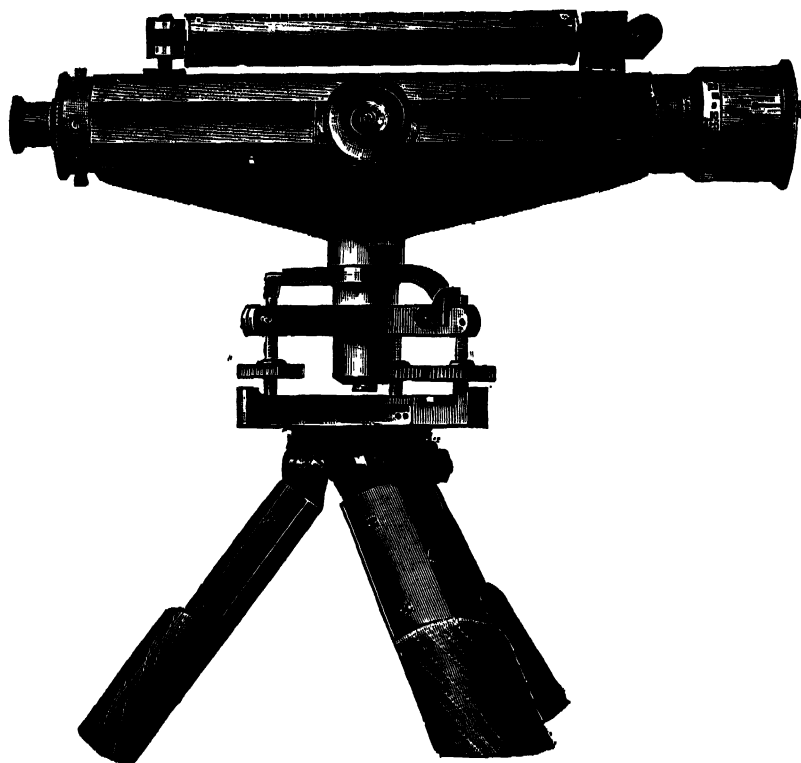
After an observation is complete the ink can be easily removed from the enamelled dial. This watch is specially useful for transit observations, as it is easy to record the exact time the star touched each of the cross wires. For many purposes this watch is more convenient than a split seconds one though less complicated and cheaper in price. A bottle of ink is supplied and a piece of wire for placing ink in the pen of the second-hand.

PRICE, **Rs. 75.**

Code word for Telegram—"CIPHER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## Solid Engineers' and Surveyors' Level.



**This Level** has been carefully designed to meet the requirements of Engineers and Surveyors, etc. The Telescope, Limb and Centre is of one solid gun metal casting, whereby no screws or solder are required in building the instrument, thus giving great stability.

This Level has many advantages over the ordinary Dumpy pattern. The collimation of the Telescope cannot get out of adjustment as there are no parts detachable. The increased length of the Centre enables the instrument to be set up in a much shorter space of time. The Object Glass is achromatic, and worked with great care to secure light and good definition, web diaphragm, three screw locking plates, and clamp and tangent adjustment. The sunshade is divided for reading vertical angles, and the whole Instrument is of the best construction, workmanship and finish. Packed in polished mahogany case, with extra deep power eye-piece. The tripod is of mahogany, round form, with solid wide knuckle head, as above illustration.

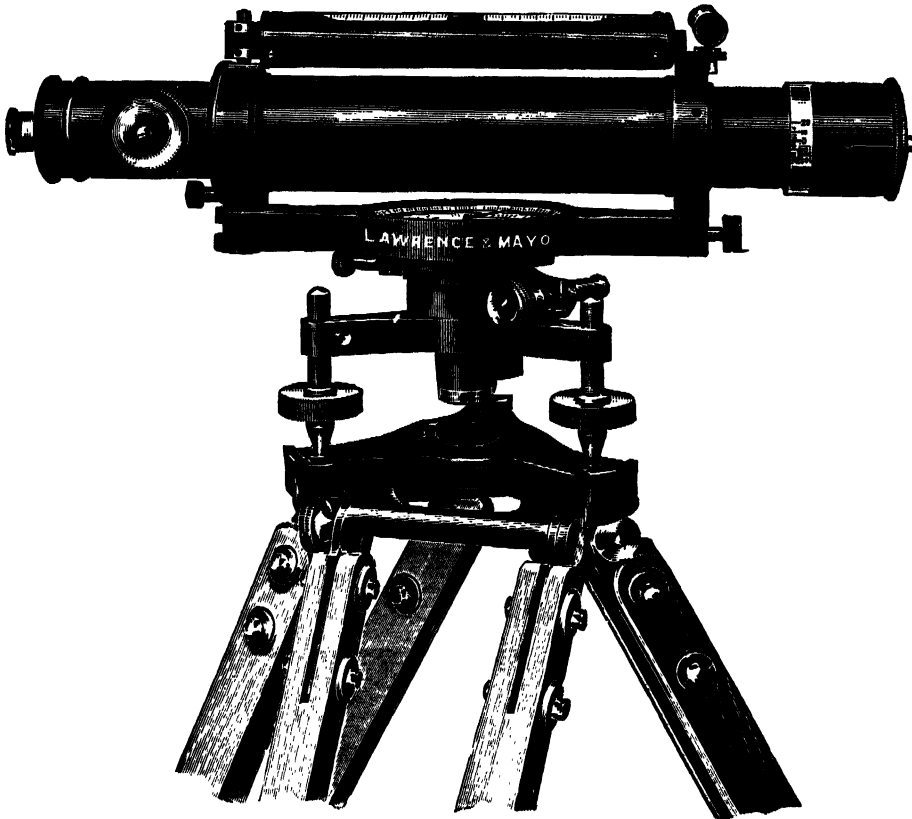
PRICE—12-inch	..	..	<b>Rs. 300.</b>	Code word for Telegrams, "ADJUSTER."
" 14-inch	..	..	<b>Rs. 350.</b>	" " "COLLIMATOR."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# REVERSIBLE LEVEL

(as supplied to the Indian Government).



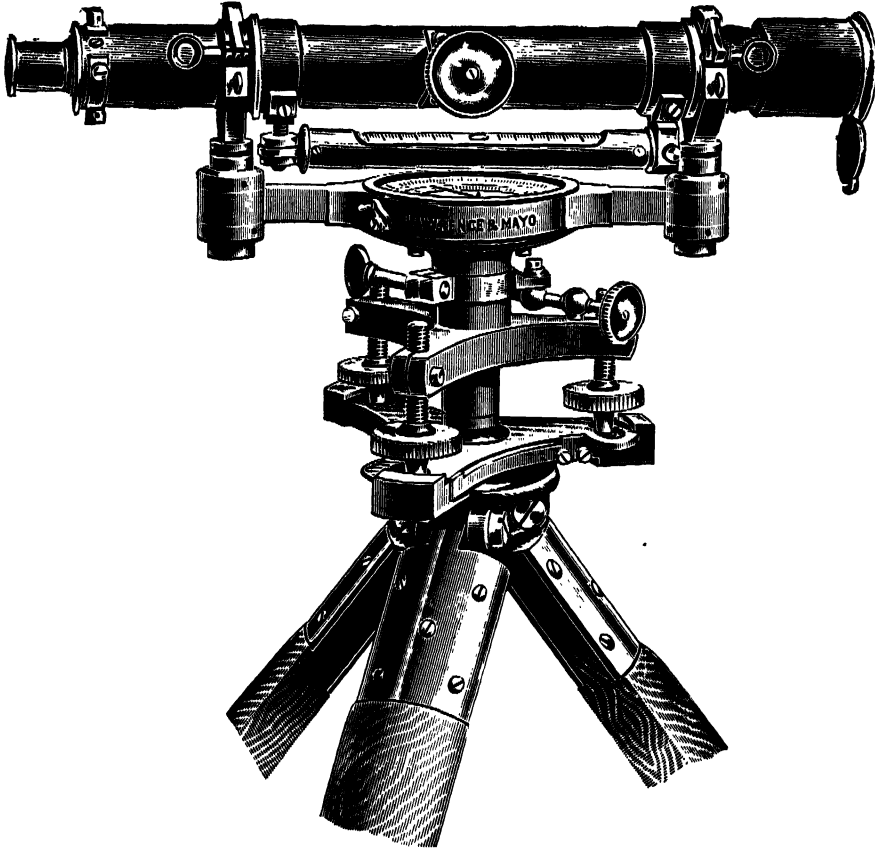
This **Level** is of best construction, first class finish and workmanship, combining the advantages of a Y Level, and retaining the solidity of a Dumpy Level. The telescope tube can be withdrawn and reversed for testing the adjustment, also rotated in its sockets for collimation giving the highest refinements of a Level. The object glass is worked with great care to secure light and good definition, the sun-shade is divided for reading vertical angles. It is fitted with Compass and Aluminium ring, also 3 screw and locking plates, clamp and tangent adjustment, and mahogany open frame tripod as above illustration. Complete in mahogany case with accessories.

PRICE—12-inch	...	...	<b>Rs. 350.</b>	Code word for telegrams—"FLANGE."
" 14-inch	...	...	<b>Rs. 380.</b>	" " "FIXTURE."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## IMPROVED Y LEVELS.



12-inch Y Level, of improved form, 3 screw locking plates, achromatic object glass of high power, and worked with great care to secure light and good definition, web diaphragm, clamp and tangent adjustment to the centre. Silver Dial compass with edge bar needle, packed in polished mahogany case, with capstan pin and round tripod stand, **Rs. 300.**

Code word for Telegrams—"SURVEYOR."

14-inch ditto ditto **Rs. 375.**

Code word for Telegrams—"ENGINEER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## GRAVATT'S OR DUMPY LEVEL.

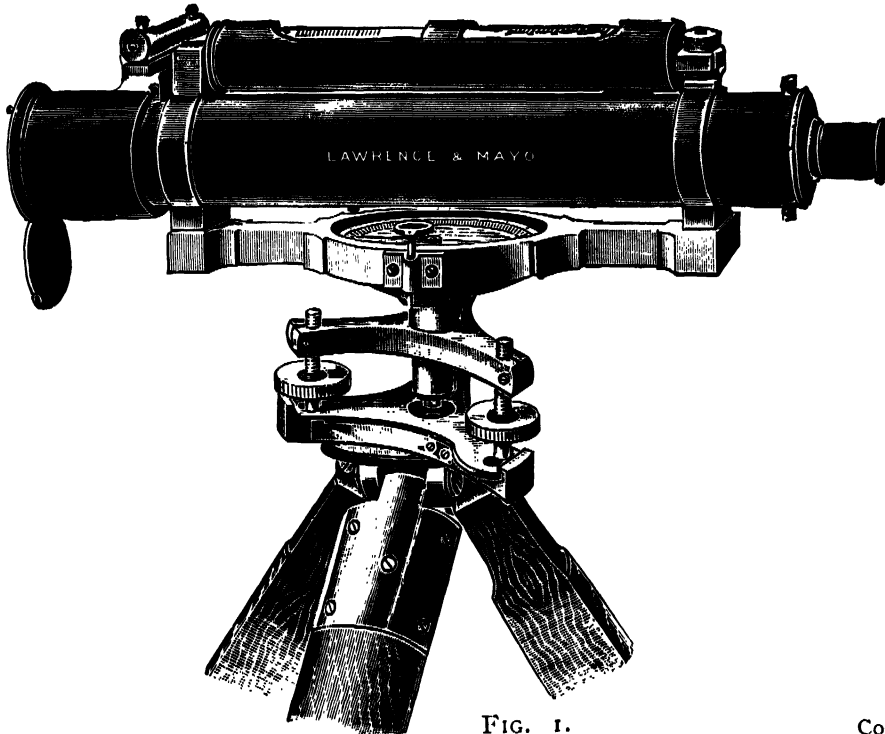


FIG. 1.

Code word for  
Telegrams.

- 1.—8 inch Builders' or Contractors' Dumpy Level, light construction, with compass and 3 screw locking plates, in case ... ..  
 10 inch Dumpy Level, with compass, 3 screw locking plates and tripod, in case ... ..  
 12 inch Dumpy Level, with compass, 3 screw locking plates and tripod, in case ... ..  
 14 inch Dumpy Level, with compass, 3 screw locking plates and tripod, in case ... ..

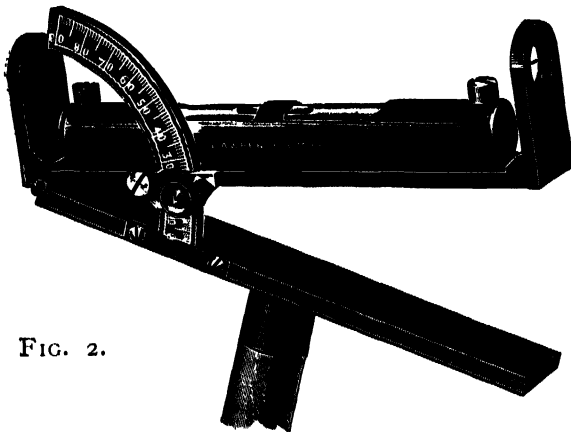
**Rs. 140** "GRAVATT."" **250** "DRILLER."" **285** "NAIL."" **320** "Y. ROMAN."

FIG. 2.

## BUILDERS' LEVEL.

(A very useful instrument for rough work.)

Fig. 2.—Builders' Level, 6 inches, best make with graduated arc and sights and socket for stand, complete in case,

PRICE, **Rs. 35.**

Code Word for Telegrams — "GEOMETER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

LAWRENCE &amp; MAYO.

# Colonel Goulier's Pocket Collimator Level and Inclinometer.

(As used in the French Army.)

FIG. 1.

THIS instrument (which weighs complete in case only 24 ounces), is certainly one of the best direct vision levels. It remains permanently in adjustment. It is extremely easy to carry, and can be set up ready for use very quickly. *On account of its portability and efficiency it should come largely into use for military purposes.*

## DESCRIPTION.

A pendulum supported on knife edge gimbals carries a scale which is optically projected on to the object observed. This scale carries divisions equal to 1 part in 100.

## INSTRUCTIONS.

To release the pendulum rotate the milled head **A** as far as it will go. All that is necessary then is to observe the object through the window; the object seen to coincide with the zero point on the scale is at exactly the same level as the eye of the observer. The scale is clearly divided into 30 divisions, above and below zero. Each division is equal to 1 in 100: for instance, if the object observed is 100 feet distant and it coincides with the 5th division below zero, it is 5 feet below the level of the observer's eye.

Before replacing the level in its case the milled head should be turned so as to close up the instrument; this fixes the pendulum and prevents the possibility of any damage in transit. If the pendulum oscillates too much when making an observation, press the button **B** on top—of course releasing it when taking a reading.

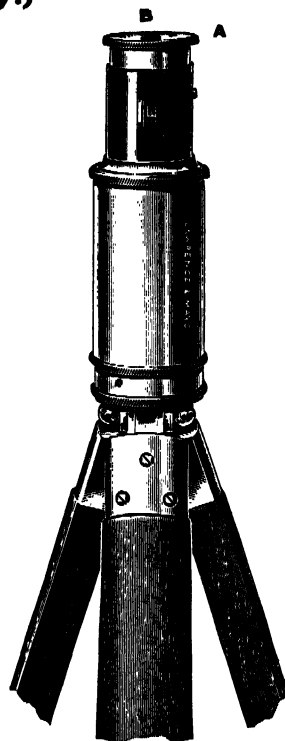
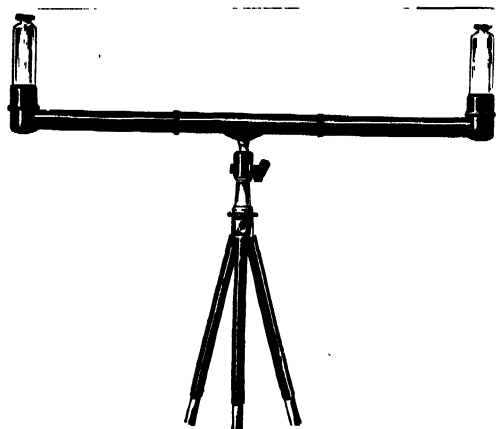


FIG. 1.

PRICE, complete, in solid leather case, with shoulder strap and portable tripod stand,

**Rs. 85.**

Code Word for Telegrams—"GOULIER."



## WATER LEVEL.

FIG. 2—WATER LEVEL.

Japanned tube with brass joints, metal covers to glasses to protect same when not in use. Complete in case, with metal telescopic tripod stand **Rs. 25.** Code Word for Telegrams—"DART."

Extra glasses for above Water Level, each **Rs. 1.**

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## IMPROVED MINER'S DIALS.

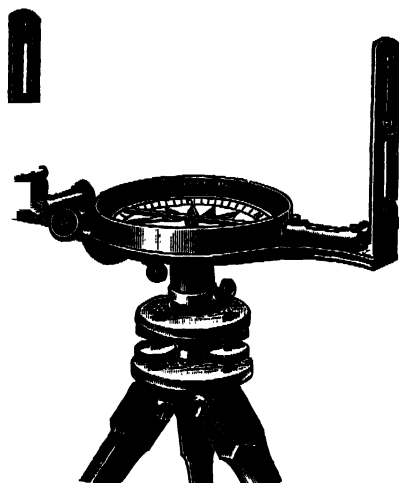


Fig. 1.

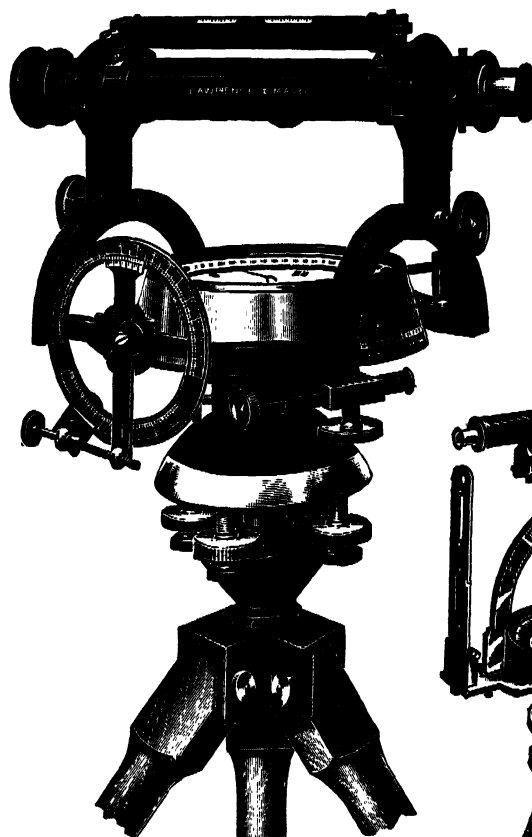


Fig. 3.

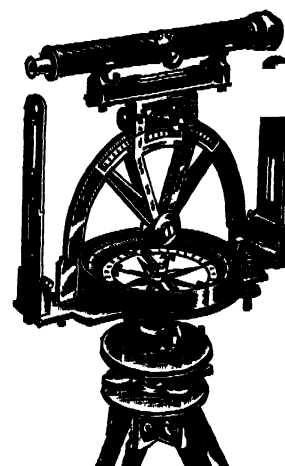
Fig. 2.  
Code Word for  
Telegrams.

Fig.

- 1.—5 inch plain Miner's Dial, Jointed sights, divided on cover for Hypotenuse and Base, with Ball and Socket, in case, jointed legs ... ..  
 1.—5 inch Hedley Dial, rocking Centre, Arc, Parallel Plates, in case, with jointed Legs in case ... ..  
 2.—5 inch Lean's Dial, with Telescope and Rack, Semicircle and Telescope to remove for use with Sights only, in case, jointed legs in case ... ..

Rs. 150 "DIAL."

Rs. 300 "HEDLEY."

Rs. 350 "LEAN."

## IMPROVED HEDLEY'S DIAL.

Fig. 3.

6 inch gun metal improved form of **Hedley's Mining Dial**, with cranked limb and Hoffman's patent combined ball and socket and parallel plates, giving a greater adjustment and enabling the instrument to be set up in a much shorter space of time, the increased bearing surface ensures perfect steadiness.

The compass box is fitted with two rectangular bubbles and its needle measures  $4\frac{1}{2}$  inches. The Telescope is fitted in Y's with subtense points for reading distances 1 in 100 removeable for sights.

The Limb or Circle under the compass box is divided to  $360^\circ$  as a Theodolite reading by vernier enabling the horizontal angles to be readily ascertained, while the bearings being taken both by the compass needle and the vernier, so that inaccurate reading is rendered almost impossible, the one checking the other.

The Vertical Arc is divided to 30 minutes and reading by vernier to 1 minute with clamp and tangent adjustment. The whole Instrument is of the most improved construction, fitted with the highest refinements of a Mining Instrument, clamp and tangent adjustments to all motions.

The tripod on which the dial is supported is made of mahogany with a brass screw joint with steel point at the centre of each leg, for use at half-lengths for working in shallow seams.

Complete, in mahogany case, with pine case for jointed leg tripod stand.

PRICE, **Rs. 500.**

Code Word for Telegrams—"ROCKING."



# Theodolites and Transit Theodolites.

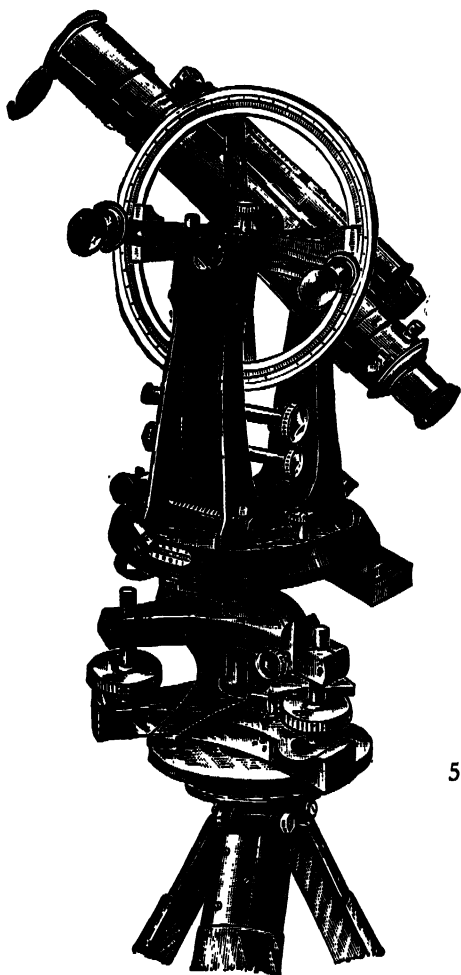


FIG. 1.

5 inch Best Y Theodolite,  
with 3 screw locking  
plates, in mahogany case  
and tripod stand complete

FIG. 1. 5 inch Improved  
Transit Theodolite, with  
3 screw locking plates  
and centering or travers-  
ing head, with standards  
of one solid metal casting,

divided on silver, reading to 20 seconds, covered limb for protection of horizontal circle dividing, spring box tangent adjustments, metal trough compass, telescope of high power, hinged microscopes to read horizontal circle verniers, in polished mahogany case, erecting and inverting eye-pieces, dark head, plumb bob, and usual adjusting tools, round mahogany tripod with solid head, highest class workmanship throughout ... ..

Diagonal eye-piece for Transit Theodolite, extra ... ..

FIG. 2. Simple 4 inch Theodolite, suitable for architects and contractors, for small surveys, setting out work, etc., divided on gun metal, reading by vernier to 3 minutes of arc, with 2 centres and clamp, and tangent adjustments, 3 screw locking plate, locking pin for telescope for use as a level. Complete in case with tripod stand ... ..

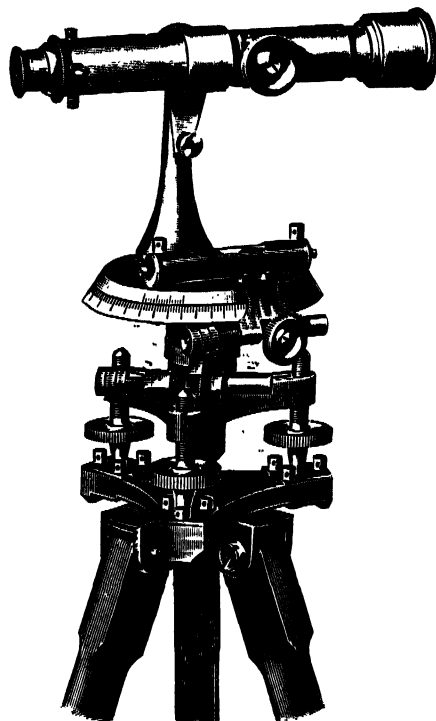


FIG. 2.

Code Word for  
Telegrams.

**Rs. 575** "LIGHTER."

**Rs. 600** "TRIAL."

**Rs. 20** "DIAGONAL."

**Rs. 250** "OCTENNIAL."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# Cross Staves & Semi-Circumferenters

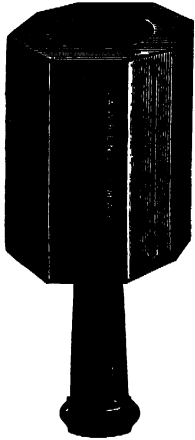


Fig. 1

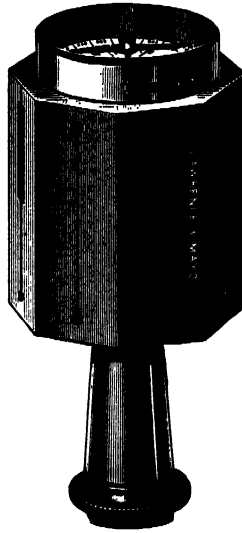


Fig. 2

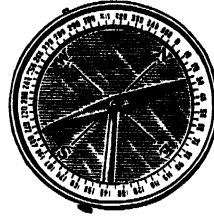


Fig. 3

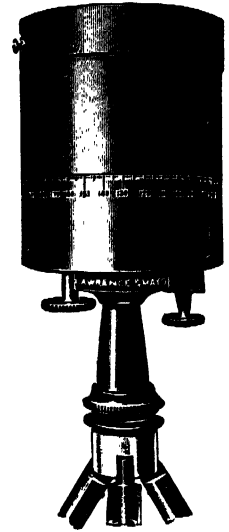


Fig. 4

**THE CROSS STAFF** is an instrument used for setting out lines at right angles to other lines, and although primitive in form, is exceedingly useful for many purposes, *i.e.*, for laying out bye-roads or paths from a base line or road; for planting trees or shrubs in correct lines from a base; for setting out lines for tents at an encampment, and any similar work where right angle lines are required correct.

They are made octagonal and round in form, but the former shape is most used, and least expensive. They are made with a metal socket, into which a staff is to be fixed tightly. To use it, thrust the staff into the ground at the end, or any point upon a given base line, and turn the cross-staff until the sight directed through two of its opposite sight-holes is in alignment with the base; if a sight is now taken through the two sight-holes at right angles to the base, an object may be seen and marked, or a stake driven in by an assistant, who would be directed by the observer, until in right position, when the right angle to base is set off.

Fig. 1—Cross Staff Head, with staff socket,  $2\frac{1}{2}$  in. long,  $2\frac{1}{2}$  in. diameter **Rs. 7** "STAFF."  
 Do. do.  $2\frac{3}{4}$  do.  $2\frac{3}{4}$  do. **Rs. 8** "STICK."  
 Do. do. 3 do.  $2\frac{3}{4}$  do. **Rs. 9** "CANE."

Fig. 2—Cross Staff Head, with best bar needle compass and staff socket ... ..  $2\frac{1}{2}$  in. long,  $2\frac{1}{2}$  in. diameter **Rs. 10** "NAVY."  
 Do., do. ... ..  $2\frac{3}{4}$  do.  $2\frac{3}{4}$  do. **Rs. 12** "NEGUS."  
 Do., do. ... .. 3 do.  $2\frac{3}{4}$  do. **Rs. 14** "NEST."

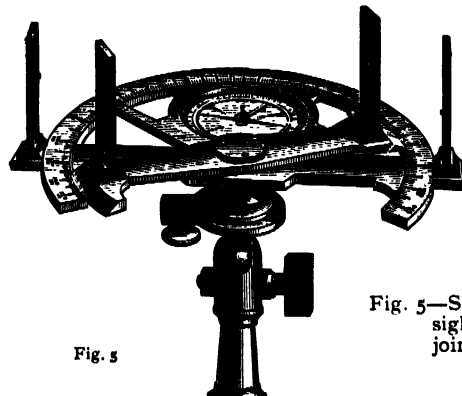
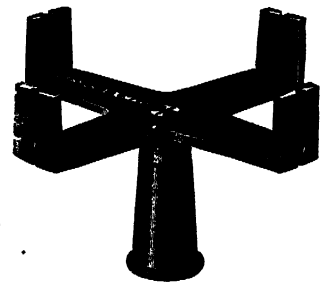


Fig. 5

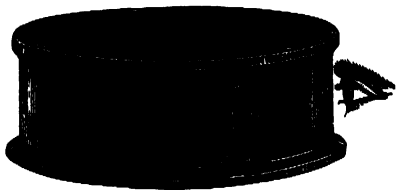
Fig. 3—Cross Staff Head,  $3\frac{1}{2} \times 3$  in., divided to  $360^\circ$  in the centre, with sights in upper and lower half, rack work adjustment and clamping screws, best bar needle compass fitted on top. Complete, with tripod stand... .. **Rs. 55** "ANGLE."

Fig. 4—4 in. Bronze Cross Staff Head in case **Rs. 7-8** "HEAD."

Fig. 5—Semi-Circumferenter, diameter  $8\frac{1}{2}$  in., fitted with sights and best bar needle compass, ball and socket joint and clamping screw, in case, with stand **Rs. 75** "MONUMENT."

Code word for  
Telegrams

# Optical Squares, Plummets, Ghat or Road Tracers, and Lamps for Miners' Dials.



THE OPTICAL SQUARE. Fig. 1.

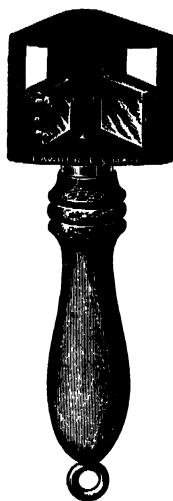
THIS instrument, 2 inches in diameter, is exceedingly useful as well as portable, and can with facility and rapidity be used to set off a perpendicular from a given point on a base line. It is constructed with two mirrors, fixed with their faces at  $45^\circ$  to each other, so that the reflected image is seen correctly at  $90^\circ$ . To set off a perpendicular, the observer should stand at the end, or at any point upon a given line or base, holding the instrument in the hand and sighting through the sight-hole in the case. The mirror directly in line with the sight-hole is only silvered the half of its height, so that the eye can traverse right across to any object, or stake, upon the base line. An assistant who walks out with a rod is directed by the observer, keeping the reflection of the rod in the mirror in coincidence with the object on the line seen through the unsilvered part of the mirror then the perpendicular is attained.

Price, complete, in leather case, **Rs. 16.**

Code word—"OPTICAL."

Optical square as above, but with the addition of a screw for adjusting the mirror **Rs. 20.**

Code word for Telegrams—"OBELISK."



OPTICAL SQUARE

Fig. 2.

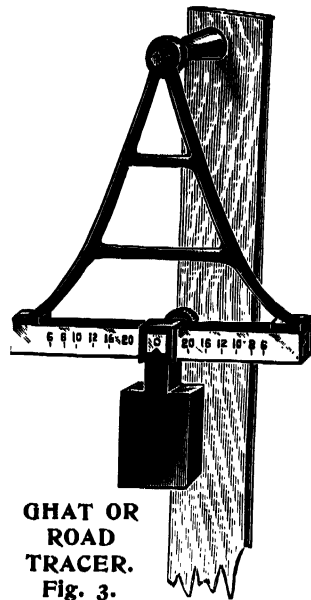
Survey of India pattern, in leather case.

PRICE, **Rs. 8.**

Code word for

Telegrams -

"PARAGON."



GHAT OR ROAD TRACER.

Fig. 3.

A simple form of Clinometer for the Tracing of Roads, divided to gradients and inclines, 1 in. 20, 15, 10, 8, 6. **Rs. 50.**

Code word for Telegrams - "ROADSTER."



Fig. 4.

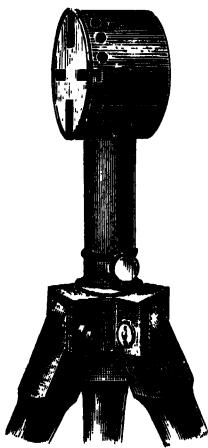


Fig. 5.



Fig. 6.



Fig. 7.



Fig. 4.—LAMP PLUMMET

" 5.—LAMP TARGET or SIGHTING LAMP, for use with Miners' Dial, with strong jointed tripod stand

" 6.—PORTABLE BRASS PLUMMET, to reverse and turn inwards, with loose parallel piece to use

as plumb rule, 1 inch diameter, in case

" 7.—BRASS PLUMMET, with screw cap and steel point, weight 6 ounces, in wood case

Do. do. do. weight 8 " " " "

Do. do. do. weight 11 " " " "

Do. do. do. weight 16 " " " "

" 8.—PLUMMET in bronze, nickel plated, with slide for adjusting height, weight 6 ounces, in case

This model has been adopted by the French Government.

Telegrams.  
" PLUMMET."  
" PARSESIAN."

Rs. 25.  
Rs. 50.  
Rs. 6-8.  
Rs. 3.  
Rs. 3-8.  
Rs. 4.  
Rs. 4-8.  
Rs. 6.

" PAROTIA."  
" PICADAR."  
" PICARDIST."  
" PICARIAN."  
" PARNASIAN."  
" TASMANIAN."

## ROAD PERAMBULATOR or VIAMETER.

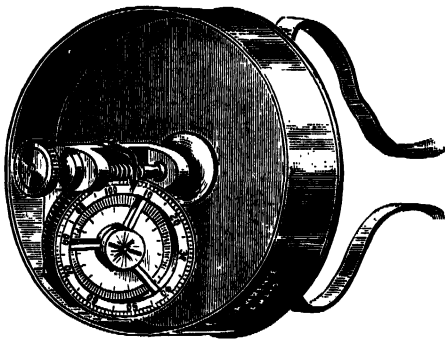
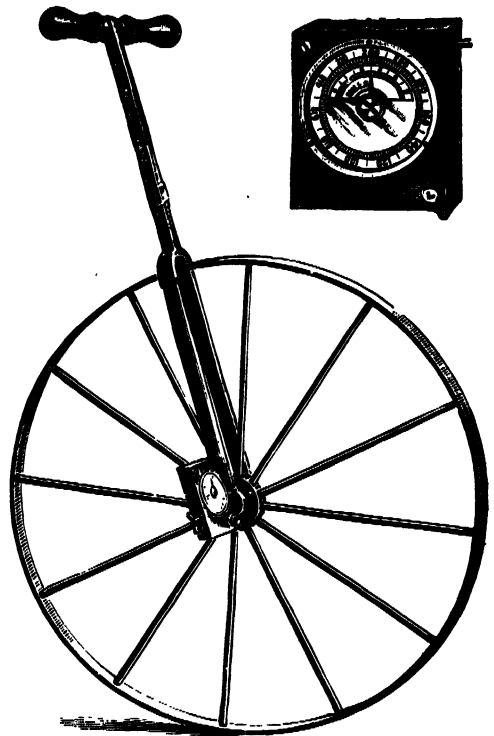
An instrument for accurately measuring the length of roads, tracks of country, etc., etc.

It consists of an accurate iron wheel, connected from its axis to two divided wheels, encased in a brass box, dustproof, which registers yards, furlongs and miles, from 1 yard to nearly 14 miles without re-setting. This instrument is specially recommended for its durability, simplicity, and cheapness, being about one-third the price of the old perambulator which it supersedes.

One of the features of this instrument is the ease and rapidity in which the dials can be set back to zero at the commencement of a journey, or where subsidiary measurements have to be made.

PRICE ... **Rs. 115.**

Code word for Telegrams—"VIAMETER."



## TROCHEAMETER.

**An Instrument for Registering the Revolutions  
of a carriage wheel, and thereby determining  
the distance travelled.**

Applicable also for counting with certainty the rotations of machinery, however high the velocity.

The instrument is composed of two revolving toothed wheels, the upper wheel having 101, and the lower 100 teeth; also an endless screw and two indices, the upper index pointing out every single, and the lower every 100 revolutions.

The whole circuit of the Instrument is 10,100 revolutions, which, with a carriage wheel of 12 feet circumference, would indicate 23 miles, *minus* 80 yards. **EXAMPLE**—55 Revolutions give 220 yards, or 1 Furlong; 110 Revolutions give 440 yards, or 1 mile; 440 Revolutions give 1,760 yards, or 1 mile; 7,040 Revolutions give 16 miles; 10,100 Revolutions give 23 miles, less 80 yards.

To set the instrument, unscrew the milled nut from off the steel endless screw, and move the wheels round, until both indices coincide; screw the nut firmly in its place, shut up the instrument and strap it securely to the off wheel, in the centre of the nave.

PRICE, **Rs. 38.**

Code word for Telegrams—"INDICATOR."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# SPIRIT LEVELS.

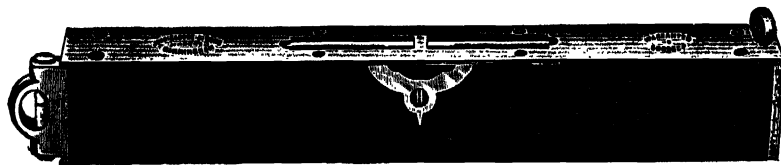


FIG. 1.

FIG. 1.—12 in. brass mounted Plumb and Level, with field sight and graduated screw slide to show fall per foot.

**Rs. 7-8.**

Code word for Telegrams,  
"DANDELION."

FIG. 2.—Superior 12 inch iron Level, with screw adjustment and scale for showing fall per yard. Especially suitable for drainage and water works.

**Rs. 7-8.**

Code word for Telegrams, "DEACON."



FIG. 2.



FIG. 3.

## Brass Levels and Level Tubes.

Fig. 3.—Superior quality Brass Levels, each **Rs. 1·8** **Rs. 2·8** **Rs. 3·8** **Rs. 4·8** **Rs. 5·8**  
 Code word for Telegrams, "HUB." "HEMP." "HERB." "HIDE." "HOST."

Fig. 3a.—Brass Pocket Level, 2½-in., in round Boxwood

Case, with pull-off top, **Rs. 1·4.**

Code word for Telegrams, "DIALATIC."



## BEST PROOF LEVEL TUBES.



FIG. 4.—

Best quality Ground Level Tubes, each—**Rs. 0·8·0** **Rs. 0·12·0** **Rs. 1·0·0** **Rs. 1·8·0**  
 Code word for Telegrams, "HOOP." "HORN." "HUN." "HUSK."



FIG. 5.

**BEST QUALITY GROUND AND DIVIDED  
BUBBLES FOR THEODOLITES, DUMPY  
LEVELS, &c.**

FIG. 5.—To fit on Telescopes of the following size Dumpy Levels—

10-in. **Rs. 5.** 12-in. **Rs. 6.** 14-in. **Rs. 8.** 16-in. **Rs. 9.** 18-in. **Rs. 10.**  
 Code word for Telegrams, "LEGATE." "LEMON." "LENTIL." "LICTOR." "LILAC."

To fit on Telescopes of the following sizes of Theodolites—

4-in. **Rs. 5.** 5-in. **Rs. 6.** 6-in. **Rs. 7.**  
 Code word for Telegrams, "LIMPET." "LISBON." "LIZARD."

**CROSS AND PLATE LEVELS FOR THEODOLITES, DUMPY LEVELS, &c.,  
SUPPLIED TO ORDER.**

**LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The PORTABLE CURRENT METER.

THIS Instrument is constructed and used for the measurement of **Rate** or **Flow** of small Rivers and Streams, also for the flow of **Tides**.

For this purpose, the meter should be placed in the stream, as per directions supplied, and allowed to run for a given time. The rate of the stream per unit time is then shown by reference to the graduations of the circles which are actuated by the force of the water upon the Fan-screw. The value of the graduations is as follows:—

- 1.—The inner circle, graduated to show **8 miles** in a revolution.
- 2.—Each mile, subdivided into eight parts, showing **furlongs**.
- 3.—Each furlong graduation, subdivided into three parts, equal to 220 feet each.
- 4.—The outer circle graduated to show **single feet**, and a complete revolution 220 feet.

The circles **B** are attached to a moveable arm, which throws the endless screw in or out of gear. This arm can be raised by turning the screw which passes through the coil spring **E**, which would **fix** the gearing for constant use. It can also be raised by pulling the cord **D** after the meter is submerged in the stream at the instant of a given time, and also released at the expiration of the given time.

The meter can also be used for determining the **quantity** of water flowing from a reservoir or tank.

For this purpose, it is necessary to know accurately the area of the channel or tube through which the water is passing, and the meter to be placed within it. Then the volume of water passing per minute is shown in cubical feet by multiplying or dividing (according to area of tube) the area of the tube by the rate per minute as shown by the meter.

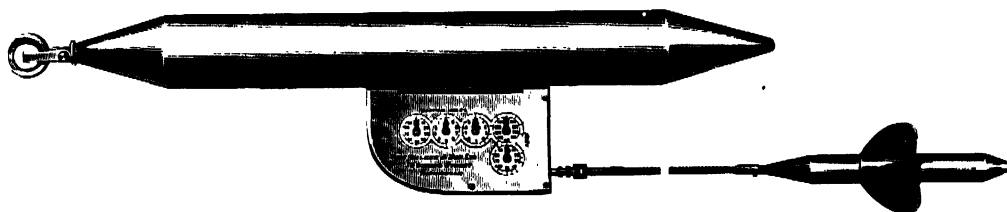
## DIRECTIONS FOR USE.

The meter should be fixed upon a long staff **A** and clamped with the screw at such distance from the bottom end of staff to allow it to be pressed into the bed of the stream, when the meter should be placed about 6 inches below the surface of the water. The **flat vane F** should be attached, which will keep the meter in the proper position with its fan screw **C** facing the current. When the graduated circles are out of gearing, they can be turned by the hand until both **Indices** correspond with their respective Zeros of graduations.

It is essential to keep the meter cleaned well after use, and to be oiled at time of using. The best oil is provided in the case with the instrument. These instruments can also be graduated in Metres and Kilometres.

PRICE, complete in Mahogany Case, **Rs. 115.** Code Word for Telegrams—"MANDARIN."

# WALKER'S CURRENT METER.



This instrument is for measuring the speeds of tides or currents, and the flow of rivers and streams. It can also be used in lake surveys. It consists of a cigar-shaped brass float and registering wheelwork, with a very light rotator attached, which will revolve in the slowest currents. The registration is shown on five dials, the three to the left giving the current in nautical miles and parts thereof, the remaining two showing the current in feet.

Price, complete in Mahogany Case, **Rs. 110.** Code Word for Telegrams—"CALIOPTIC."

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON**

# MICROMETER GAUGES.

Fig. A.—Pocket Micrometer Gauge, German Silver, measuring all sizes less than 20 millimeters, by hundredths of a millimeter.

PRICE, including Leather Pocket Case, **Rs. 12.**

Code word for Telegrams—"ERMINITE."

Pocket Micrometer Gauge, measuring all sizes less than 40 millimeters, by hundredths of a millimeter. **Rs. 18.**

Code word for Telegrams—"ERMISTINE."

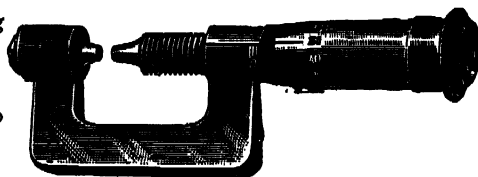


FIG. A

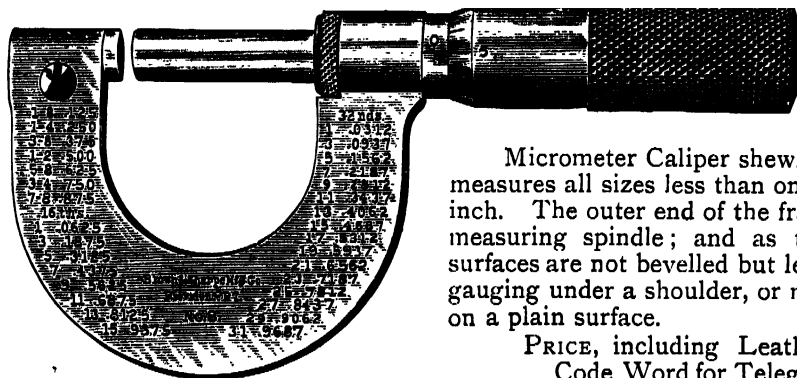


FIG. 1.

Micrometer Caliper shewn full size in illustration, and measures all sizes less than one inch by thousandths of an inch. The outer end of the frame is the same size as the measuring spindle; and as the edges of the measuring surfaces are not bevelled but left square, it is convenient for gauging under a shoulder, or measuring a small projection on a plain surface.

PRICE, including Leather Case, **Rs. 27.**

Code Word for Telegrams—"LAGGARD."

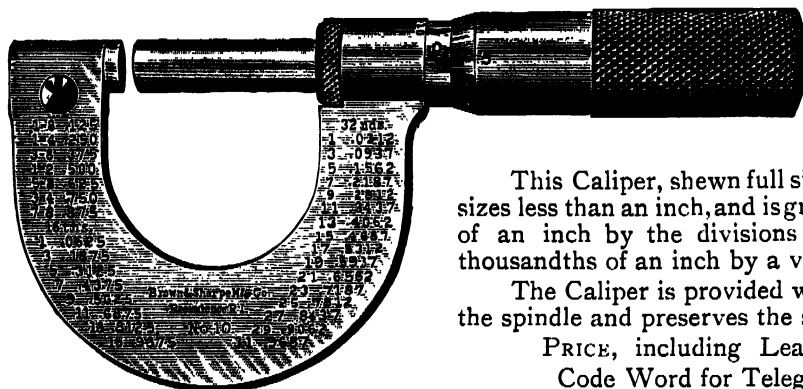


FIG. 2.

This Caliper, shewn full size in illustration, measures all sizes less than an inch, and is graduated to read to thousandths of an inch by the divisions shown on thimble, and ten thousandths of an inch by a vernier on the front of barrel.

The Caliper is provided with a clamp nut which clamps the spindle and preserves the setting.

PRICE, including Leather Case, **Rs. 35.**

Code Word for Telegrams—"LAMELLAR."

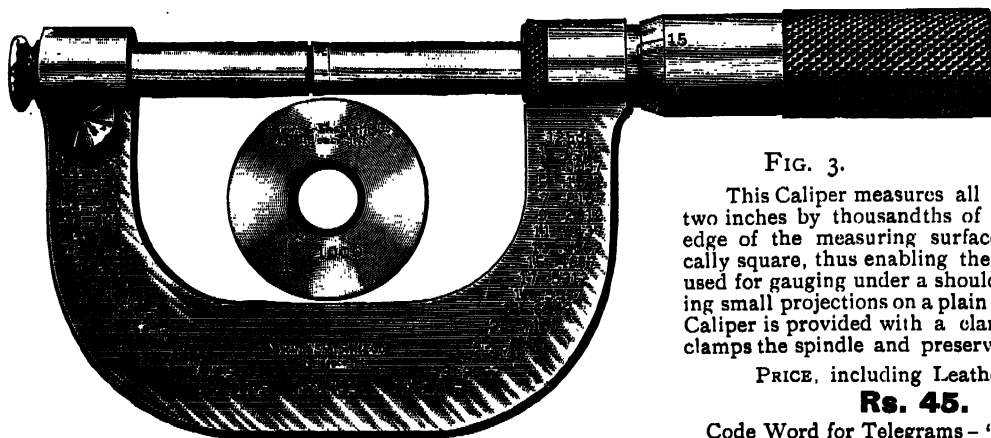


FIG. 3.

This Caliper measures all sizes less than two inches by thousandths of an inch. The edge of the measuring surface is left practically square, thus enabling the Caliper to be used for gauging under a shoulder, or measuring small projections on a plain surface. Each Caliper is provided with a clamp nut, which clamps the spindle and preserves the setting.

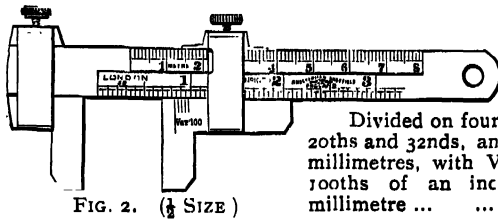
PRICE, including Leather Case,

**Rs. 45.**

Code Word for Telegrams—"LAMPOON."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## Chesterman's Steel Caliper Gauges, &c.

FIG. 2. ( $\frac{1}{2}$  SIZE)

Divided on four edges, inches into 20ths and 32nds, and centimetres into millimetres, with Verniers reading to 100ths of an inch and 10ths of a millimetre ... ..

INCHES.				
3	6	9	12	18
Rs. 10	Rs. 13	Rs. 17	Rs. 20	Rs. 27

Code words for Telegrams—"KILN" "KNOB" "KINGDOM" "LARK" "LEAF"

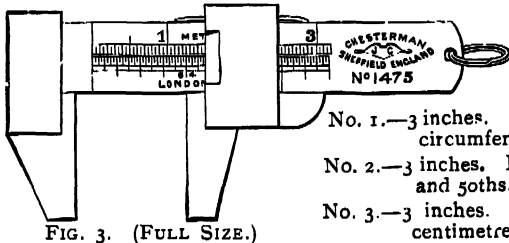


FIG. 3. (FULL SIZE.)

FIG. 3. This is a handy little Gauge for use in light work. Very small and portable. A split ring is provided for attaching to the watch chain.

- No. 1.—3 inches. Divided on one side inches into 32nds and circumference measure into 16ths ... .. **Rs. 4** Code Word "INSTEP."  
 No. 2.—3 inches. Divided on one side inches in 64ths and 50ths... .. **Rs. 4** "INSULAR."  
 No. 3.—3 inches. Divided on one side inches into 64ths and centimetres into millimetres and halves ... **Rs. 4** "INVADER."

## Steel Depth Gauge for Engineers.

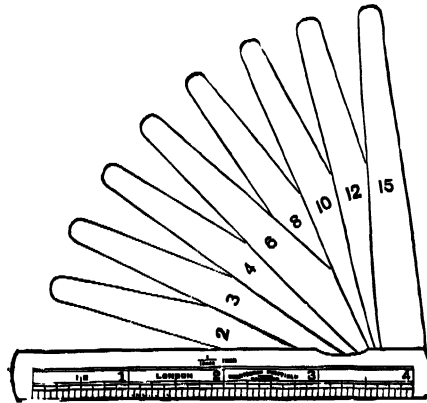
FIG. 4.—Made of best Hardened and Tempered Steel, and is used for Measuring Depths of Holes, Recesses, &c.  
 3 inches  $\times$   $\frac{1}{4}$  inch, in Leather Case.

FIG. 4. ( $\frac{1}{2}$  SIZE.)

The slide for measuring the depth is marked to read by verniers to inches and 100ths and to millimetres and 10ths.

The other side is for use as a rule, and is marked into inches and 64ths and millimetres and halves.

PRICE, **Rs. 5.** Code word for Telegrams—"LAMPREY."

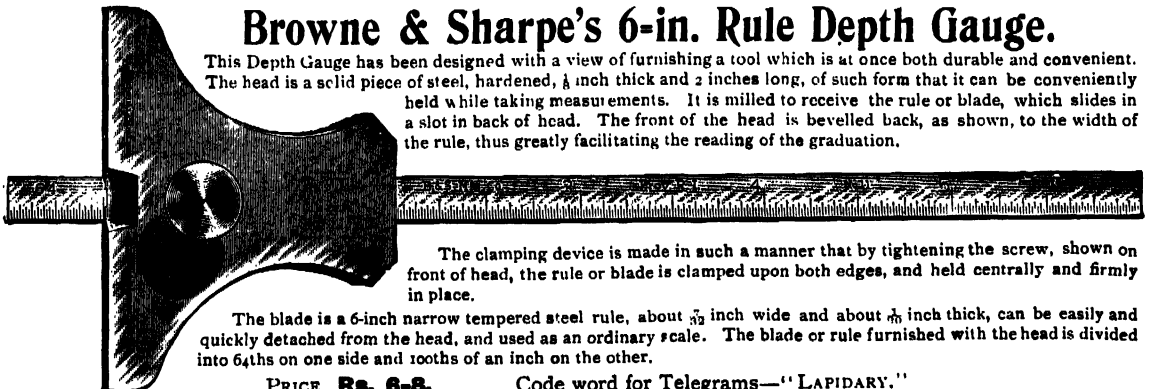
FIG. 5. ( $\frac{1}{2}$  SIZE).

## Chesterman's Steel Feeler (or Thickness) Gauge for Engineers, &c., &c.

FIG. 5.—Consists of eight hardened and tempered steel blades, ranging from .002 to .015 of an inch. The blades are 4-in. long and tapering in width. The case is marked for use as a rule, and is divided inches into 16ths on one side and centimetres into millimetres on the other side. **Rs. 3-8.** Code word for Telegrams—"FABRICANT."

## Browne & Sharpe's 6-in. Rule Depth Gauge.

This Depth Gauge has been designed with a view of furnishing a tool which is at once both durable and convenient. The head is a solid piece of steel, hardened,  $\frac{1}{8}$  inch thick and 2 inches long, of such form that it can be conveniently held while taking measurements. It is milled to receive the rule or blade, which slides in a slot in back of head. The front of the head is bevelled back, as shown, to the width of the rule, thus greatly facilitating the reading of the graduation.



The clamping device is made in such a manner that by tightening the screw, shown on front of head, the rule or blade is clamped upon both edges, and held centrally and firmly in place.

The blade is a 6-inch narrow tempered steel rule, about  $\frac{1}{32}$  inch wide and about  $\frac{1}{16}$  inch thick, can be easily and quickly detached from the head, and used as an ordinary scale. The blade or rule furnished with the head is divided into 64ths on one side and 10ths of an inch on the other.

PRICE, **Rs. 6-8.**

Code word for Telegrams—"LAPIDARY."



## SLIDE CALIPER RULES.

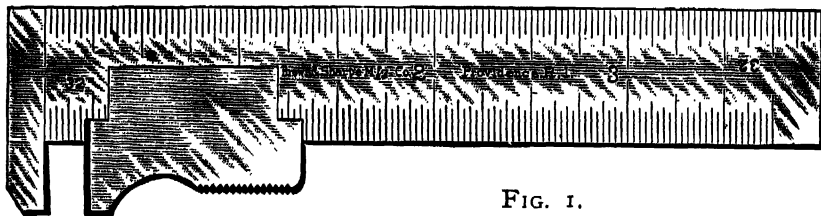


FIG. 1.

FIG. 1.—This Rule will be found especially convenient for use in the stock room or store, in selecting small rods, tubing, &c. It is made of steel, nicely finished, about  $4\frac{3}{16}$  inches long by  $\frac{1}{16}$  inch thick, and graduated on both corners to thirty-seconds of an inch.

The slide is held in place by a tongue or groove, and is of such form that it can be quickly adjusted by the thumb without removing the Rule from the hand.

The jaws are  $\frac{3}{8}$  inch deep.

PRICE, **Rs. 6.**

Code Word for Telegrams—"KANGAROO."

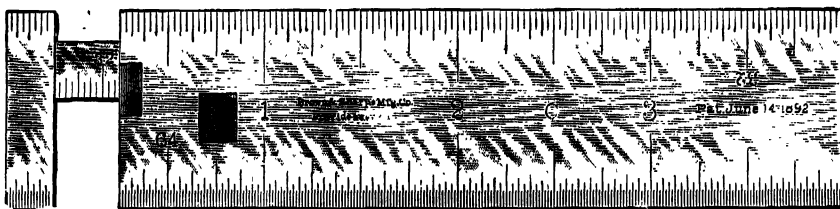


FIG. 2.

FIG. 2.—This Rule will be found convenient for use in the stock room or store, in selecting sheet or bar stock, wire, tubing, &c., and is also of service in the machine shop as a tool of ready reference. It is accurately graduated, and provided with a clamp nut for clamping the slide in position, when gauging a number of pieces, or selecting a certain size of stock.

Size 4 inches, when closed, and about  $\frac{1}{8}$  inch thick. The slide can be drawn out to measure  $3\frac{1}{4}$  inches.

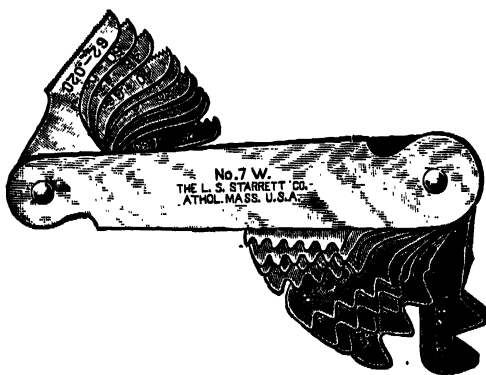
Rule divided into parts of an inch, as follows, 8, 16, 32, 64ths, slide 64 and 100.

PRICE, **Rs. 10.**

Code Word for Telegrams—"KESTREL."

## STEEL CALIPER RULES.

## WHITWORTH SCREW PITCH GAUGE



Has the following pitches:—4,  $4\frac{1}{2}$ , 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 40, 48, 60.

For Whitworth Standard Thread only.

PRICE, **Rs. 6.**

Code Word for Telegrams—"KINSMAN."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# Wyke's Patent Improved Universal Screw-Cutting, Centre, Depth, Angle, and Twist-Drill Gauge.

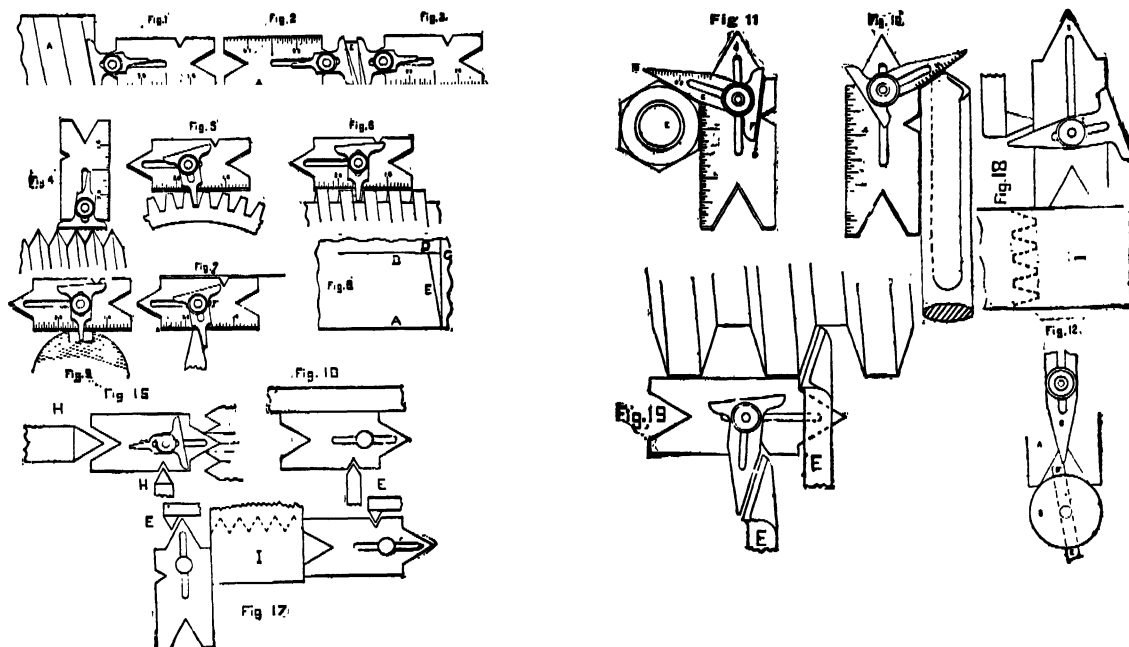
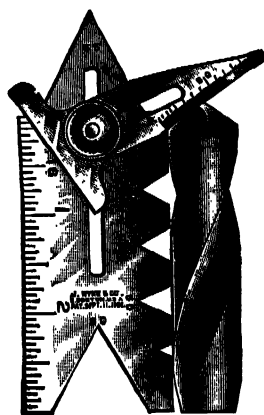


FIG 14



No. 4  
Shows method of gauging drills.  
small bevel gears, bevel collars, making angular templets, angular tools for lathe or planer, and all similar short work.

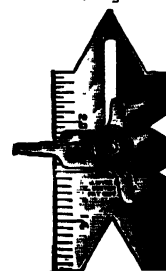
- No. 3.—2½ inches long, 1½ inches wide, 2 inch scale ...  
Code word for Telegrams—"LATCHET."  
No. 4.—4 inches long, 1½ inches wide, 3 inch scale ...  
Code word for Telegrams—"LATINIST."

These Gauges are almost indispensable to the intelligent mechanic. They can be used on almost all classes of work, and in situations where ordinary tools cannot be used. Their great utility will be seen at once from a glance at the accompanying illustrations, which show a few of the uses to which they can be applied. The fixed angles used in these gauges are the Whitworth or English standard (55 degrees).

Fig. 14 shows the No. 4 Gauge, full size. It also shows the angles, 50, 55, and 60 degrees, as arranged in the English standard gauge. The angle 50 degrees is the Holtzapffel standard thread gauge, used also by Whitworth for threads on lathe spindle noses. Angle 55 degrees is the regular angle for the Whitworth or English standard thread gauge. The angles 60 degrees are the standard gauges for large or small lathe centres, also for United States standard threads. Figs. 10 and 11 show the angles as arranged in the United States thread gauge.

The No. 4 Gauge is 4 inches long × 1½ inches wide and ¼ inch thick. It has a graduated scale, 3 inches long, on each side of the main gauge, and one on the auxiliary gauge, 1¼ inches long. It can be used to gauge the largest as well as the smallest centres, and also for the largest kind of screw cutting, especially for screws that are too large to be cut by tools filling the space of the thread, but which are cut by square and side tools which must be set to the exact angle required to form the thread. The graduated scale is useful for measuring screw pitches, &c., for the angles of

FIG. 13.



No. 3.

PRICE, Rs. 5.

PRICE, Rs. 7-8.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# STARRETT'S UNIVERSAL BEVEL PROTRACTOR.

Fig. 1.

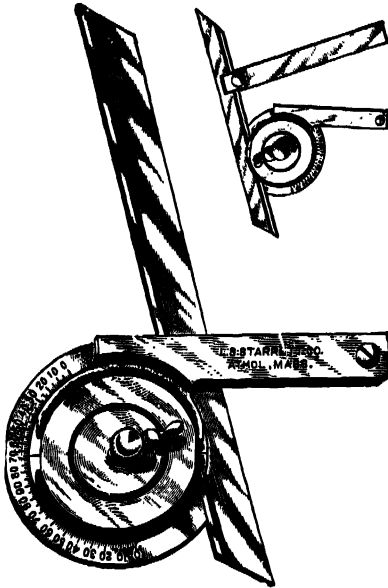
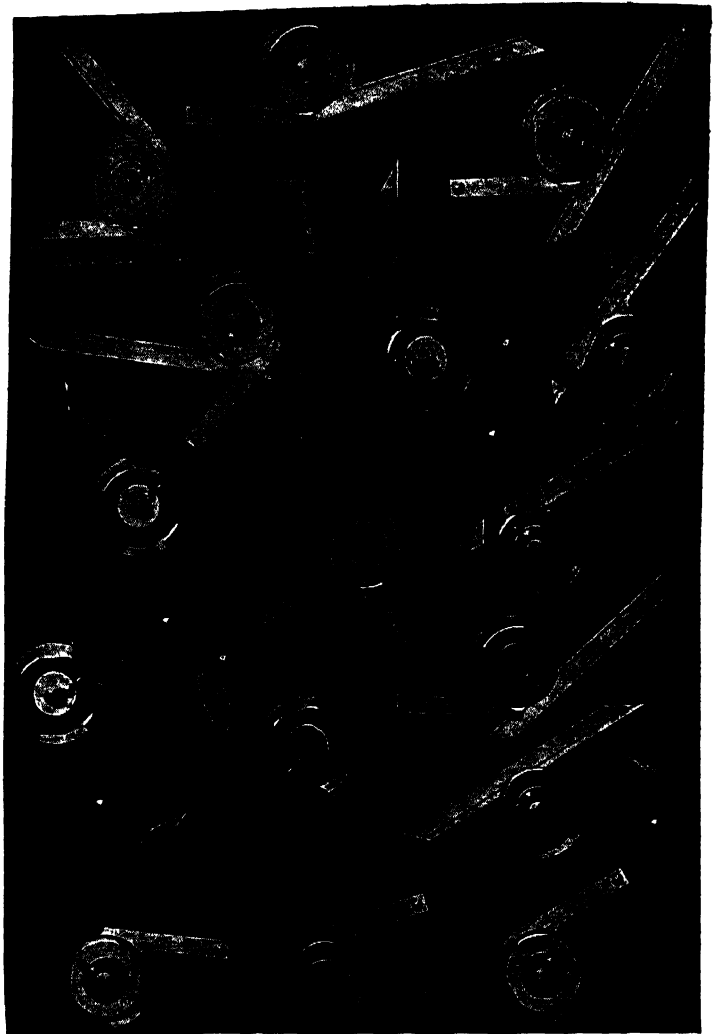


Fig. 1.

**T**HIS Tool weighs 6 ounces. The blade is either 7 or 12 inches by  $\frac{1}{4}$  inch, the stock  $\frac{1}{4}$  inches long, and both are made from sheet steel, nicely finished. The disc is graduated in degrees from 0 to 90 each way, and rotates the entire circle on a central stud inside the case. The blade (clamped by an eccentric stud against the edge of the disc) may be slipped back and forth its full length, or turned at any angle around the circle and firmly clamped at any point, adapting it for work in positions where others cannot be used, and rendering the common universal bevel (for transferring angles) unnecessary. One side of the stock being flat, makes it a convenient tool for laying on paper in drafting, &c., and it has double the utility of any other tool of the kind.

The Attachment shown in the smaller engraving will be found very convenient for grinding worm-thread tools, tapers on lathe centres, and all long tapers.

PRICE, with both 7 and 12 inch blades and attachment, in leather case, **Rs. 35.**  
Code word for Telegrams—"KITTEN."



THE ABOVE ILLUSTRATIONS SHOW A FEW OF THE VARIOUS USES OF THE UNIVERSAL BEVEL PROTRACTOR.

## IMPROVED UNIVERSAL BEVEL.

THREE INCHES LONG.

Fig. 2.

The Improved Features embodied in this Tool adapt it for obtaining any Angle, however slight.

**T**HE off-set in the heel of the blade greatly increases the capacity of the Bevel, and makes it especially valuable for turning bevel gear blanks, or work of a similar character.

The top of the case is solid for  $1\frac{1}{2}$  inches from the square end, thus forming a rest directly under the blade, and enabling work to be accurately fitted.

PRICE, **Rs. 6-8.**

Code word for Telegrams—"KNITTER."

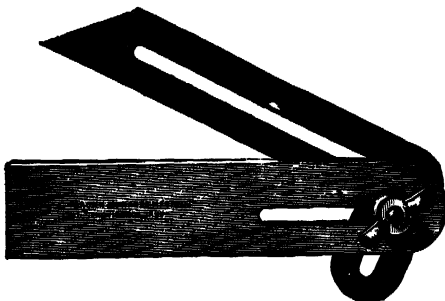
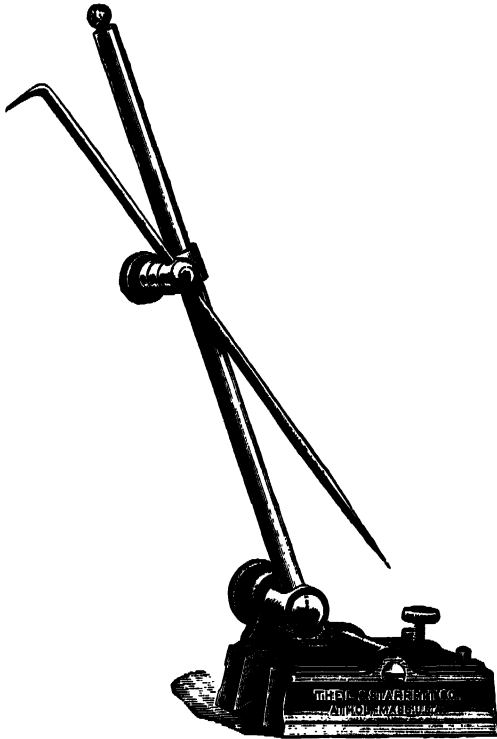


Fig. 2.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# New Universal Surface Gauge.



This Gauge has the latest improvements, which make it all that can be desired, possessing the following points of merit :—

Heavy base, grooved through the bottom and end, adapting it for use on or against circular work as well as flat surfaces.

The spindle passes through a rotating head, jointed to a rocking bracket, pivoted in base. Said bracket being adjusted by a knurled screw in one end against a stiff spring in the other, the spindle may be set upright or at any angle, or turned so as to work under the base and be sensitively adjusted to any position.

The snug and head carrying the scribe are so made that when the clamp nut is loosened all may be freely moved to any position and by friction springs retained in place until a slight turn of the clamp nut holds them firm.

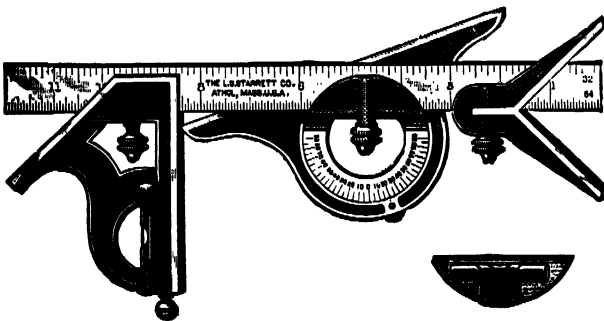
In the rear end of the base are two gauge pins frictionally held, and may be pushed to bear against the edge of a surface plate or in the slot of a planer bed for lenial work.

For small work the spindle may be removed and the scribe inserted in hole provided, where it can be sensitively adjusted and used to advantage on bench work.

PRICE, 3-inch Base, 9 and 12-inch Spindle ... .. **Rs. 12-8.**

Code Word for Telegrams—“LEADER.”

# Starrett's Combination Set.



No. 9.

This Set consists of a Combination Square, with centre head and a 7-inch Bevel Protractor Head, all on the No. 11 Square scale. Each head may be instantly removed, or replaced and used interchangeably with the scale, thus forming the most useful combination set of tools ever devised for mechanics' use.

PRICE, 12 inch, set complete (with hardened Blades) and Level ... .. **Rs. 25**

Code Word for Telegrams—“LEEWARD.”

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON**

## THE "PIONEER" WOOD OR TREE BORER.

For Estimating Age, Growth and Quality of Growing Trees or Cut Timber.

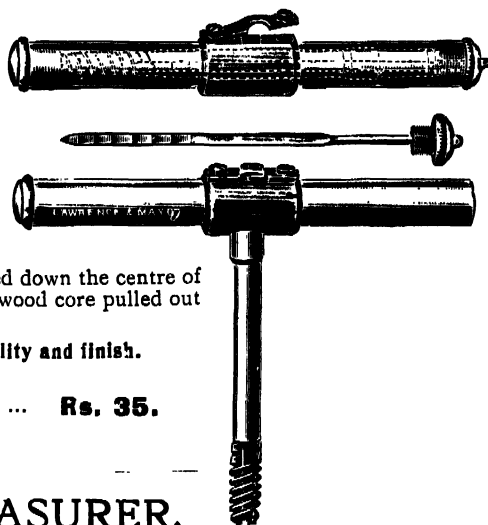
This instrument is of the greatest use for ascertaining the age of trees and their other properties for industrial purposes. They are most valuable tools in the hands of forest officers, timber merchants, etc., etc., and are largely used in Sweden, Norway and Germany for ascertaining the relative increase of growth and condition of the trees in experimental plantations.

**Instructions for Use.**—Unscrew the cap fitted with small hole at one end. To this cap the tool for withdrawing the wooden core is fixed. The drill is then taken out of the handle and placed in position as shown in the illustration. It is secured firmly by a blued steel catch. A boring is then made in the tree or cut timber to be examined. When the screw is deep enough in the wood, the tool attached to the cap is pushed down the centre of the screw. The latter is then withdrawn from the tree and the wood core pulled out from the centre of the screw.

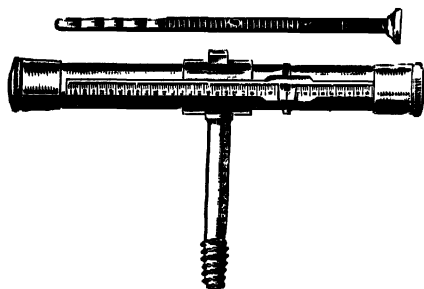
**Steel case, hardened and tempered steel drill, very best quality and finish.**  
Will bore to a depth of 8 inches.

PRICE, complete in Leather Case ... .. **Rs. 35.**

Code Word for Telegrams—"ASCENDANT."



## TREE BORER & HEIGHT MEASURER.



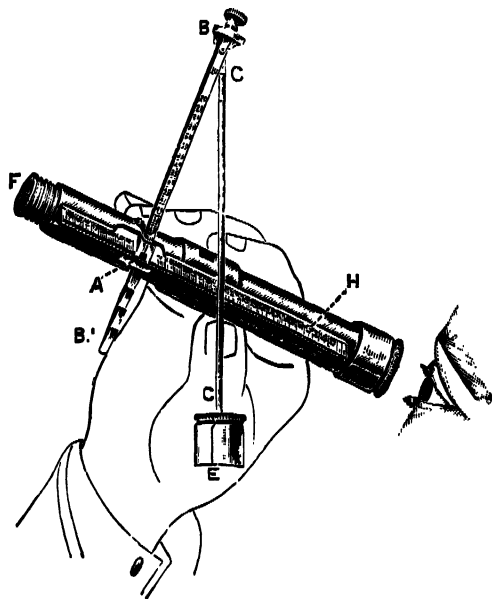
This instrument is smaller in size than the "Pioneer" Borer, and can be readily carried in the pocket. The Borer is of hardened steel and is suitable for boring to a depth of 2½ inches. This is quite long enough for use in experimental stations, etc.

It has the addition of a small appliance for measuring the height of trees, which will be found of very great use. This appliance, with the drill or borer, is contained in a brass protecting case, which also forms the handle when in use.

**Instructions for Use.**—The drill is used in the ordinary way. For use in measuring the height of trees, the tool used for extracting the piece of wood from inside the screw is placed in the catch A, at right angles to the handle of the instrument. The small pendulum is then suspended at the point marked B C in the illustration. The cap E, with the slot in it unscrewed from the cross wire end of the handle F, is hung on the end of the pendulum G. The cross piece B B' is then placed to the number of yards the observer stands from the base of the tree. With the pendulum swinging freely, the cross wire is then sighted on the top of the tree. The height is then read off in yards on the notched scale H, engraved on the handle. It is advisable to take care that the knife edge of the pendulum is placed with the edge against the notched scale.

PRICE, complete in Leather Case, suitable for carrying in the pocket ... .. **Rs. 40.**

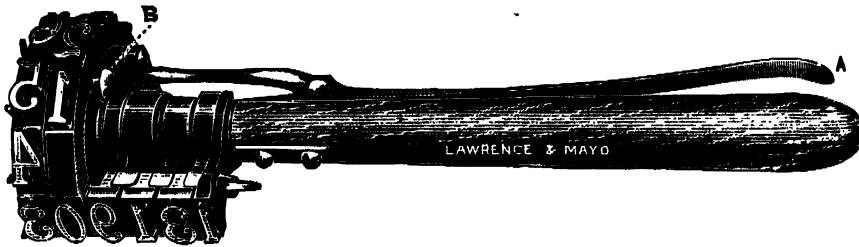
Code Word for Telegrams—"ASSAYER."



**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# THE "PIONEER" HAMMER,

For marking numbers on Trees and Cut Timber.



The "Pioneer" Hammer will be found to meet a great demand in India and Burmah for a suitable and effectual instrument for numbering trees, cut timber, etc., etc.

The instrument consists of two revolving wheels, each wheel containing 10 numerals, 0 to 9, the outside wheel being adjusted to revolve into position one figure at a time, by the action of the lever A (see illustration), attached to the handle. The second circle containing the same number of figures can also be quickly changed by pressing the small brass knob "B," and then turning circle by hand; with the two circles of figures acting at the same time, any number from 1 to 99 can be obtained. To obtain higher numbers, the hammer is fitted to take in addition three extra sets of figures, and also an extra figure 1 to be used in conjunction with the two circles of figures already mentioned, thereby enabling any number to be stamped or impressed up to 199999. With this instrument no less than 500 trees can be effectually marked in an hour. Price of the "Pioneer" Hammer, including the three sets of figures in tin case, with loop for attaching to belt, brush and tin of suitable ink, all fitted into polished wood case, with handle, **Rs. 75.**

Code Word for Telegrams — "GRADUATION."

## The "Pioneer" Hatchet and Marking Hammer.



This instrument has been designed for marking a number of planks or trees, etc., with the same set of figures or letters, *i.e.*—for instance, any two letters and one figure, or two figures and one letter, etc., etc. The hatchet will be found useful for smoothing the bark of trees before numbering. Price, complete, including one set of figures, 0 to 9, and one set of alphabet, also brush and tin of suitable ink, all enclosed in polished wood case, with handle, **Rs. 50.**

Code Word for Telegrams—"GRIDIRON."

NOTE.—After use tool should be cleaned with kerosine or petroleum. The ink should be very thick. The easiest ink to make is the mixture:—

500	parts of Vaseline
50	" " Ultramarine Blue
150	" " Lamp Black.

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# HARDING'S IMPROVED MACHINE AND POCKET COUNTERS.

NO ENGINEER OR MANAGER SHOULD BE WITHOUT ONE.



FIG. 1. HALF SIZE.

**Fig. 1.**—This little Instrument is not intended, like the other patterns of HARDING'S Counters, to be permanently attached to machinery, but it is designed for the purpose of ascertaining (watch in hand) the speed per minute of rapidly revolving machinery, by simply applying the steel rubber-faced bit, with which the Instrument is provided, to the centre hole of a shaft, a very slight pressure of the hand being sufficient to transmit the motion of the shaft to the mechanism of the Counter. For use on Spindles a hollow steel rubber-lined bit is provided. It is largely used for testing the speed of Dynamos.

It is manufactured with great care, and all the chief working parts are of hardened steel, so that it may be used with accuracy at speeds over 5,000 per minute.

PRICE, complete in case ... .. **Rs. 35.**

Code Word for Telegrams—"GOAT."

## HARDING'S HAND COUNTER.

**Fig. 2,** shown half size in the illustration, has been specially designed for checking Cargo, Passengers, Persons entering or leaving a room, &c., and is worked by pressure of thumb or finger. It is supplied complete in handsome leather case.

PRICE ... .. **Rs. 25.**

Code Word for Telegrams—"GABLE."



FIG. 2. HALF SIZE.

## The HARDING'S IMPROVED COUNTER.

**Fig. 3,** shown half size in the illustration, is a very useful and cheap **Reciprocating Counter**, adaptable to a great variety of purposes, but chiefly used for counting the strokes of Feed Pumps, many thousands having been supplied for this purpose alone. The Counter is actuated by the upward and downward movement of the steel driving-rod shown on the right hand side.

The reciprocating movement is exterior to the Counter, so as to facilitate oiling and cleaning.

PRICE, Five Figures, as illustrated ... .. **Rs. 25.**

Code Word for Telegrams—"GALLEY."

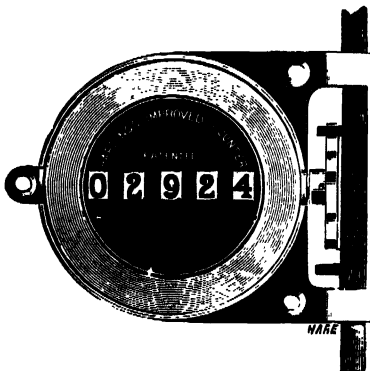


FIG. 3. HALF SIZE.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## CHESTERMAN'S LAND CHAINS.

No. 8 wire gauge, made of best iron wire, with three oval rings, brass swivel handles and tallies, divided into links, and tallied at every ten links. ... 4 poles. **Rs. 12**

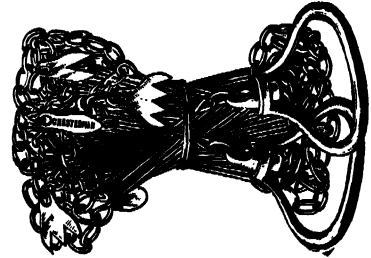
Code word for Telegrams SARDINE.

No. 8 wire gauge, made of best iron wire,  
with three oval rings, brass swivel 50 feet.  
handles and tallies ... **Rs. 8-8**  
Code word for Telegrams SAPPHIRE

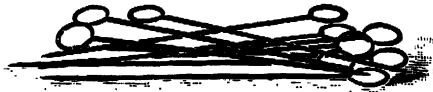
100 feet.  
**Rs. 12**  
SATURN

No. 12 wire gauge, made of best cast steel  
wire, hardened, tempered, and black  
enamelled, with three oval rings, brass  
swivel handles and tallies ... **Rs. 11**  
Code word for Telegrams SAUCER

**Rs. 17**  
SCABBARD



## LAND CHAIN ARROWS.



15 inches long, in sets of ten.

Made of best No. 7 cast steel wire, hardened  
tempered, and black enamelled, per set, **Rs. 2.**

Code word for Telegrams—SCHOLAR.

## CHESTERMAN'S STEEL STRAIGHT EDGES.

FOR DRAUGHTSMEN AND ENGINEERS.

Bright steel, with one edge bevelled, and hole at one end.

FOR DRAUGHTSMEN.

Width and thickness	$1\frac{1}{2}$ in. × 15G.	$1\frac{1}{2}$ in. × 15G.	$1\frac{1}{2}$ in. × 15G.	$2$ in. × 13G.
Length in inches	$\frac{12}{18}$	$\frac{24}{30}$	$\frac{30}{36}$	$\frac{42}{48}$
	<b>Rs. 2</b>	<b>Rs. 3</b>	<b>Rs. 4-8</b>	<b>Rs. 6-8</b>
Code word for Telegrams	SCARF	SCEPTRE	SCISSOR	SCIENTIST
				SCORPION
				SCOUT
				SERPENT

FOR ENGINEERS.

Width & thickness in inches	$1\frac{1}{2}$ × $\frac{3}{16}$	$2\frac{1}{2}$ × $\frac{1}{2}$	$3$ × $\frac{5}{16}$
Length in inches	$\frac{12}{18}$	$\frac{24}{30}$	$\frac{36}{42}$
	<b>Rs. 6</b>	<b>Rs. 9</b>	<b>Rs. 12</b>
Code word for Telegrams	SNAIL	SEAL	SAILOR
			SNIPER
			SECTOR
			SEED
			STONE

## STRAIGHT EDGES, MAHOGANY,

DOUBLE EBONY EDGE.

	$\frac{12}{18}$ in.	$\frac{24}{30}$ in.	$\frac{36}{42}$ in.	$\frac{48}{54}$ in.
	<b>Rs. 1</b>	<b>Rs. 1-8</b>	<b>Rs. 2</b>	<b>Rs. 2-8</b>
Code word for Telegrams	SHADE	SEGMENT	SCIMITAR	SCULPTOR
				SENATOR
				SENTINEL
				SERVITOR

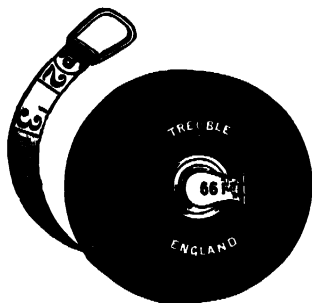
LAWRENCE & MAYO, Manufacturing Opticians,

67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



## CHESTERMAN'S WIND-UP MEASURES.

With patent "Constantia" Metallic and Linen Tapes, marked on one side in links and feet on the other side.



	Width of Tape.	Length.	Price.	Code Words for Telegrams.
1. Leather case with folding handle, patent "Constantia" linen tape ...	$\frac{5}{8}$ in.	50 ft.	<b>Rs. 7</b>	"UNICORN."
2. Do. do. do.	$\frac{5}{8}$ in.	100 ft.	<b>" 10-8</b>	"UMPIRE."
3. Red Leather case with folding handle, linen tape	$\frac{9}{16}$ in.	50 ft.	<b>" 3-8</b>	"UMBRELLA."
4. Do. do. do.	$\frac{9}{16}$ in.	100 ft.	<b>" 5-8</b>	"UNION."
5. Leather case do. patent metallic tape ...	$\frac{5}{8}$ in.	50 ft.	<b>" 7</b>	"URANIUM."
6. Do. do. do.	$\frac{5}{8}$ in.	100 ft.	<b>" 12</b>	"URN."

## RABONE'S STEEL WIND-UP MEASURING TAPES.

These steel measuring tapes are of the highest quality and great care is exercised in the tempering and marking. They may be depended on as Standard Measures, and should be used for taking all important measurements. For testing chains and woven tapes they are indispensable. They are very portable, the size of the case being less than the ordinary metallic or linen tape.

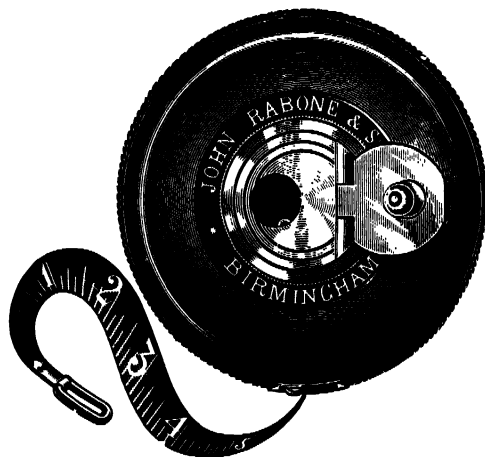
Steel wind-up measuring tape  $\frac{3}{4}$  inch wide in leather case with special spring flush handle, marked in feet into inches and eighths one side and links on the other side.

50 Feet, **Rs. 15.**

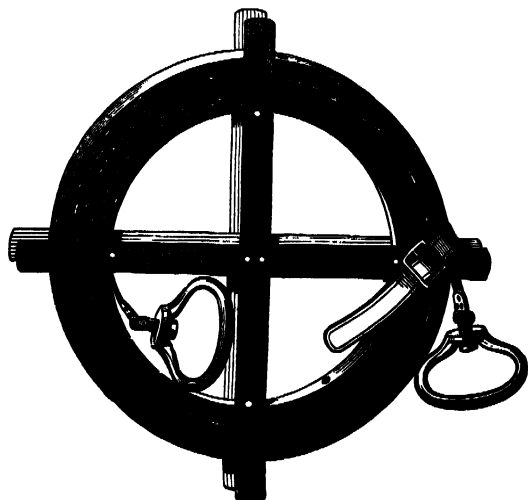
Code Word for Telegrams, "VALUE."

Do. do.  $\frac{1}{2}$  inch wide, 100 feet, **Rs. 30**

Code Word for Telegrams, "VAMPIRE."



## CHESTERMAN'S PATENT STEEL BAND MEASURING CHAIN.



This steel band chain is introduced with the full expectation that it will largely supersede the use of the Ordinary Land Chains, and to a great extent the Ordinary Woven Tapes also. All Chains and Woven Measuring Tapes are liable to contraction or expansion, but this article, being a strong Steel Band, is practically unalterable.

As compared with a Chain, it has equal strength, greater correctness, is easier to clean and to coil or uncoil, and is very much lighter and more compact.

As compared with the ordinary Woven Tape, it is heavier and more bulky, but it is correct, and will stand the wear of a number of Tapes.

As compared with the Patent Steel Tape, its advantages are cheapness of first cost and greater strength and durability, so that it can be used by persons and in situations where the Steel Tape is impracticable from its liability to fracture.

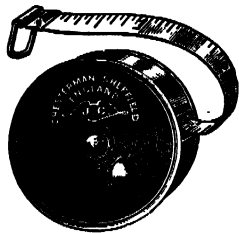
The Chains are  $\frac{3}{4}$  inches wide, and are divided into feet and numbered at every 10 feet.

PRICE 100 feet, **Rs. 28.** Code Word—"BAND."  
 " 50 " **Rs. 18.** " —"BATLET."

## CHESTERMAN'S PATENT SPRING MEASURES.

With Linen Tapes,  $\frac{1}{4}$  inch wide.

In German Silver Cases, with spring stop, with two measurements (one on each side)



	3 feet	4 feet	6 feet	9 feet	12 feet	18 feet
Code word	<b>Rs. 2-4</b>	<b>Rs. 2-8</b>	<b>Rs. 3</b>	<b>Rs. 4</b>	<b>Rs. 5</b>	<b>Rs. 7</b>
for Telegrams	"OCTAVE"	"OCULAR"	"OMELET"	"OPERATIVE"	"ORACLE"	"ORANGE."

With Steel Tapes,  $\frac{1}{4}$  inch wide.

	3 feet	4 feet	6 feet	9 feet
	<b>Rs. 3</b>	<b>Rs. 3-8</b>	<b>Rs. 4-8</b>	<b>Rs. 6</b>
Code Word for Telegrams,	"OMATOR."	"ORCHARD."	"ORDEAL."	"ORGAN."

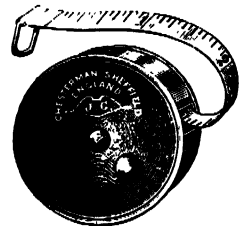
## CHESTERMAN'S STEEL TAPES

FOR MEASURING

## DIAMETERS AND CIRCUMFERENCES.

This Measure is for use in ascertaining the diameter and circumference of circular objects, and may be used to obtain the diameter when the circumference only can be measured, or, to obtain the circumference when only the diameter can be measured.

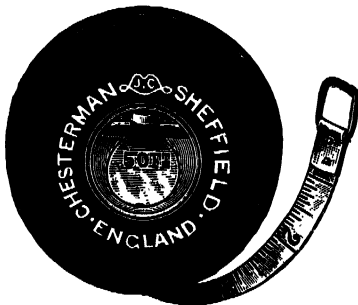
It is made as a Spring Pocket Measure in German silver case, with spring stop.



	6 feet	9 feet	12 feet	18 feet
	<b>Rs. 5</b>	<b>Rs. 6-0</b>	<b>Rs. 7-8</b>	<b>Rs. 10</b>
Code words for Telegrams,	"BAROON."	"BACILLIAN."	"BARKTASH."	"BARKSTONE"
(The 6ft. is made 1-4 in. wide, other lengths 5-16 in wide)				

Also as a wind-up measure in leather case with flush handle, steel tape 3-8 in. wide

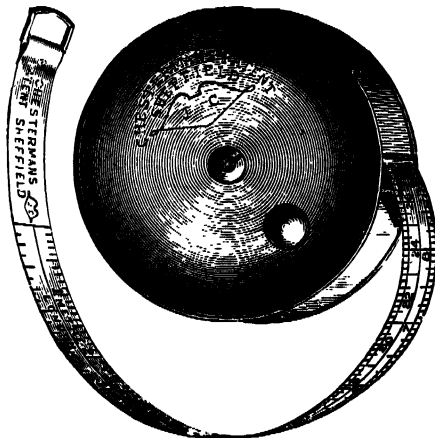
	25 feet	33 feet	40 feet	50 feet
Code word	<b>Rs. 12-8</b>	<b>Rs. 15</b>	<b>Rs. 18</b>	<b>Rs. 22</b>
for Telegrams	"BACTERIDES."	"BAILSMAN."	"BAINBERG."	"BALAMITE."



### INSTRUCTIONS FOR USE.

To obtain the **diameter** by measuring the circumference:—Measure the circumference with the diameter side of the tape.

To obtain the **circumference** by measuring the diameter:—Measure the diameter with the **Standard** side of the tape, then refer to the same dimensions on the **diameter** side, and on the other side will be found the **circumference**. Thus—Suppose the diameter to be  $11\frac{1}{8}$  Standard inches, refer to  $11\frac{1}{8}$  on the diameter scale of the tape and **opposite to that** (on the other side) will be found the circumference, viz.,  $36\frac{1}{2}$  inches.



## CHESTERMAN'S

## Patent Spring Measures,

with STEEL TAPES  $\frac{3}{8}$  in. wide,

in German Silver Case, with Spring Stop.

**SPECIALLY ADAPTED FOR ARCHITECTS AND ENGINEERS.**

2 Metres long, marked on one side English Inches and Metres, and on other side one or other of the following sets of Scales:—

No. 1 Scale (for **Mechanical Draughtsmen**), 12 fully-divided 12 in. duodecimal scales, ranging from 1-16 in. to 3 in. **Rs. 5.** Code word "BALDRIC"

No. 2 Scale (for **Architects**), 8 fully-divided duo-decimal scales and 4 chain scales, 10 to 40. **Rs. 5.** Code word, "BAILAGE."

**LAWRENCE & MAYO, Manufacturing Opticians,**

67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## Levelling Staves, Ranging Poles or Pickets, Surveyors' Rods, etc.

"Sopwith's" Levelling Staves, best quality stout mahogany frames, screwed, with painted scales,					Each.	Code Word
14 feet	...	...	...	...	Rs. 45	for Telegrams.
Do.	do.	do.	do.	16 feet	Rs. 55	"SCALE."
Do.	do.	do.	do.	18 feet	Rs. 65	"SCALING."
						"SCAFFOLD."

### SURVEYORS' RODS.

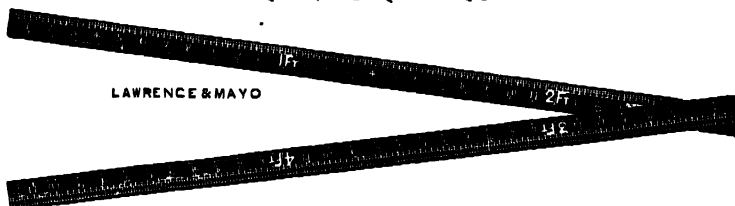


Fig. 2.

5ft. Lancewood, fully divided, best quality ...	Per Pair	Code Word for
5 ft. Do. spring jointed, fully divided,	Rs. 7-8	Telegrams.
best quality ...	Rs. 10-8	"ROD."
		"RODDER."

### Lawrence & Mayo's Improved Pattern 10 foot 3-draw Surveyor's Rod.



Fig 1



Fig 2

This rod is specially made for taking measurements inside buildings, &c. When closed it is 3 feet 8 inches long, the slides being locked together automatically for the purpose of carrying. The sliding form renders it particularly useful for gauging widths between any two boundaries up to 10 feet distance apart. As, for instance, height of ceilings width of doorways, passages, &c.

For widths up to 6 feet 10 inches there are alternative ways in which the rod may be used; one way being by means of the small slide, a portion of which is shewn in Fig 2, and the other way by means of the first rod, as shewn in use on Fig 1. When it is desired to measure an opening of more than 6 feet 10 inches in width, the small slide is first fully drawn, and the reading taken on the second slide where indicated at the top edge of the first rod. The rod locks itself automatically at its full extension of 10 feet, and as the reverse side is marked right through in feet and inches, it may then be used for any description of running measurements. This rod will commend itself to Surveyors and others on account of its simplicity and portability, the entire rod when closed being very little longer than the ordinary 5 foot surveyor's rod.

PRICE, Rs. 18. Code Word for Telegrams—"DANGLER."



Fig 5.



Fig. 6.



Fig. 3.



Fig. 4.

Fig. 3.—Picket or Ranging Poles made from selected pine, painted 3 colours, red, white and black, and varnished wrought iron shoes with solid steel point welded in

Do.	do.	do.	do.	do.	do.	do.	do.	6 feet long, each
Do.	do.	do.	do.	do.	do.	do.	do.	8 " "
Do.	do.	do.	do.	do.	do.	do.	do.	10 " "

Fig. 4.—Off-set Rod, 10 link, with hook and shoe ...

Fig. 5.—Boning Rods, for drainage works, etc. ... set of three

Fig. 6.—Light Pole, 5 feet long, painted black with iron spike, top tapered to hold cross staff heads, &c. ... each

Code Word for Telegrams.

Rs. 2-4.	"DEPUTY."
Rs. 3.	"DERIDER."
Rs. 3-12.	"DEROCANT."
Rs. 3-8.	"FASCINATOR."
Rs. 8.	"FASCIOLET."
Rs. 1-12.	"DORIAN."

# SCALES, &c. ALL MADE EXTRA STOUT FOR INDIA.

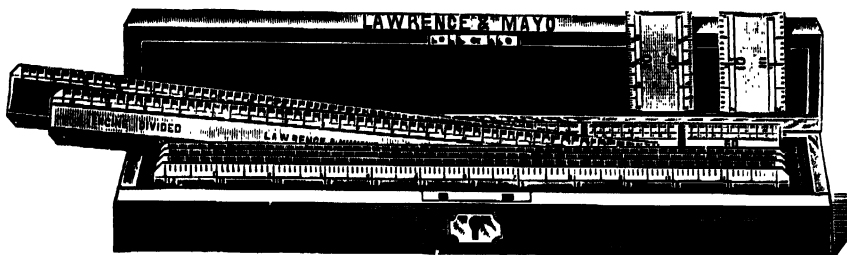
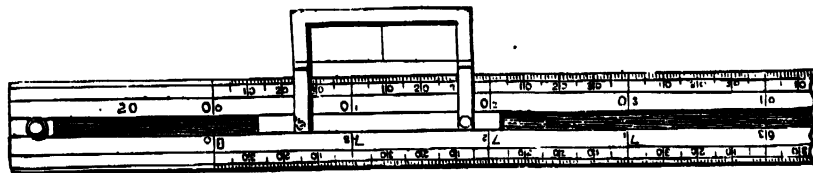


Fig 1.

	Boxwood.	Code Word for Telegrams.	Ivory.	Code Words for Telegram.
1. CHAIN SCALES, 6 in., 10 to 60°, engine divided, each ..	<b>Rs. 1-4</b>	"CHAIN."	<b>Rs. 4</b>	"MAT."
2. Do. do. 12 in., do. do. do. ..	" 2	"CURB."	" 8	"RABBIT."
3. PLOTTING SCALE, 12 in. 1 inch = 330 yards. ..	" 2	"APOLOGUE."	" 8	"APPRIZER."
4. Set of Six 12 inch CHAIN SCALES one each 10 to 60° with Six 2 in. offsets, one each 10 to 60°, in case, as Fig. 1	" 15-8	"NUTSHELL."		
5. OFFSETS for Chain Scales, 2 in., 10 to 60°, each ..	" 0-8	"COAL."	" 1-8	"RACK."
6. ARCHITECTS' SCALES 12 in., flat section ..	" 2	"ARK."	" 9	"RADIANT."
7. Set of Six 18 inch BOXWOOD ARCHITECTS' SCALES, bevelled edge, flat section, $\frac{1}{8} \times \frac{1}{4}, \frac{1}{8} \times \frac{3}{8}, \frac{1}{8} \times 1, 1 \times \frac{1}{2}, 3 \times \frac{1}{2}, 1 \times \frac{3}{4}, \frac{1}{2} \times 1$ inch in case ..	" 25	"DISPENSER."		
8. UNIVERSAL SCALES 12 in., flat section ..	" 2	"OAK."	" 9	"RADISH."
9. ARMSTRONG'S do. 12 in. do. ..	" 2	"AMBER."	" 8	"RAIMENT."
10. ENGINEERS' do. 12 in., oval section, fully divided ..	" 2	"HAMMER."	" 9	"RIDER."
11. Set of five 18 in. BOXWOOD ENGINEERS' SCALES, bevelled edge, flat section, $\frac{1}{8} \times \frac{3}{8}, \frac{1}{2} \times \frac{3}{8}, \frac{1}{2} \times \frac{1}{2}, 1 \times 1 \frac{1}{2}, 3 \times 3$ . in case ..	" 22	"UTOPIAN."		
12. GUNTER'S SCALES, best boxwood, 12 in. ..	" 2	"GUN."		
13. Do. do. do. 18 in. ..	" 3	"GUNTER."		
14. Do. do. do. 24 in. ..	" 3-8	"GINNER."		
15. TRIANGULAR do. 6 in. ..	" 4	"PENITENT."	" 14	"RAMPANT."
16. Do. do. 12 in. ..	" 5	"TEST."	" 28	"ROPE."
17. PROTRACTOR, 8 Scales, and 40 on edge, best boxwood ..	" 1-12	"TESTER."	" 6	"TOP."
18. SERVICE PROTRACTOR, best boxwood ..	" 1-8	"RING."	" 6	"EWE."
19. MILITARY RED-LINE PROTRACTOR, 6 in. ..			" 5	"RATION."
20. MILITARY SKETCHING PROTRACTOR, with scales of yr ls, slopes, etc., as required for military sketching ..			" 6	"INVENTOR."
21. SECTOR ..			" 5-8	"DOVE."
22. MARQUOIS SCALES, per set, Woolwich pattern, in case ..	" 7-8	"RAMROD."		
23. Do. do. do. Sandhurst do. do. ..	" 9-8	"CHARMER."		

## COMPUTING SCALES.

UNIVERSAL COMPUTING SCALE,  
containing 1, 2, 3, 4, 5, 6  
chains to an inch, complete in  
mahogany case, made to order,  
from **Rs. 15**—Code Word,  
"COMPUTER."



## ACRE COMB SCALES, etc.

ACRE COMB SCALE, 16 inches = 1 mile, spaces 100 links or 2 inch scale to $\frac{1}{100}$ of an acre, printed on cardboard ..	each	<b>Rs. 1</b>	Code Words.
DIAGONAL SCALE, printed on cardboard, 64 inches to a mile feet ..	"	" 1	"LION."
Do. do. do. 16 inches to a mile feet ..	"	" 1	"LIVERY."
	"	" 1	"LORDLING."

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## JOINTED POCKET RULES.

Code word for  
Telegrams.

Strong boxwood 2 feet two-fold rule, arch joint, brass pin holes, 8 scales and 8 square lines, 4 bevelled edges, marked inches in 8ths and 16ths ... ..

Re. 1-8 "EDGE."

Strong boxwood 2 feet four-fold rule,  $1\frac{1}{4}$  inch wide, arch joint, bevelled edges, with 8 scales, marked inches in 8ths, 16ths, 10ths and 12ths

" 2-8 "EDICT."

Strong boxwood 2 feet four-fold rule,  $1\frac{1}{4}$  inch wide, German silver mounts arch joint, 8 bevelled edges, with 8 drawing scales, and 4 chain scales ... ..

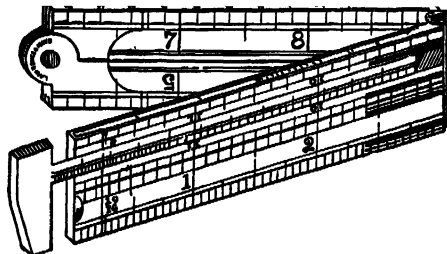
" 5 "EDITOR."

Strong boxwood 2 feet four-fold rule, brass mounts, with spirit level and degrees

" 5 "EDITION."

Strong boxwood 1 foot 4-fold rule, with calliper gauge ... ..

" 2 "EDUCATOR."



6. GARRETT'S Engineers' rule (as fig 6), 2 feet long,  $1\frac{1}{2}$  inches wide, with brass slides and tables, marked inches in 8ths and 16ths, scales and Gunter's line.

Re. 5.

Code word for Telegrams,  
"RULE."

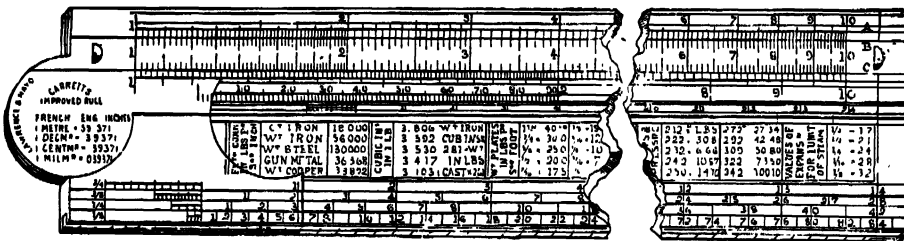


FIG. 6.

## IVORY RULES.

Nickel Silver

Mounts. . .

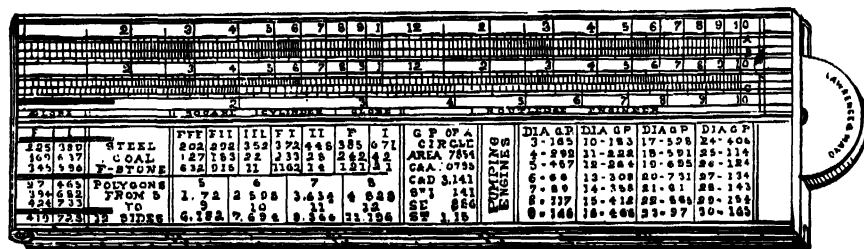


FIG. 10.

Code word for  
Telegrams.

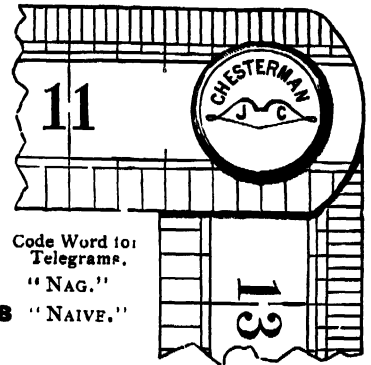
- 6a. Two feet four-fold ivory rule, one inch wide, arch joint, bevelled edges with 16 scales, and 4 bevelled edges marked inches in 8ths, 16ths, 10ths and 12ths ... .. **Re. 15** "EMPEROR."
7. One foot four-fold ivory rule,  $\frac{3}{4}$  inch wide, arched joint, marked inches in 8ths, 16ths, 10ths and 12ths... .. **" 5-8** "EFFUSION."
8. Do do do  $1\frac{1}{4}$  inch wide, arch joint, calliper gauge, and iron tables, marked inches in 8ths and 16ths ... .. **" 15** "EXHIBIT."
9. Two feet four-fold ivory rule, with slide and calliper gauge, iron and copper tables ... .. **" 25** "EMPIRE."
10. ROUTLEDGE'S Engineers' slide rule (as fig. 10), two feet four-fold  $1\frac{1}{4}$  inch wide ... .. **" 30** "ELDER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## CHESTERMAN'S JOINTED RULES.

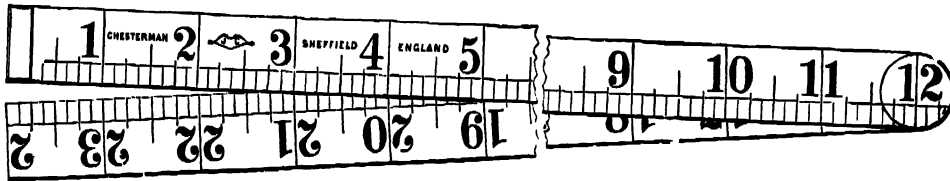
## MACHINE-DIVIDED FOR ENGINEERS.

Forming a Rule and Square combined, with one Stop Joint—  
2 feet  $\times$   $1\frac{1}{4}$  in.  $\times$  19 W.G.



Code Word for  
Telegrams.

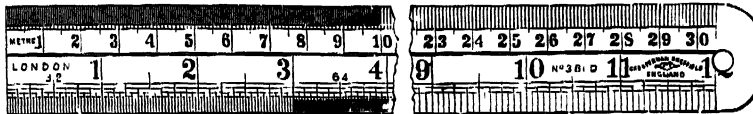
1. 2 feet long, inches on 2 edges into 8 and 16ths .. .. **Rs. 3** "NAG."  
2. 2 feet long, do. do. 8, 16, 32 and 64ths .. .. **Rs. 3-8** "NAIVE."



Code Word for  
Telegrams.

3. Etched on both sides 2 feet long  $\times$   $\frac{3}{4}$  inch  $\times$  21 W.G., one stop joint, and brass ends **Rs. 1-4** "NARCOTIC."  
4. Machine-divided, 2 feet long  $\times$   $\frac{3}{4}$  inch  $\times$  21 W.G., one stop joint, and G.S. ends,  
inches on both sides, into 8 and 16ths .. .. **Rs. 1-8** "NATION."

## IMPROVED MACHINE-DIVIDED STEEL RULES.



12 INCHES LONG,  $1\frac{1}{4}$  in.  $\times$  19 W.G.

Marked LONDON on Two Edges.

- Code Word for  
Telegrams.
5. Inches into 8 and 16ths .. **Rs. 1** "NEGATIVE."  
6. Do. 8, 16, 32, and 64ths **Rs. 1-4** "NEPTUNE."  
7. Do. 16, 32, 64ths tapping  
and spanner sizes .. **Rs. 1-8** "NICKEL."  
8. Do. 16, 32, 64, 10, 20, 50,  
and 100ths .. **Rs. 1-12** "NIMBLE."

Marked LONDON on Four Edges.

9. Do. 8, 16, 32, and 64ths **Rs. 2** "NUMERAL."

12 INCHES LONG,  $1\frac{1}{4}$  in.  $\times$  19 W.G.

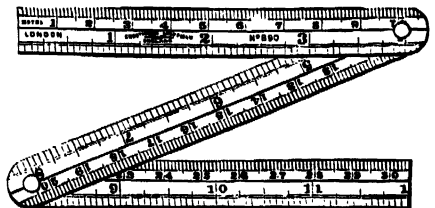
Marked LONDON & METRE on Two Edges.

- Code Word for  
Telegrams.
- Centimetres into millimetres,  
inches into 16ths .. **Rs. 1-4** "NUTMEG."  
Centimetres into millimetres  
and halves, inches into 16,  
32, and 64ths .. **Rs. 2** "OBJECT."  
Marked LONDON & METRE on Four Edges  
Centimetres into millimetres  
and halves, inches into 16,  
32, 64, 10, 20, 50, 100, 12,  
24, 48, and 96ths .. **Rs. 2-4** "OBSTACLE."

## MACHINE-DIVIDED STEEL POCKET RULE.

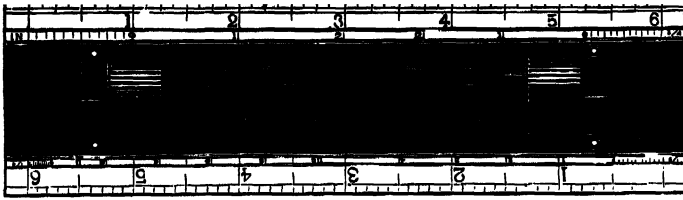
Twelve inches long  $\times$   $\frac{1}{2}$  in. wide  $\times$  25 W.G. thick,  
and folds into three.

- Code Word for  
Telegrams.
13. Marked on one side into inches, 16, 32, and 64ths **Rs. 1** "OSPREY."  
14. Marked on one side into inches and 16ths, centi-  
metres into millimetres .. **Rs. 1-4** "OCEAN."  
15. Marked on one side into inches, 16, 32, and 64ths,  
centimetres into millimetres and halves **Rs. 1-8** "OCTAGON."



LAWRENCE & MAYO, Manufacturing Opticians,

67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



## ROLLING PARALLEL RULES.

	Inches 6	9	12	15	18	24
Plain ebony rolling parallel rules, brass mounted .. ..	Rs. 5-8	Rs. 7-8	Rs. 9-8	Rs. 12	Rs. 14	Rs. 20
Code word for Telegrams ... ..	"ELONG."	"ELOPE."	"ELUDE."	"ELVK."	"ELM."	"END."
Solid gun metal do. do. do. ... ..	Rs. 12	Rs. 15	Rs. 20	Rs. 25	Rs. 30	Rs. 40
Code word for Telegrams ... ..	"EQUIP."	"ERODE."	"ETHIC."	"EVEN."	"EVIL."	"EXAM."
Ebony rolling parallel rules, ivory edge, brass mounted, divided as illustration ... ..	Rs. 7	Rs. 10	Rs. 14	Rs. 18	Rs. 21	Rs. 30
Code word for Telegrams ... ..	"EXPEL."	"EXPERT"	"EXTENT."	"EAGER"	"EVENT."	"EGG."

### THE ELPHINSTONE-KEITH IMPROVED SPACING ROLLING PARALLEL RULE.



**This Improved Spacing Rolling Parallel Rule**, Designed by Lieutenant G. T. Elphinstone-Keith, of the King's Own (Royal Lancaster Regiment), is specially adapted for Draughtsmen and others who require perfect accuracy in detail, and can be used either as an ordinary rolling parallel rule, or for drawing parallel sectional lines in tenths, eighths, quarters and half-inches. The wheels are so constructed that one revolution corresponds with three inches of traverse when the rule is used upon a flat surface such as a drawing board or table. To enable the ruler to be used for spacing sectional lines, a small steel bolt is fitted into each poppet head, which, acted upon by a spiral spring, engages the teeth or notches, accurately cut upon the flat faces of the wheels, as they revolve, and representing eighths and tenths of an inch respectively; the catch or bolt when engaging the teeth or notches gives a distinct click, thus enabling the spacing to be judged by sound alone. When the ruler is not required as a spacer the bolts can be withdrawn from the wheels, and by turning them either to the right or left the rule will then run freely in either direction and becomes an ordinary rolling parallel. A scale of divisions is engraved upon each of the wheels, one representing inches and eighths of inches, and the other inches and tenths of inches; these may be used independently of, or in conjunction with, the clicking arrangement. One edge of the rule is divided into eighths and sixteenths, and the other tenths and twelfths. This rule will be found of great advantage over the ordinary form of rolling parallel rule, as it will save the absorbing attention necessary when ruling continuous lines of definite spaces, and will prove a great time saver in Orderly Rooms where many Rosters and Ledgers have to be ruled, and where the Army book issued generally consists of foolscap size; also to Architects, engineers and all engaged in mechanical drawing.

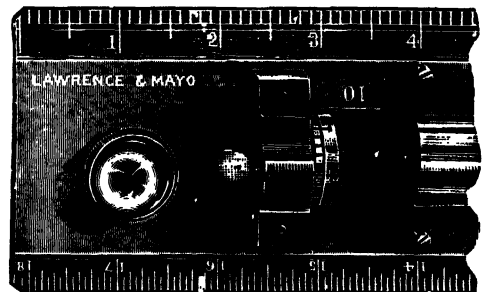
Price of the Elphinstone-Keith Improved Spacing Rolling Parallel Rule; solid gun metal; size 12 inches; complete in mahogany case ... .. **Rs. 35**

Code word for Telegrams—"DRAMATIC."

Price of the Elphinstone-Keith Improved Spacing Rolling Parallel Rule; solid gun metal; size 18 inches; complete in mahogany case ... .. **Rs. 45**

Code word for Telegrams—"CALVACADE."

Other sizes of this rule specially made to order.



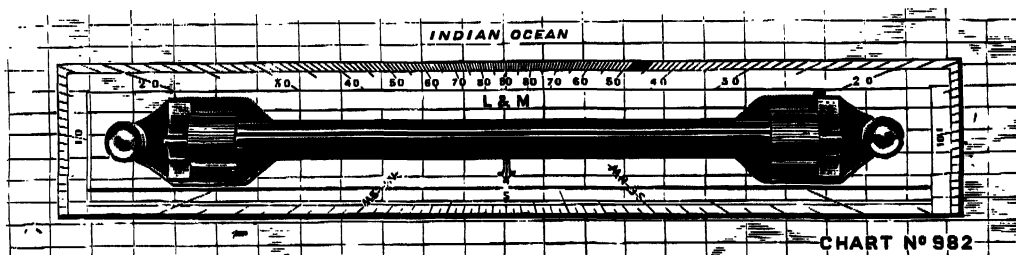
Enlarged section of the Elphinstone-Keith Rule showing divided scale on toothed wheel and divisions on both edges.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## Nautical or Chart Parallels.

# Admiralty Pattern

## Field's Rolling Parallel Rule.



18 inch, **Rs. 30.** Code Word for Telegrams, "PACIFIC."  
24 " **Rs. 36.** " " " "PANEGYRIC."

67 & 69, CHANCERY LANE, LONDON; also BOMBAY CALCUTTA, MADRAS and RANGOON.



## FABER'S IMPROVED CALCULATING RULE.

The value of this Instrument to Engineers, Architects, and technical men generally is becoming increasingly obvious—a fact fully demonstrated by the continually growing demand.

The Rule is made of boxwood, and has a celluloid surface, on which the markings are shown with great clearness.

It has one side bevelled, the other being at right angles, as illustrated, the moderate size of the instrument, which is 10½ in. long, together with the neat case in which each is sent out, rendering it specially adapted for pocket use and out-door purposes.

The set of scales on the reverse of the slide, for solving trigonometrical problems and those involving logarithmic calculations, considerably enhances the value and usefulness of the Rule.

The number and variety of problems that can be worked out with the aid of A. W. FABER'S CALCULATING RULE is almost endless, and so simple and expeditious is the mode of procedure that, with a little practice, the Rule becomes a reliable and time-saving adjunct to all who are engaged in arithmetical work, no matter of what description.

In order to render the construction and mode of employment of the Rule intelligible even to those who possess but a moderate amount of technical knowledge, a new Book of Instructions has been prepared, which will be found a concise and practical guide to the use of the Instrument, having special regard to English or American requirements.

The Book consists of 47 pages of printed matter and 14 sheets of diagrams.



FIG. 1. REDUCED SIZE.

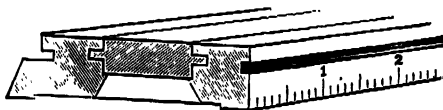
FIG. 1.—Calculating Rule, with decimals marked and with Ordinary Cursor, 10½ in. long, celluloid surface.

Price, **Rs. 12** including Book of Instructions.

Code word for Telegrams, "SANDAL."



FIG. 2. REDUCED SIZE.



SECTIONAL VIEW, ACTUAL SIZE.

FIG. 2.—Calculating Rule, with decimals omitted and with Slide Spring and Ordinary Cursor, 11 in. long, celluloid surface.

Price, **Rs. 14** including Book of Instructions.

Code Word for Telegrams, "SALVER."



FIG. 3. PORTION OF RULE, REDUCED SIZE.

FIG. 3.—Calculating Rule, with decimals omitted, and with Slide Spring and Registering Cursor, 11 in. long, celluloid surface.

Price, **Rs. 15** including Book of Instructions.

Code word for Telegrams, "SMARK."

### LOGARITHMS FOR BEGINNERS.

BY

CHARLES N. PICKWORTH, Wh.Sc.

logarithms and their uses, particular care having been taken to elucidate all difficult points by the aid of a number of worked examples. Illustrations are also given of the method of using seven-figure tables, while a series of graded exercises and a collection of logarithms of useful factors are included.

"We do not remember a work on logarithms which is characterised by such clearness, thoroughness, and usefulness; . . . no point which presents any difficulty is overlooked."—ELECTRICAL MAGAZINE.

Crown 8vo., Cloth Boards, post free, **Rs. 1.**

Code word for Telegrams, "PICKWORTH."

## CALCULATING CIRCLE.

### BOUCHER'S SYSTEM, With Improvements.

The **Calculating Circle** is an instrument by means of which one can solve all arithmetical operations, and consequently all numerical formulæ no matter what sciences to which they belong. These operations are not only performed with extraordinary facility and rapidity, but with an approximation to accuracy sufficient for all practical purposes.

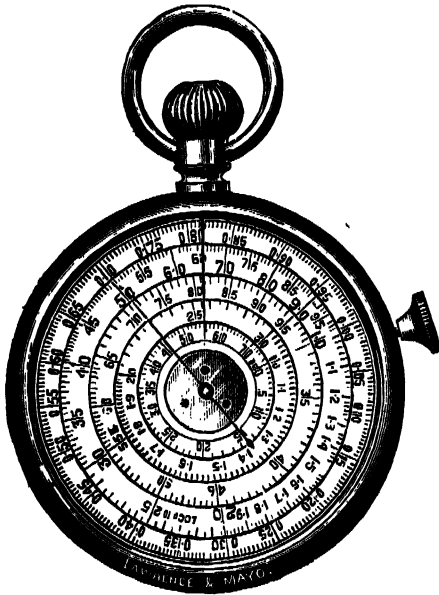
The **Theory of the Instrument** is the property of logarithms "that the sum of the logarithms of two numbers is equal to the logarithm of their product," and inversely "that if from the logarithm of a number one subtracts the logarithm of another number one obtains the logarithm of the quotient by the division of the first by the second."

But it is not necessary to know the theory of logarithms in order to employ this instrument. It can be usefully handled by any person intelligent enough to read on a circumference numbers represented by divisions, just the same as one reads on a yard measure, the number of inches measuring some given distance.

Book of instructions for use supplied with each instrument.

PRICE, **Rs. 15.**

Code Word for Telegrams—  
"CALCULATOR."



ACTUAL SIZE.

## Paceometers and Pedometers.

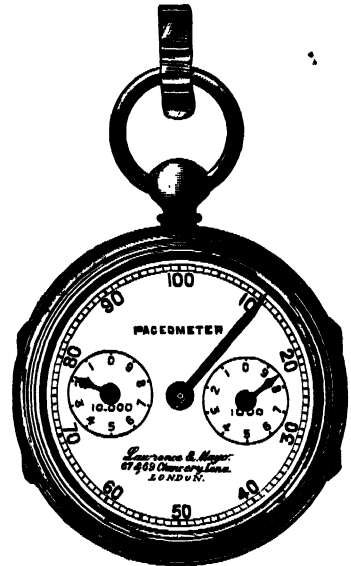
### PACEOMETERS.

The **Paceometer**, is for the use of Surveyors and Military and Civil Engineers for obtaining an approximate idea of distances by pacing them. It is constructed upon the same principle as the Pedometer, but with this difference, *i.e.*, that each step or pace gives a definite and specific movement of the hand upon the dial, which is graduated and figured accordingly. This instrument is extremely useful to Military Engineers when roughly laying out works, it prevents the possibility of error through false counting, and that absorbing attention which the counting of any considerable number of paces necessitates. In the military training and pacing the regulation step or pace is fixed at that length which makes 110 paces equal to 100 yards, so that by reference to the dial of the Paceometer, the distance, in miles, can be readily seen by the number of yards. The large hand shows each pace up to 100, the two small dials carry on the enumeration up to 1,000 and 10,000 respectively. The case of the instrument is made of bronzed metal,  $1\frac{3}{4}$  inches in diameter.

PRICE ... .. **Rs. 22.**

Instructions with each Instrument.

Code Word for Telegrams—"PACEOMETER."



### PEDOMETERS.

The **Pedometer** consists of a simple arrangement of weight, and pendulum actuating a mechanism by which the distance walked by the wearer is accurately measured.

It should be suspended by the hook in the waistcoat or side pocket, and must be maintained in an upright position.

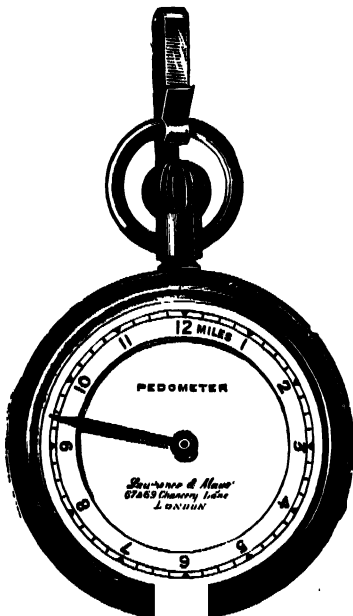
The figures on the dial represent miles, and the spaces between the figures are quarter-miles. When the Pedometer is to be used the dial should be turned by means of the keyless button until the figure 12 is brought exactly under the hand. It can be readily adjusted to the step of the wearer.

The case of the instrument is made of bronzed metal,  $1\frac{3}{4}$  inches diameter.

PRICE ... .. **Rs. 22.**

Instructions with each Instrument.

Code Word for Telegrams—"PEDEOMETER."



# T SQUARES.



Fig 1.—T Squares, Mahogany, Brass or Ebony edges, fixed heads.

18 in. 24 in. 30 in. 32 in. 42 in. 54 in.

Rs. 3-0 Rs. 4-8 Rs. 6 Rs. 6-8 Rs. 9 Rs. 10-6

Code Word—Drug Dupe Deer Dole Door Dyke

Fig. 1.

Fig 2.—T Squares, shifting heads and brass edges, with clamping screw.

18 in. 24 in. 30 in. 32 in. 42 in. 54 in.

Rs. 8 Rs. 9-8 Rs. 10-8 Rs. 11-8 Rs. 13-8 Rs. 15-8

Code Word Wasp Wave Wing Whip Wand Wire

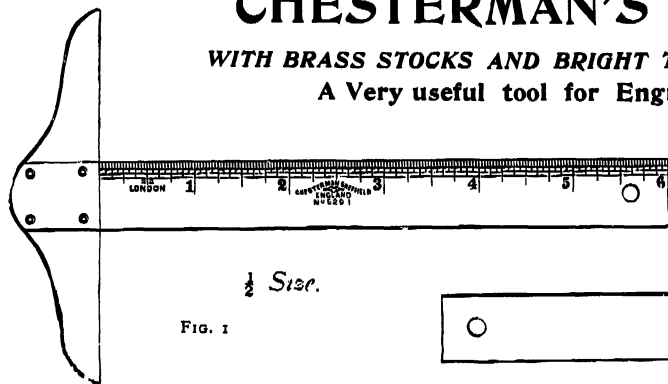


Fig. 2.

## CHESTERMAN'S T SQUARES.

WITH BRASS STOCKS AND BRIGHT TEMPERED STEEL BLADES.

A Very useful tool for Engravers, Fitters, &c.



$\frac{1}{2}$  Size.

FIG. 1

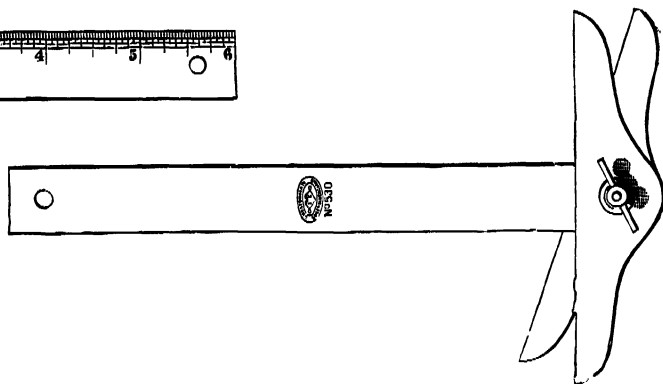


FIG. 2.

$\frac{1}{2}$  Size.

FIG 1.—Bright steel blade, with fixed brass head, one edge machine-divided into inches and 32nds ... ..

6 in. 8 in. 10 in. 12 in.

Rs. 2-8 Rs. 3 Rs. 3-8 Rs. 4

Code words for Telegrams—"IDEAL." "IDIOM." "IDLER." "IBIS."

FIG. 2.—Bright steel blade, with fixed and moveable brass head, with lock nuts, and with one edge machine-divided into inches and 32nds .. ..

Rs. 4 Rs. 4-8 Rs. 5 Rs. 5-8

Code words for Telegrams—"IRON." "INDEX." "INGOT." "INLET."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

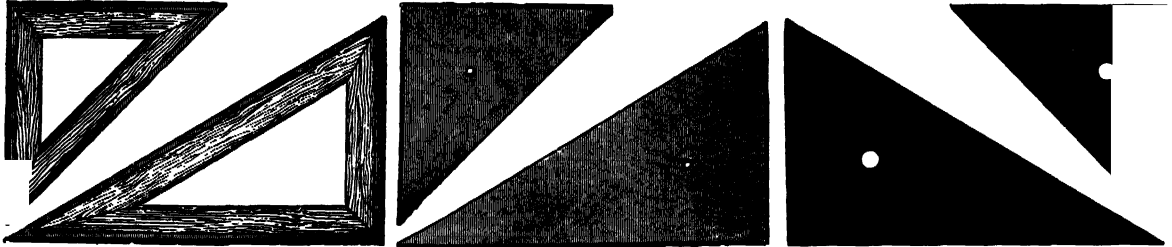
# HIGH-CLASS SET SQUARES.

With a view to mathematical correctness, we have devised a special system of truing, so that errors are the remotest possibility, and we guarantee all to be true.

**MAHOGANY, EBONY EDGE.**—These are of Spanish mahogany and genuine Ebony, and they are put together with Cross-grained Wood Keys. The fallacy of Metal Keys and Rivets is fast becoming evident. Glue will not adhere to Metal, consequently the Metal Keys do *not* hold, and the only adhesive portion is the end grain of the joint. The Crossgrain Wood Key holds all over its service, and becomes one homogeneous mass of great strength.

**VULCANITE.**—Best quality Vulcanite only is used, which is guaranteed thoroughly Seasoned.

**TRANSPARENT CELLULOID.**—These are invaluable for finishing fine detail on expensive drawings, as the slightest spot or ink is at once discernable, thus the accident of inking a drawing with an inky Set Square is impossible. Only the best American Seasoned Celluloid is used.



Mahogany Framed, Ebony Edge.

Transparent Celluloid.

Vulcanite.

## Mahogany, Ebony Edge, 45°.

	4-in.	5-in.	6-in.	7-in.	8-in.	9-in.	10-in.	11-in.	12-in.	14-in.	15-in.	16-in.	18-in.
	<b>Rs. 1-4</b>	<b>Rs. 1-8</b>	<b>Rs. 2</b>	<b>Rs. 2-4</b>	<b>Rs. 2-8</b>	<b>Rs. 2-12</b>	<b>Rs. 3</b>	<b>Rs. 3-4</b>	<b>Rs. 3-8</b>	<b>Rs. 4</b>	<b>Rs. 4-8</b>	<b>Rs. 5</b>	<b>Rs. 5-8</b>
<b>Code Word for Telegrams—</b>	<b>Flg</b>	<b>Frog</b>	<b>Fir</b>	<b>Fly</b>	<b>Foe</b>	<b>Fop</b>	<b>Fox</b>	<b>Ant</b>	<b>Ape</b>	<b>Arm</b>	<b>Axe</b>	<b>Awl</b>	<b>Bag</b>

## Mahogany, Ebony Edge, 60°.

	Rs. 1	Rs. 1-4	Rs. 1-8	Rs. 1-12	Rs. 2	Rs. 2-4	Rs. 2-8	Rs. 2-12	Rs. 3	Rs. 3-8	Rs. 4	Rs. 4-8	Rs. 5
Code Word for Telegrams—	Box	Bed	Bat	Bee	Boy	Cup	Cog	Car	Cat	Cow	Dog	Hat	Hop

## Transparent Celluloid, 45° $\frac{60}{1000}$ of in. thick.

Rs. 1	Rs. 1-4	Rs. 1-8	Rs. 1-12	Rs. 2	Rs. 2-4	Rs. 2-8	Rs. 2-12	Rs. 3	Rs. 3-8	Rs. 4	Rs. 4-8	Rs. 5
Code Word for Telegrams — Imp	Ink	Log	Mug	Nut	Nap	Nib	Rag	Ram	Spv	Sip	Sty	Sag

## Transparent Celluloid, 60° $\frac{60}{1000}$ of in. thick.

	1000												
	0-12	Rs. 1	Rs. 1-4	Rs. 1-8	Rs. 1-12	Rs. 2	Rs. 2-4	Rs. 2-8	Rs. 2-12	Rs. 3	Rs. 3-4	Rs. 3-8	Rs. 3-12
Code Word for Telegrams	Tug	Tie	Gap	Hoe	Ice	Inn	Jar	Jig	Jet	Oil	Ode	Tap	Pin

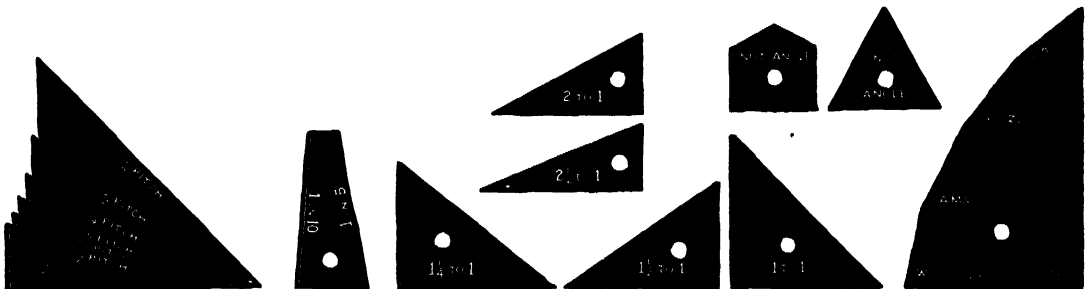
## Vulcanite, 45°.

0-8	0-12	Rs. 1	Rs. 1-4	Rs. 1-8	Rs. 1-12	Rs. 2	Rs. 2-4	Rs. 2-8	Rs. 2-12	Rs. 3	Rs. 3-4	Rs. 3-8	
Code Word for Telegrams —	Dab	Day	Dile	Dor	Dun	Ear	Elf	Era	Gag	Gas	Gem	Ivy	Jay

## Vulcanite, 60°.

0-8	0-12	Rs. 1	Rs. 1-4	Rs. 1-8	Rs. 1-12	Rs. 2	Rs. 2-4	Rs. 2-8	Rs. 2-12	Rs. 3	Rs. 3-4	Rs. 3-8	
Code Word for Telegrams —	Jam	Kit	Net	Pad	Paw	Pie	Rib	Tun	Tow	Van	App	Awn	Bar

## LETTERING SET SQUARES, SLOPES AND BATTERS, ROOF PITCHES, AND NUT ANGLES.



Code Word  
for Telegrams.

**LETTERING SET SQUARES** giving angles of Roman and block letters, per set of 3, in vulcanite ... .. Rs. 3

**SLOPES AND BATTERS**, set of 6 4-inch vulcanite, 1 to 1, 2 to 1, 3 to 1, 4 to 1, 5 to 1, 6 to 1, 8 to 1, 12 to 1 ... .. Rs. 4

**Set of 8 ditto**, 6-inch vulcanite, 1 to 1,  $1\frac{1}{2}$  to 1, 2 to 1,  $2\frac{1}{2}$  to 1, 3 to 1, 4 to 1, 5 to 1, 6 to 1, 8 to 1, 12 to 1 ... .. Rs. 6

**HEXAGON NUT ANGLES**, Equilateral and Cottage Shapes, set of 2, vulcanite ... .. Rs. 1-8

**ROOF PITCHES**, vulcanite, set of 6,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1,  $1\frac{1}{2}$ , 2, 3 ... .. Rs. 4-8

"ANGULATIC."

"ADRIATIC."

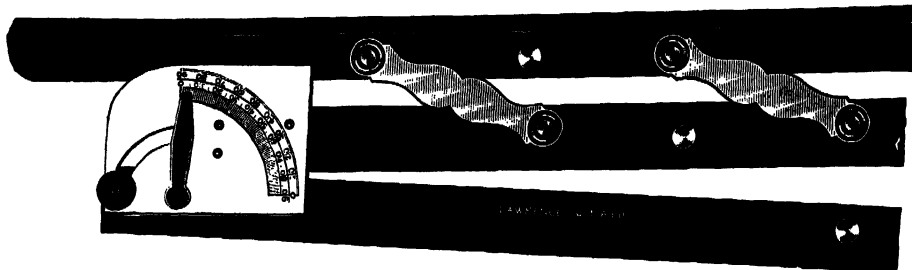
"ANTARTIC."

"ALGEBRIC."

"ARBITIC."

LAWRENCE &amp; MAYO.

## The Sectograph.

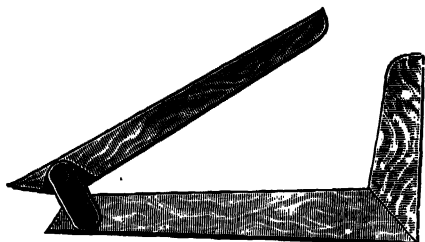


**THE SECTOGRAPH.**—This is an instrument for the setting off of the Sections of a Circle, being a combination of the Parallel Rule and Set Square, with the following special and important advantages:—(1) The Arm attached to the Parallel Rule can be moved to any angle, from  $1^\circ$  to  $90^\circ$ , with most perfect accuracy. (2) When required, any angle can be set and made a fixture by a thumbscrew attached to the Degree Plate, and by the aid of the Parallel Rule lines parallel to such degree can be made with the greatest ease. It is an instrument which will be of the greatest assistance to Architects, Surveyors, Designers, and in fact all Draughtsmen, as without having to adjust a Drawing on the Board for additions, or alterations, it can be used as a T-square and set square combined. To Carpenters it is invaluable, as it enables them to set off quarter spaces of Winding Staircases, or any work in which Angles or Parallels are required.

PRICE, **Rs. 10.**

Code word for Telegrams—"SECTOGRAPH."

## The Clinograph (Harrison's Patent).



The Clinograph is a set-square with a swivelling blade used in conjunction with a T-square, for drawing lines parallel, perpendicular, or symmetrically inclined to any given line or direction.

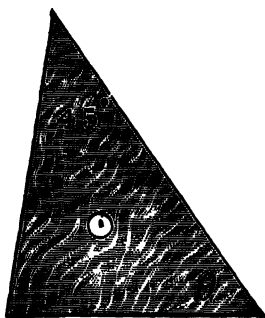
With one edge of the instrument resting against the edge of the T-square, the blade can be instantly set to the required position, and the friction of the joint is sufficient to hold it firmly while in use.

For drawing parallel lines it is slid along the T-square, to any part of the drawing paper. For perpendicular or symmetrical lines, after being set, it is turned with its other edge against the T-square, or with its other face on the paper, as the case may be, after which it is slid into any position as before.

Since one edge always rests against the T-square, the discomfort attending the ordinary methods of drawing inclined lines is avoided, and such work is greatly facilitated, whilst at the same time greater accuracy is secured.

Size 7-inch, Mahogany, **Rs. 3-8.**

Code word for Telegrams—"CHARCOAL."



## Spanton's Patent Sciographic Set-square.

This Set-square enables the draughtsman to project shadows on architectural and Engineering drawings with great facility.

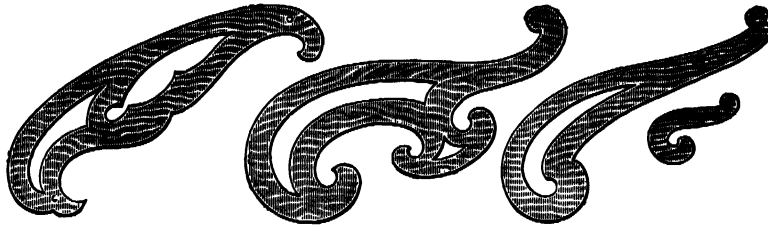
Its shape is shown in the illustration. The angle marked  $O$  (theta) is the angle which a diagonal of a cube forms with one of its vertical edges; the other marked angle is  $45^\circ$ .

PRICE, **Rs. 1-8.**

Code word for Telegrams—"SPANTON."

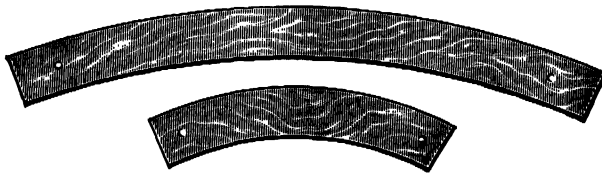
**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## French Pearwood Curves.



Small sizes, **Rs. 0-4** each, **Rs. 2-8** per doz. 10 inches and larger, **Rs. 0-6-0** each, **Rs. 3-8** per doz.

### RAILWAY CURVES.



Set of 25 Railway Pearwood Curves, from $1\frac{1}{2}$ to 30 inch radius, in case..	<b>Rs. 15</b>	Telegrams. "KEEL."
Set of 50 do. do., $1\frac{1}{2}$ to 120 inch radius, in case ..	<b>25</b>	"KERNEL."
Set of 100 do. do., $1\frac{1}{2}$ to 240 inch radius, in case ..	<b>50</b>	"KETTLE."
Set of 50 m/m Curves, from three centimetres to 300 centimetres ..	<b>25</b>	"KNIFE."

### CURVE RADIATOR.

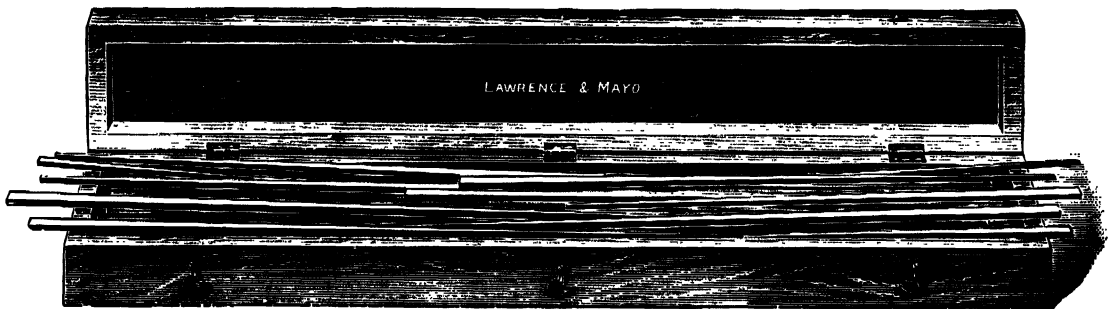


To find centre of any curve and to erect perpendicular, Vulcanite. "Fashioner."  
**Rs. 2.**

### SHIP CURVES AND SPLINES.



Set of 40 Vulcanite Ship Curves, Admiralty patterns, in case. **Rs. 55.** Code Word for Telegrams, "ADMIRALTY."



**SPLINES** or Penning Battens for Naval Architecture or Ship Builders. Set of 20, Lancewood, in 5-feet case.  
Code Word for Telegrams, "ARCTOMETER." **Rs. 30.**

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# BROOKS' Patent FLEXIBLE CURVES for Draughtsmen.

Made in several styles to suit all classes of work. For Architects, Engineers, Machine Designers and Railway Draughtsmen, Shipbuilders, Physicists (for drawing experimental curves, &c.).

FIG. 1.—Pattern A (and AA) is a flexible strip of steel, provided with tabs at intervals along its whole length. The 8-inch size can be held down in position by placing the fingers of one hand on the tabs (see Fig. 1), while the pen is used with the other. In the larger sizes the tabs are secured by weights or drawing pins. Weights resting on the tabs do not obstruct the ruling pen. In Pattern AA (for very sharp bends), the tabs are set close together, and the strip, being very thin, can be bent to a curve of half-inch radius.

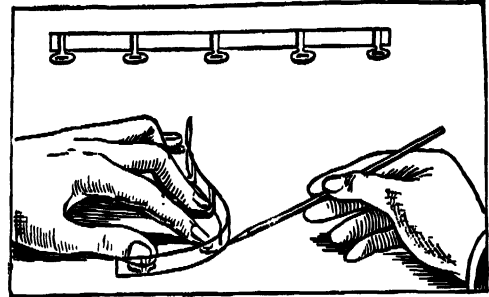


FIG. 1. Pattern A.

Made in all sizes up to 4 or 5 feet and over. Large sizes secured by weights or drawing-pins.

Patterns B, C and D, being self-clamping, are reversible, and can be used for making symmetrical drawings. B and C are also very useful as adjustable templates for transferring the outline of mouldings, &c.

FIG. 2.—Pattern B has a steel strip, and any shape given to it is retained by means of the stiff-hinged linkwork attached to the tabs, as shown in Fig. 2.

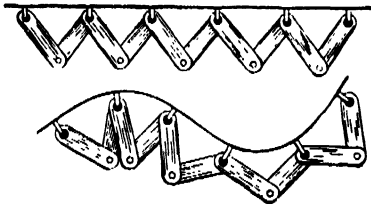


FIG. 2.—Pattern B (self-clamping), 9 inch size.

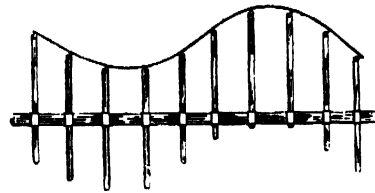


FIG. 3.—Pattern C (self-clamping), made up to any length.

Pattern C has a steel strip thicker than in B pattern and is specially designed for drawing long curves such as are required by ship and boat-builders, and is made in sizes from 1 foot up to any length. Light wooden cross-bars, hinged to the tabs, slide through brass spring-clamps and are thereby held friction-tight against a long wooden bar running the length of the Curve. The Curve is adjusted by pushing at either end of the cross-bars, taking care not to press on the strip between the tabs. The instrument, *when being shaped*, should be placed on the paper with the long bar *under* the cross-bars. In this position, pressing down on the long bar at a point near any clamp will temporarily diminish the stiffness of the latter, thus enabling the cross-bars to slide with ease.

Pattern D is a modification of pattern C, embodying the suggestions of leading naval architects. Instead of the steel band of pattern C, a lancewood spline, tapered towards one end, is used, and the centre bar is provided with two setting points, so that the Curve can be set accurately to the centre line of the drawing, and held down by the two long drawing-pins (provided) which pass through holes in the end blocks.

## PRICES.

<b>Pattern A</b> (FIG. 1)	8 in.	12 in.	18 in.	24 in.	48 in.	72 in.
	<b>Rs. 1-8.</b>	<b>Rs. 2.</b>	<b>Rs. 2-8.</b>	<b>Rs. 3.</b>	<b>Rs. 4.</b>	<b>Rs. 5.</b>
Code word for Telegrams—	"FACETIC."	"FACTORIC."	"FADDIST."	"FAIRSHIP."	"FAITERY."	"FAITHFUL."
(The thickness increases with the length.)						
<b>Pattern AA</b> (for very sharp bends)	8 in.	12 in.				
	<b>Rs. 2.</b>	<b>Rs. 3.</b>				
Code word for Telegrams—	"FALCADE."	"FALCATOR."				
<b>Pattern B</b> (FIG. 2)	9 in.	12 in.	18 in.			
	<b>Rs. 3.</b>	<b>Rs. 5.</b>	<b>Rs. 6.</b>			
Code word for Telegrams—	"FALERNO."	"FALERNIAN."	"FALISCAN."			
<b>Pattern C</b> (FIG. 3)	12 in.	24 in.	48 in.	72 in.		
	<b>Rs. 4-8.</b>	<b>Rs. 7-8.</b>	<b>Rs. 12.</b>	<b>Rs. 18.</b>		
Code word for Telegrams—	"FALLOWIST."	"FALSIFIER."	"FAMILIAR."	"FAMULATIC."		
<b>Pattern D</b> (Lancewood)	24 in.	48 in.	72 in.			
	<b>Rs. 12.</b>	<b>Rs. 22.</b>	<b>Rs. 30.</b>			
Code word for Telegrams—	"FANATICAL."	"FANDANGO."	"FANTASTIC."			

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

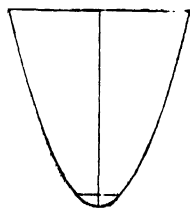
## THE BROOKS' MATHEMATICAL CURVES.

**T**HE BROOKS' Mathematical Curves are very accurately cut in transparent sheet celluloid, to equations, and they have several uses.

1st—They may be employed with squared paper by mathematical students in schools and colleges in the graphical solution of algebraic problems (a method which has come very much into favour). Quadratic equations may be solved in a moment, squares, cubes, square roots, cube roots obtained, and so on, and the student is easily familiarized with the connexion between geometry and algebra. Pamphlet with full instructions given with each curve. *Mathematical Gazette*, May, 1905.—“... of use in teaching geometrical conics... accurately constructed.”

2nd—The edge being machined with great accuracy, they may be used as straight edge rulers, and, by means of the fine engraved line, as most convenient set squares.

3rd—They have the obvious use as French curves for draughtsmen.



### PARABOLA

Eqn.  $y = x^2$   
Unit 1 inch.  
Axis, focus, and latus rectum marked.

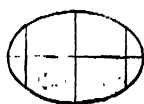


FIG. 2.

### ELLIPSE.

Axes 3 and 2 inches.  
Axes and foci marked

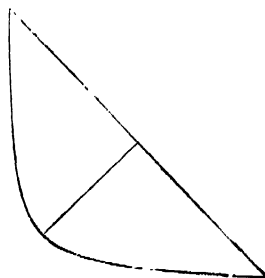


FIG. 3.

### RECTANGULAR HYPERBOLA.

Eqn.  $xy = 1$  inch.  
Axis marked.



FIG. 4.

### CYCLOID.

Roulette of Circle 2 inches diameter.  
Central ordinate marked.



FIG. 5.

### CUBIC CURVE.

Eqn.  $y = x^3$ .  
Unit 1 inch.

- FIG. 1. Parabola  
,, 2. Ellipse  
,, 3. Rectangular Hyperbola.  
,, 4. Cycloid  
,, 5. Cubic

Code Word for full set of the above Curves (1 to 5).

Rs.  
Rs.  
Rs.  
Rs.  
Rs.

Code Word  
for Telegrams.  
‘PARABOLA.’  
‘PATROON.’  
‘PATERNAL.’  
‘PASTORIST.’  
‘PARTIZAN.’  
‘PARLATORY.’

## THE BROOKS' CORNER CURVE.

FIG. 6.

**T**HIS curve is a great time-saver for MACHINE DRAUGHTSMEN. It consists of a circular disc of transparent celluloid, about 2 inches in diameter, having a series of small circular notches of different sizes on its edge, and provided with a small handle at the centre. With this instrument the machine draughtsman may draw in with the ruling pen all the smallest curves, such as those which round off corners to indicate filets, without once having recourse to the bow compass. The instrument is simply twirled slowly by its handle over the place where the curve is to be drawn till the suitable notch comes into position, and the curve is at once drawn in. Each curve has straight tails so that it merges smoothly into the straight lines of the drawing. The working edge is raised slightly to prevent the ink running under. The time expended by the old method in changing tools, wiping pens, and finding centres is obviously worth saving. Another advantage is that the appearance of the curve may be judged of before the ink is applied to the paper.

Full instructions sent with each curve.

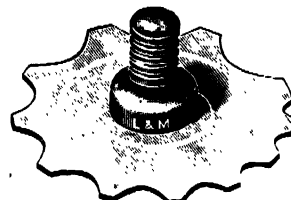


FIG. 6.

PRICE, Rs. 1.

Code Word for Telegram, “PARHELION.”

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON: also BOMBAY. CALCUTTA. MADRAS and RANGOON.



## PROTRACTORS AND STATION POINTERS.

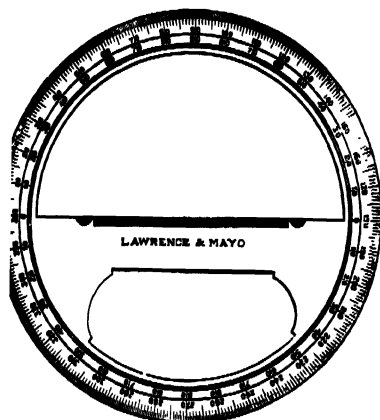


FIG. 1.

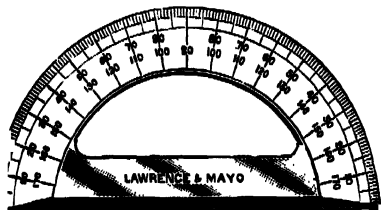


FIG. 2.

FIG. 1.—PROTRACTOR, circular, German silver, divided to  $\frac{1}{2}^\circ$ , in mahogany case. 6 in., **Rs. 18.** Code word, "ROUND." 8 in., **Rs. 24.** Code word, "ROUNDER." 10 in., **Rs. 32.** Code word, "RUNNER."

PROTRACTOR, circular, transparent celluloid. 6 in., **Rs. 3.** Code word, "VOLLEY." 8 in., **Rs. 4-8.** Code word, "VIOLIN." 10 in., **Rs. 6.** Code word, "VIOLET."

FIG. 2.—PROTRACTOR, semi-circular, German silver, divided to  $\frac{1}{2}^\circ$ , in mahogany case. 6 in., **Rs. 10.** Code word, "NOTARY." 8 in., **Rs. 16.** Code word, "NUMERATOR." 10 in., **Rs. 21.** Code word, "NEBULAR."

PROTRACTOR, semi-circular, transparent celluloid. 6 in., **Rs. 1-8.** Code word, "PEDESTAL." 8 in., **Rs. 2-8.** Code word, "PETARD." 10 in., **Rs. 3-8.** Code word, "PEWTER."

FIG. 3.—6 in., German silver, circular PROTRACTOR, with arm and vernier divided to 1 minute, in mahogany case. **Rs. 50.** Code word for Telegrams, "KEYSTONE."

FIG. 4.—6 in., German silver, semi-circular PROTRACTOR, with arm and vernier divided to 1 minute, in mahogany case. **Rs. 40.** Code word for Telegrams, "KEEPER."

FIG. 5.—Gun-metal, 6 in., circular PROTRACTOR, with two folding arms graduated on silver with two verniers, reading to one minute of arc, clamp and tangent screw adjustment, in mahogany case. **Rs. 85.** Code word for Telegrams, "KNOCKER."

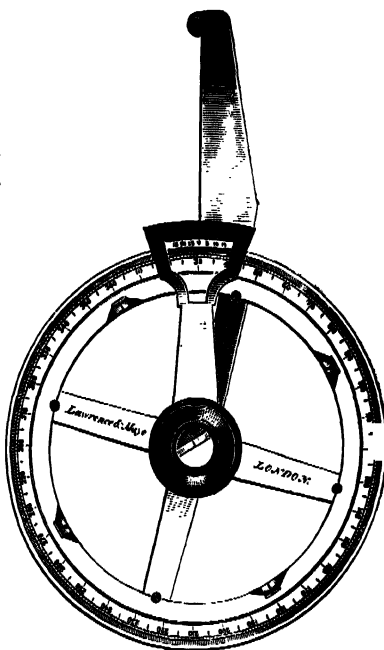


FIG. 3.

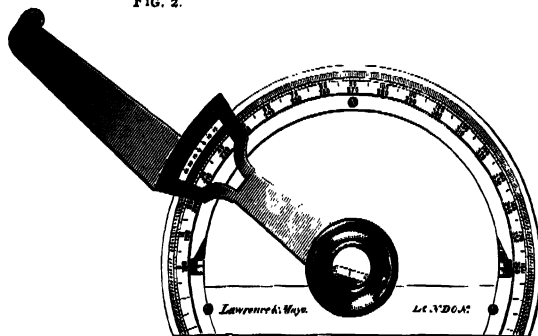


FIG. 4.

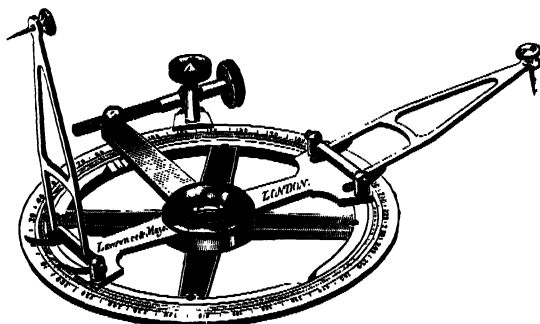


FIG. 5.

## STATION POINTER.

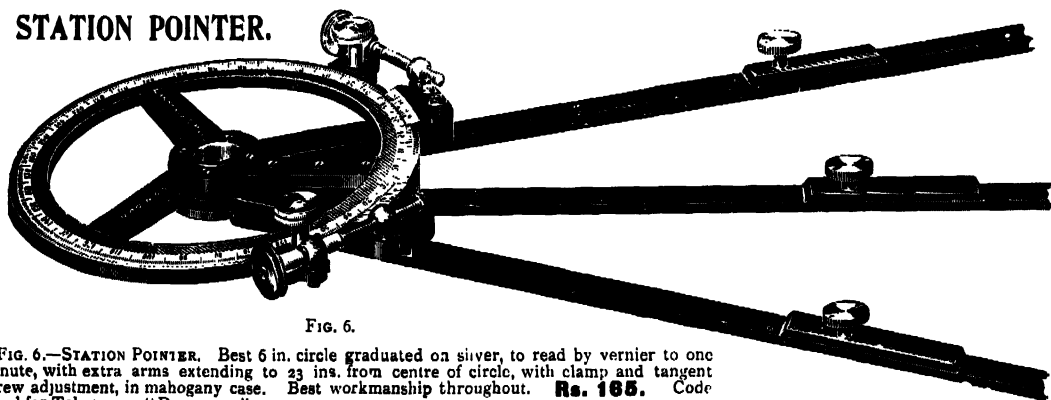
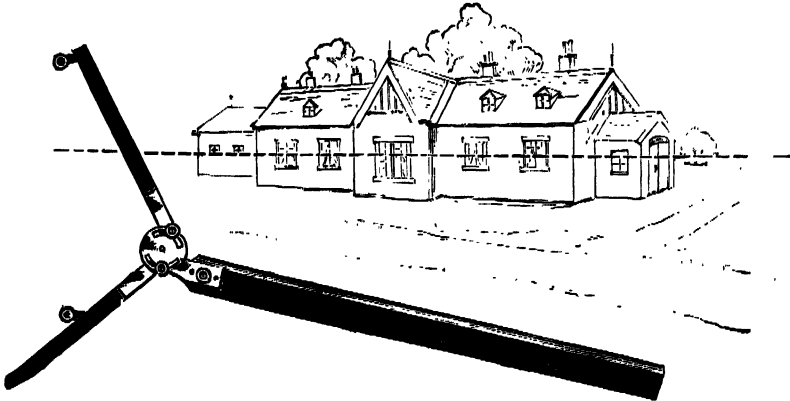


FIG. 6.

FIG. 6.—STATION POINTER. Best 6 in. circle graduated on silver, to read by vernier to one minute, with extra arms extending to 23 ins. from centre of circle, with clamp and tangent screw adjustment, in mahogany case. Best workmanship throughout. **Rs. 165.** Code word for Telegrams, "DESIGNER."

**Perspective Instruments, Planimeters, Pentagraphs, Eidographs, Centrolineads, ETC.**



30 inch or 42-inch Centrolinead in mahogany, edged with ebony, with studs to work against, and electrum mounts.

**PRICE, Rs. 25**

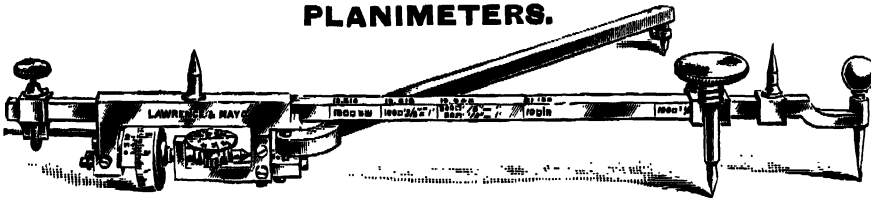
Code word for Telegrams,  
30-inch, "ROLINEAD."  
42-inch, "REGAL."

Eccentrolinead, for drawing eccentric lines—very useful for mechanical drawing—ivory and electrum.

**PRICE, Rs. 10**

Code word for Telegrams,  
"DIAGRAM."

**PLANIMETERS.**



Amsler's Patent Planimeter, for computing areas, with special arrangement for finding rapidly the mean height of indicator diagrams, and special screw for lifting pointer from paper so as to allow the diagram to be exchanged without disturbing roller readings.

**PRICE, Rs. 85.** Code word for Telegrams, "AMSLER."

**PENTAGRAPHS.**

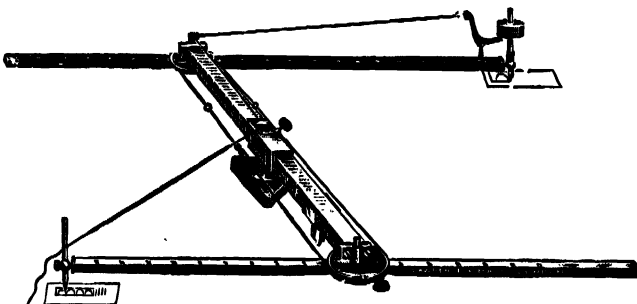
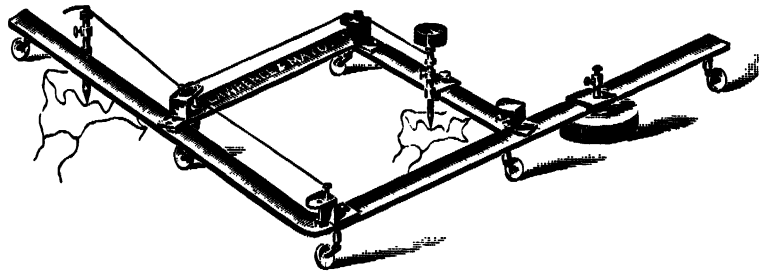
Pentagraph for enlarging or reducing Plans, Maps, &c. (as supplied to His Majesty's Government).

36 inch, in brass divided and engraved, in polished mahogany case.

**PRICE, Rs. 135**

Code word for Telegrams,  
"PENTAGRAPH."

Other sizes of Pentagraphs made to order.



**EIDOGRAPH.**

Improved pattern Eidograph, 30 inch. Capable of working reductions from equal size to one eighth, with all fittings complete, in mahogany case. Best workmanship throughout.

**PRICE, Rs. 240.**

Code word for Telegrams, "EIDOGRAPH."

**BOOK ON DRAWING AND MEASURING INSTRUMENTS.**

By J. F. HEATHER, M.A.

This Book thoroughly describes the use of the Planimeter, Pentagraph, Eidograph and other Drawing and Measuring Instruments, and will at all times be found useful for reference.

**PRICE, Rs. 1-8.**

Code word for Telegrams, "KNOWLEDGE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

Best make, with turned over edges, arranged suitable for Architects, in Polished Mahogany Box, 9 in. by 5 in. by 1½ in., with lock and key. Containing 70 sets Alphabets, 1 each 38 to 47. 6 sets Figures, 1 each 50 to 55. 48 various plates, 1 each Scale Chains to 1 Inch, Scale Feet to 1 Inch, Scale Inch to 1 Foot, as 62. 1 each Drawing No., Sheet No. as 59. 1 each Specification, Reference, as 36. 1 plate, 58. 1 each Plan, Section, Elevation, as 56. 1 plate, 57. 1 each Back Elevation, Side Elevation, Front Elevation, End Elevation, Transverse Section, Longitudinal Section, First Floor Plan, Second Floor Plan, Third Floor Plan, Roof Plan, Ground Plan, Basement Plan, Section on Line, as 60. 1 each Dressing Room, Breakfast Room, Library, Hall, Sitting Room, Dining Room, Drawing Room, Bath Room, Passage, Coach House, Wine Cellar, Stable, Scullery, Porch, as 61. 1 each 48, 64. 2 corner pieces, 35, 37. 3 North points, 63, 65, 66. 2 Brushes and Ink. PRICE, **Rs. 75.** Code Word for Telegrams—“Logwood.”



# Copper Stencil Plates for Engineers.

Best make, with turned over edges, arranged suitable for Engineers. In Polished Mahogany Box, 9 in. x 5 in. x 1½ in., with lock and key. Containing 10 sets Alphabets, 1 each, 4 to 13. 6 sets Figures, 1 each, 14 to 19. 40 various plates, 1 each Corner pieces, 1-3-32. 1 each Border pieces, 31-34. 1 each Scale Chains to one Inch, Scale Fathoms to one Inch, Scale Feet to one Inch, Scale Inch to one Foot, as 25. 1 each Scale of Feet, Scale of Chains, as 26. 1 each Drawing No., Sheet No., Full size Half size, Quarter size, as 21. 1 plate 28. 1 each Plan, Section as 27. 1 plate 2. 1 plate 20. 1 each Plan, Section, Elevation, as 23. 1 each Transverse Section, Section on line, Cross Section, Ground Plan, Longitudinal Section, Horizontal Scale, Drawing No., Vertical, Front Elevation, End Elevation, as 24. One each, North Point 29-30-31, 2 Brushes and Ink. Price, **Rs. 75.** Code Word for Telegrams, "LOGICIAN."





## Drawing Instruments.

SUPERIOR QUALITY.

**Indestructible Geometrical Set for Colleges and Schools.**

**In Black-Japanned Tin Case, with Lift-Out Tray.**

**Without doubt the most Practical Geometrical Set ever introduced.**

FIG. 1A. Black-Japanned Tin Case with hinged clasp, loose satin cushion and velvet lined lift-out tray, fitted with :

Knee Jointed Bow Pencil Compass with patent holder for solid leads.

Brass School Divider.

6-inch Boxwood Protractor, divided inches and  $\frac{1}{4}$ ths, inches and  $\frac{1}{10}$ ths and millimeters.

Pearwood Set Squares, 45° 4-inch and 60° 5-inch.

Good quality Drawing Pencil, and

Metal Case of Solid Leads.

Price, complete, as illustrated,

**Rs. 5.**

Code word for telegrams—  
"DOLPHIN."

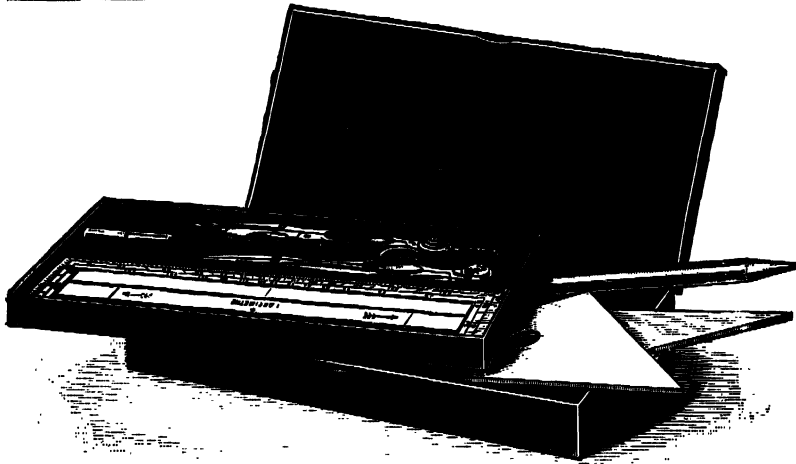


FIG. 1A.

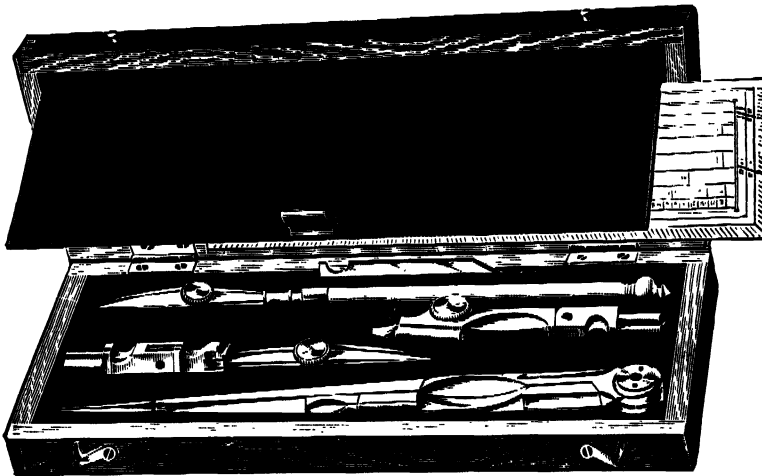


FIG. 1.

FIG. 1. Mahogany Hook Case, velvet lined with flap in lid to hold protractor rule, containing the following electrum instruments : Long steel joint compass, pen and pencil points, ivory handle drawing pen, key and boxwood protractor.

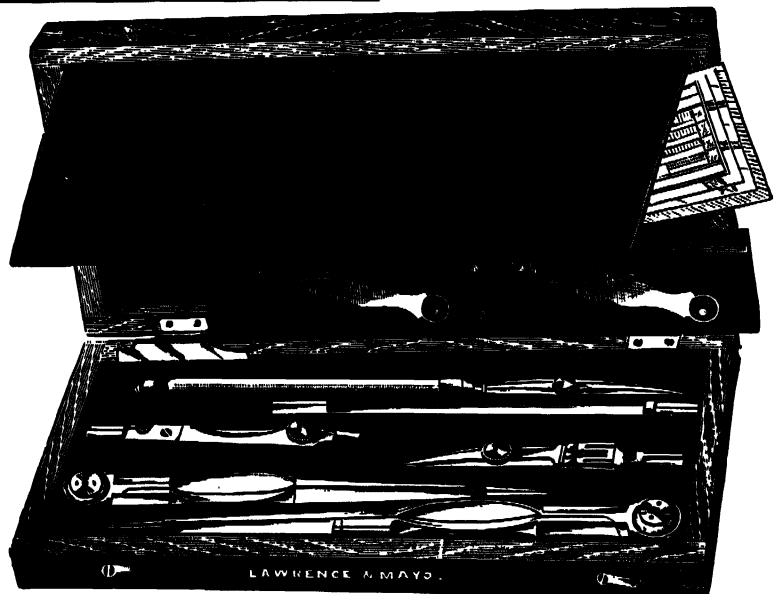
PRICE, **Rs. 10.**

Code word for Telegrams—  
"Boxwood."

Fig. 2. Mahogany Hook Case, velvet lined, with flap in lid to hold rule, containing the following electrum instruments. Long steel joint compass, pen point with lift up nib and pencil points, lengthening bar, long steel joint divider, ivory handle drawing pen, key, ebony parallel rule and boxwood protractor.

PRICE, **Rs. 18.**

Code word for Telegrams—



## Superior Quality Drawing Instruments.

FIG. 3.—Mahogany case, with lock and key, and brass name plate, movable tray, velvet lined, containing the following superior quality electrum instruments: 6-inch sector jointed improved pattern compass, pen and pencil points, lengthening bar, 5-inch sector joint divider, pen and pencil bows, ivory handle lift up nib pen, ivory handle steel pen, knife key, ebony parallel rule and boxwood protractor.

PRICE, **Rs. 35.**

Code Word for Telegrams—  
"MAHOGANY."



FIG. 3.

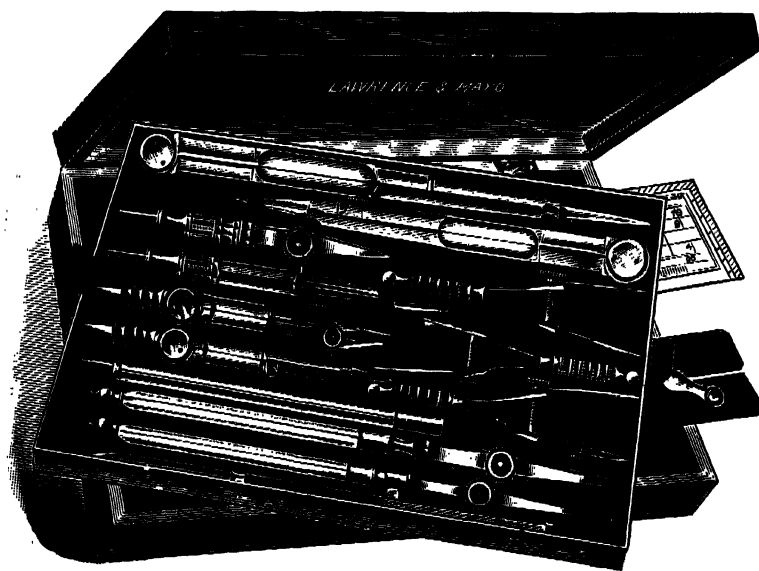


FIG. 4.

FIG. 4.—Mahogany case, with lock and key, and brass name plate, movable tray, velvet lined, containing the following superior quality electrum instruments: 6-inch improved pattern sector jointed compass, pen and pencil points and lengthening bar, 5-inch improved pattern hair spring divider, improved pattern pen and pencil bows, set of three spring bows, ivory handle lift up nib pen, ivory handle steel pen, knife key, ebony parallel rule and boxwood protractor.

PRICE, **Rs. 50.**

Code word for Telegrams—  
"MAPLE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# SUPERIOR QUALITY DRAWING INSTRUMENTS.

FIG. 5.—Russia leather case, with name plate, containing 4½-in. extra finished electrum double-jointed compass with patent B needle points, ink and pencil points, two lengthening bars, improved hair spring divider, pair of double-jointed ink and pencil bows, with patent B needle points, set of three spring bows, with patent B needle points, two drawing pens and pricker, ivory parallel rule and ivory protractor scale.

PRICE, **Rs. 100.**

Code word for Telegrams—  
"BRILLIANT."

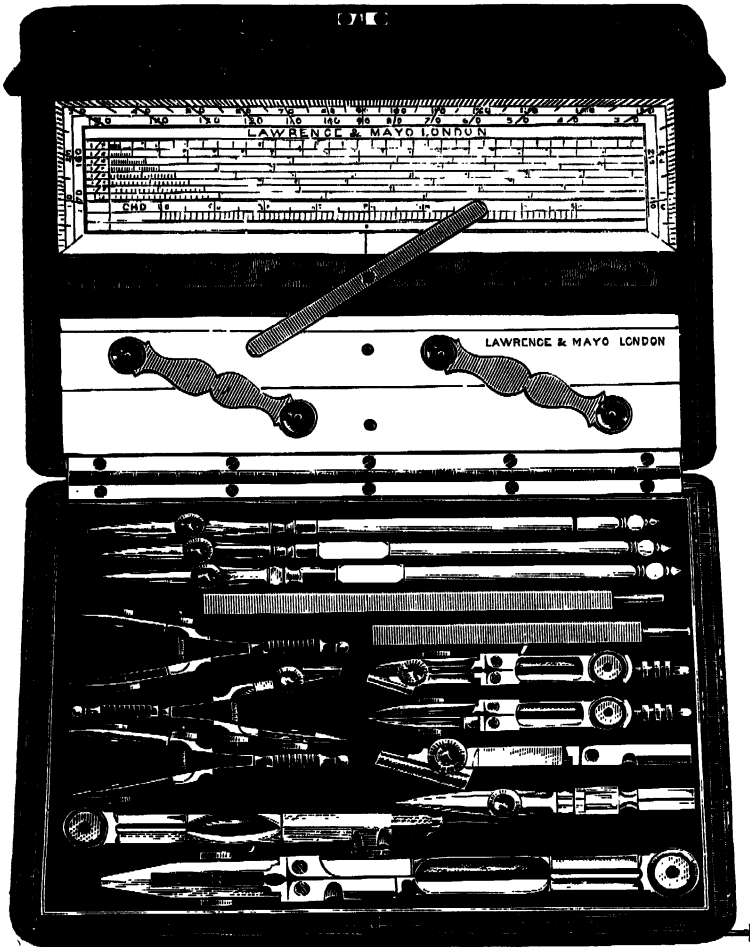
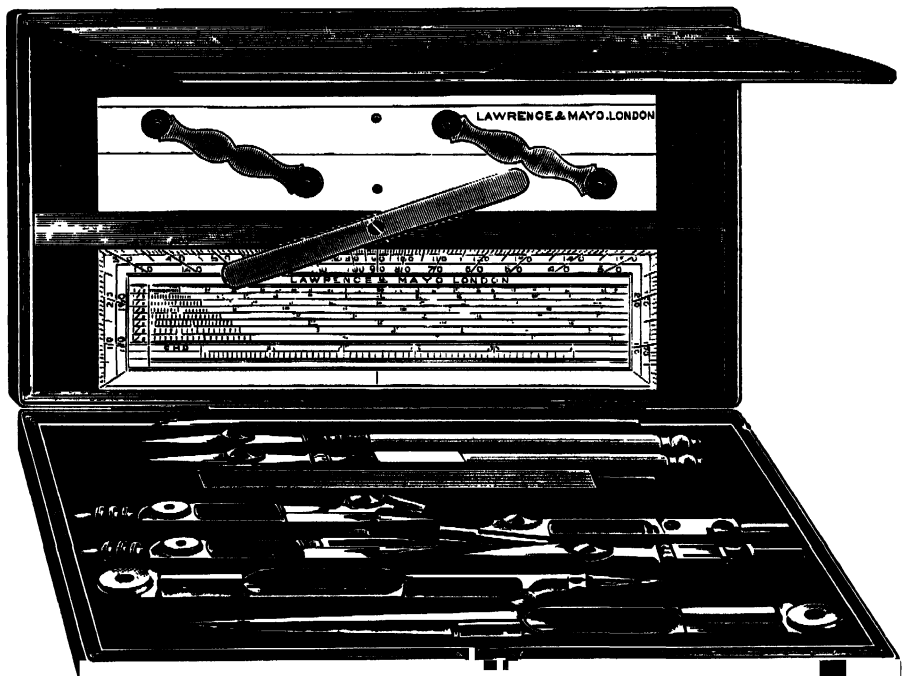


FIG. 6.—Leather case with name plate, flap in lid for rules, velvet lined, containing the following superior quality electrum instruments: 6 inch sector jointed compass, with pen and pencil points and lengthening bar, 5 inch hair spring divider, improved pattern plain point bow pen and pencil, ivory handle lift-up nib pen, ivory handle steel pen, knife key, ivory parallel rule and ivory protractor.

PRICE, **Rs. 45.**

Code word for  
Telegrams—





SUPERIOR QUALITY.  
**DRAWING INSTRUMENTS.**  
 MAGAZINE CASE.

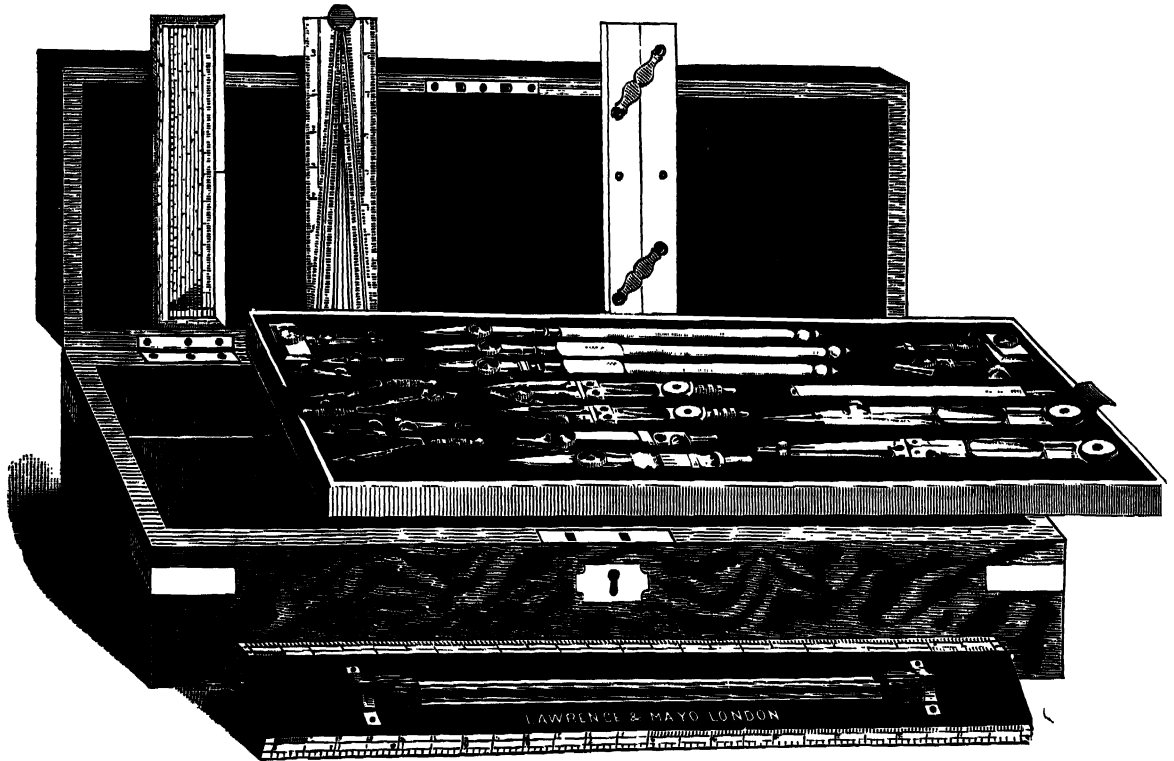


FIG. 7.

Solid Walnut Case, metal bound edges, name plate, tumbler lock and key, with tray velvet lined, containing the following finest quality and extra finished electrum instruments.

Six inch double-jointed compass with needle points, pen and pencil points and lengthening bar, 5-inch improved pattern hair divider, double-jointed pen and pencil bows with needle points, set of three spring bows with needle points, set of beam compasses with adjustment and needle points, 2 ivory handle drawing pens and pricker, knife key, 12-inch ivory edge rolling parallel rule, ivory protractor, parallel, and sector.

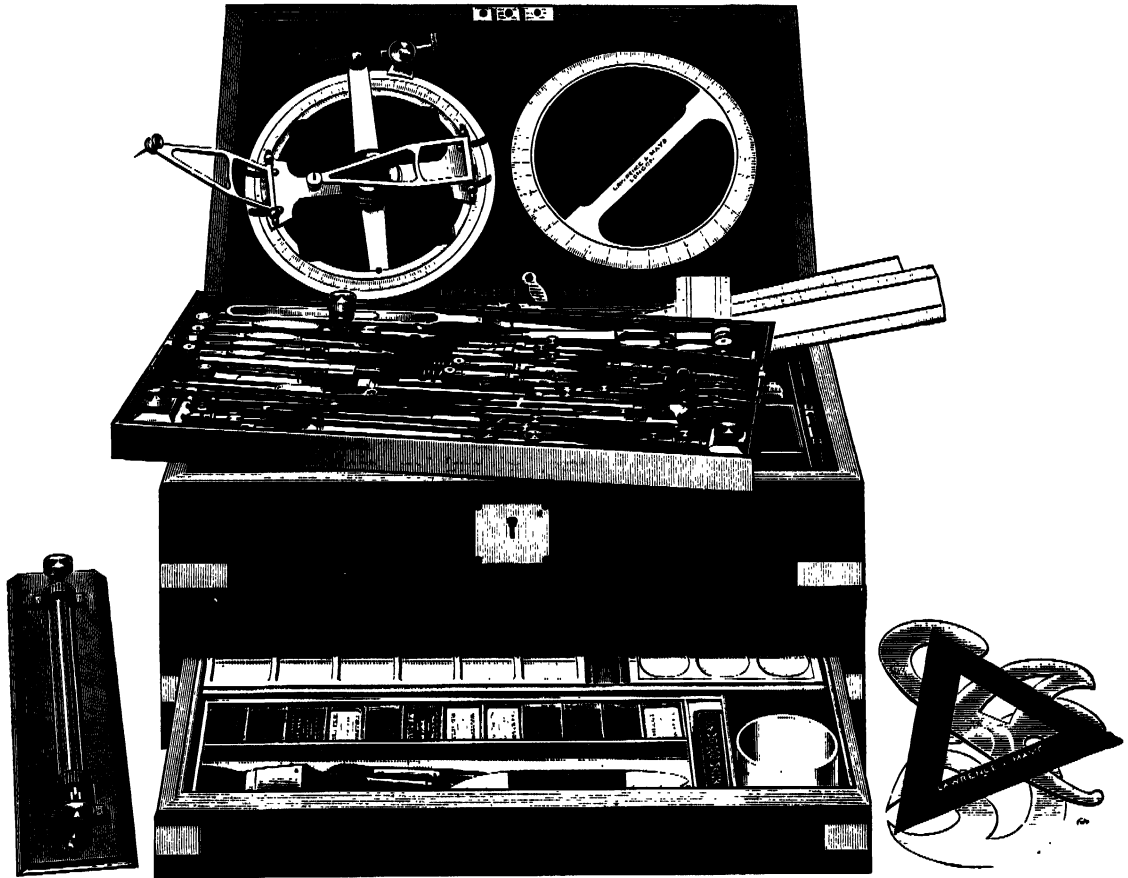
PRICE, **Rs. 165.**

Code word for Telegrams—"MAGAZINE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
 67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## THE "EMPORIUM"

## PRESENTATION CASE OF DRAWING INSTRUMENTS.



**P**RESENTATION CASE.—HANDSOME ELECTRUM-BOUND WALNUT CASE,  $14\frac{1}{2} \times 8\frac{1}{2} \times 6\frac{1}{2}$ , lined with silk velvet, with two trays, Chubb's lock, drawer, etc., containing the following **finest quality and extra finished electrum and gun-metal instruments**:—6-in. compass, with improved needle points, ink, pencil, and wheel points, and two lengthening bars—beam compass heads with adjustment, with improved needle points and ink, and pencil points—9-in. proportional compass fully divided—Napier compass—triangular compass—4 $\frac{1}{2}$ -in. compass, with improved needle points and ink and pencil points—4-in. improved hair divider—5-in. sector divider—ink and pencil bows, with improved needle points—set of three needle spring bows—opisometer—wheel pen and set of four wheels—two improved steel upper nib pens—fine steel pen—red ink pen—road pen—border pen—pricker—tracer—knife key—bow key—6-in. electrum circular protractor, with 2 folding arms graduated on silver, with two verniers reading to one minute of arc, clamp and tangent screw adjustment—6-in. electrum circular protractor, divided to  $\frac{1}{4}^\circ$ —six 12-in. ivory chain scales and offsets—12-in. solid gun-metal rolling parallel rule—angles and curves—twelve cakes of colours—Indian ink—brushes, palette, and tinting cup.

The above case forms as complete a collection of drawing instruments as could possibly be desired, and in every respect can be strongly recommended as a perfect case for presentation purposes.

PRICE, **Rs. 550.**

Code word for Telegrams—"TAMARIND."

---

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## Cases of Drawing Instruments as used in Public Schools.

Addiscombe Case : 13-inch mahogany case, lock and key and brass name plate, velvet lined, containing the following sector-joint brass instruments : 6-inch compass with pen and pencil points and lengthening bar, 5-inch divider, pen and pencil bows, 6-inch brass-jointed drawing pen, 6-inch steel pen, knife key, bow key, ivory military protractor, ivory sector and set of boxwood Marquois scales. . . . . **Rs. 45**  
Code word for Telegrams, "DIAMOND."

Sandhurst College Case : Mahogany case with name plate and tray, velvet lined, containing the following brass instruments : 6-inch long-joint compass with pen and pencil points, 5-inch divider, bow pen, 6-inch steel pen with ivory handle, knife key, bow key, pencil and ivory military protractor. . . . . **Rs. 22**  
Code word, "SANDHURST."

Royal India Engineering College (Cooper's Hill) Case : Walnut Case, lock and key and brass name plate, with tray, velvet lined, containing the following **extra quality electrum instruments**: Improved pattern double-jointed compass with needle points, pen and pencil points and lengthening bar, 5-inch hair divider, pen and pencil bows with needle points, set of three spring bows with needle points, lift up nib jointed pen, steel pen, knife key, ivory protractor, sector and parallel rule . . . . . **Rs. 70**  
Code word, "COOPER."

Royal Military Academy Case : Mahogany case, with tray, lock and key, containing the following brass sector-joint instruments: 6-inch compass, ink and pencil points, lengthening bar, 5-inch divider with hair spring, ink and pencil bows with steel joints, 6-inch brass drawing pen with lift-up nib, 6-inch steel drawing pen, knife key, bow key, ivory sector, and ivory fully divided protractor . . . . . **Rs. 38**  
Code word, "ACADEMY."

Royal School of Naval Architecture : Mahogany case, with tray, lock and key, containing the following electrum instruments, viz. : 6-inch sector joint compass, with one leg knee-jointed, ink and pencil points, lengthening bar, 5-inch sector-joint divider with hair spring, improved pattern needle pointed pen bow, both legs knee-jointed, steel-pointed pencil bow, 6-inch electrum drawing pen with square handle, 6-inch steel drawing pen with round handle, 6-inch ebony parallel rule, ivory protractor fully divided, knife key and bow key . . . . . **Rs. 55**  
Code word "SCHOOL."

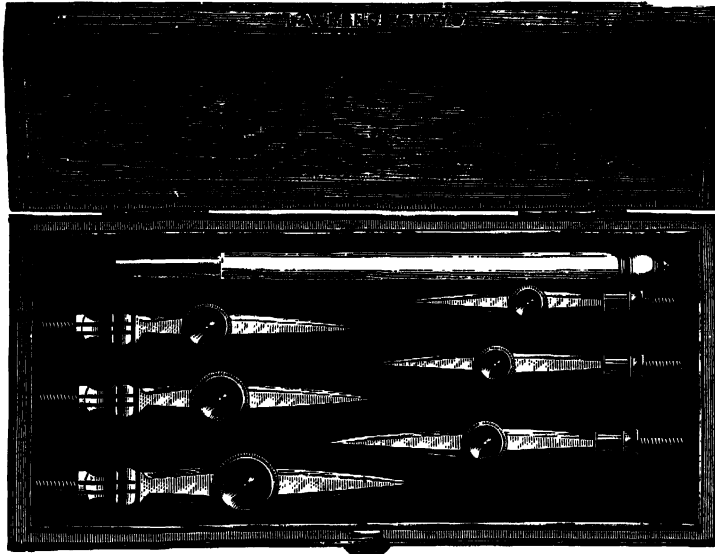
Garrison Class Case : 13-inch mahogany case, with tray, lock and key, containing the following brass sector-joint instruments, viz. : 6-inch compass, ink and pencil points, lengthening bar, 5-inch divider, ink and pencil bows with steel-joints, 6-inch steel drawing pen, 6-inch ebony parallel rule, boxwood protractor, service-pattern, knife key, bow key, and set of boxwood Marquois scales (Woolwich pattern) . . . . . **Rs. 32**  
Code word, "GARRISON."

Engineers' and Architects' Case : 8-inch walnut case, with tray, lock and key, containing the following extra quality electrum instruments : 6-inch sector-joint compass, knee-joints to both legs, improved pattern nut and bolt needle points, ink and pencil points, lengthening bar, 5-inch divider sector-joint with hair spring, needle-pointed ink and pencil bows, both legs knee-jointed, set of three spring bows, fitted with nut and bolt needle points, two 6-inch drawing pens with square ivory handles (one pen has lift-up nib), ivory fully-divided protractor, ivory sector, 6-inch ivory parallel rule, pencil, knife key and bow key . . . . . **Rs. 95**  
Code word, "ARCHITECT."

**MAGAZINE CASES FOR PRESENTATION, TO ESTIMATE AND ORDER.**

*Instruments repaired and new cases supplied.*

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**



## Drawing Pens.

Fig. 29.—Set of 6 Drawing Pens, three lift-up nib, and three fine line, to fit one handle, in morocco case.

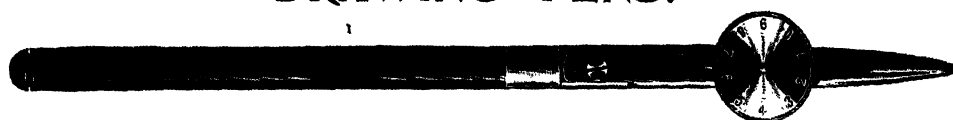
Code Word  
for  
Telegrams.  
Lifter.

**Rs. 15**

Fig 29.

30. Drawing Pen, ivory handle, steel, fine .. .. . **Rs. 2** Pen.  
31. Do. do. improved pattern, square ivory handle .. .. . **Rs. 2-8** Earring.
32. Drawing Pen, ivory handle, turn-up nib, superior quality electrum .. .. . **Rs. 3** Penny.
33. Drawing Pen, square ivory handle, turn-up nib, superior quality electrum .. .. . **Rs. 3-8** Draw.  
34. Do. extra stout back nib, jointed pen, extra quality electrum, square ivory handle **Rs. 5** Drawer.  
35. Do. ivory handle, all electrum, for red ink .. .. . **Rs. 2-4** Drawing.  
36. Bordering or Colouring Pen, improved pattern .. .. . **Rs. 5** Border.
37. Road or Double Pen, also double pencil, ivory handle.. .. . **Rs. 6** } For Pen,  
Road.  
For Pencil  
Rail.
38. Wheel Pen, improved pattern, with set of 4 wheels in handle, superior quality electrum .. **Rs. 7** Wheel.
39. Pricker, with B needle points, and reserve for needles .. .. . **Rs. 2-4** Pricker.
40. Tracer, steel, in ivory handle .. .. . **Rs. 1-6** Tracer.

## DRAWING PENS.



- 39 Drawing Pen with cross joint, steel, ebony handle, with index and graduated screw, which can be set to any desired width of line ... ..

Each.

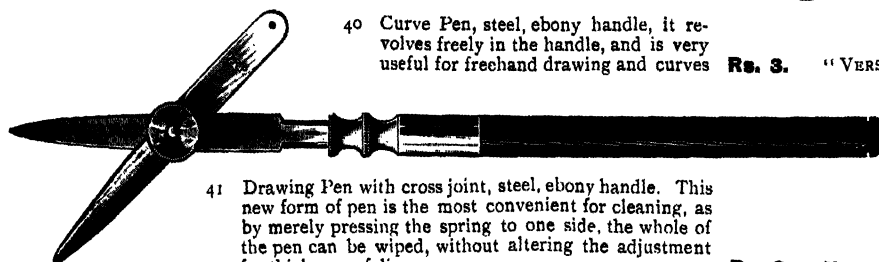
Code word for  
Telegrams.

Rs. 5. "VERIFIER."



- 40 Curve Pen, steel, ebony handle, it revolves freely in the handle, and is very useful for freehand drawing and curves

Rs. 3. "VERSIC."



- 41 Drawing Pen with cross joint, steel, ebony handle. This new form of pen is the most convenient for cleaning, as by merely pressing the spring to one side, the whole of the pen can be wiped, without altering the adjustment for thickness of line ... ..

Rs. 3. "VENUVIAN."

## DIVIDERS, &amp;c.



1. Dividers, brass, 4 in. ... .. Rs. 0.12 "BYWORD."  
Do. do. 5 in. ... .. Rs. 0.12 "BUZZARD."  
Do. do. 6 in. ... .. Rs. 0.12 "BREWSTER."



2. Divider, long steel joint, plain point, 4 in. superior quality electrum ... .. Rs. 2.8 "BRISTLER."  
Do. do. do. 5 in. do. do. do. ... .. Rs. 2.8 "BROCADER."  
3. Do. sector jointed, do. 4 in. do. do. do. ... .. Rs. 3.8 "BRACKETER."  
Do. do. do. 5 in. do. do. do. ... .. Rs. 3.8 "BROOKLET."



4. Divider, sector jointed, hair spring point, 4 in. superior quality electrum ... .. Rs. 5 "BUCKLER."  
Do. do. do. do. 5 in. do. do. do. ... .. Rs. 5 "BUFFETER."  
5. Do. do. improved pattern, 4 in. do. do. do. ... .. Rs. 6 "BULRUSH."  
Do. do. do. do. 5 in. do. do. do. ... .. Rs. 6 "BURGAMOT."



6. Divider, sector jointed, hair spring, with inside screw, 4 in. superior quality electrum ... .. Rs. 7 "BURGESS."  
Do. do. do. do. do. 5 in. do. do. ... .. Rs. 7 "BURSARY."



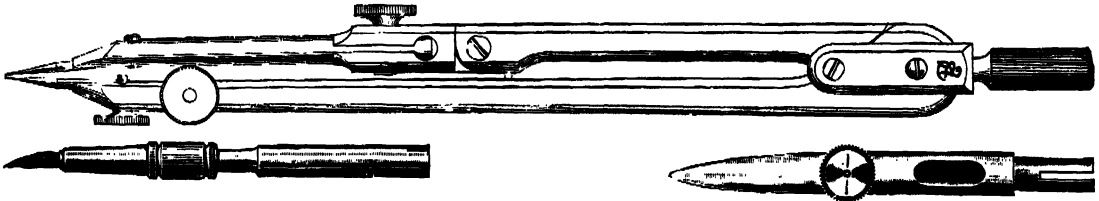
7. Divider, sector jointed for pocket, with screw off sheath to protect points, 3 1/2 in., superior quality electrum ... .. Rs. 7 "BUSTLER."  
Do. do. do. do. 4 in. do. do. do. ... .. Rs. 7 "BUTTRESS."



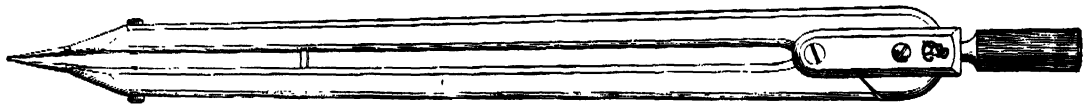
# Mathematical Instruments.

SUPERIOR QUALITY.

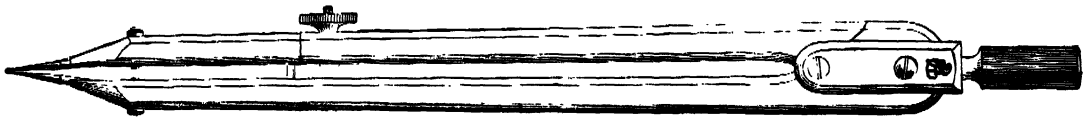
## DIVIDERS, &c.



8. Needle-point Compass, with cross-joint pen, and pencil points. Electrum and best steel 6 in. **Rs. 9.** Code word—"CADUCEAN."



9. Needle-point Divider, electrum and best steel. 6 inch. **Rs. 5.** Code word—"CALUMET"



10. Needle-point Hairspring Divider, electrum and best steel. 6 inch. **Rs. 6.** Code word—"CANNONADE."

## BOWS.



11. Bows, ink, plain points, improved pattern, superior quality electrum. **Rs. 4·8** Code word. "BYSTANDER."
12. Bows, pencil, plain points, improved pattern, superior quality electrum. **Rs. 4·8.** "BURLESQUE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# Nautical or Chart Dividers.

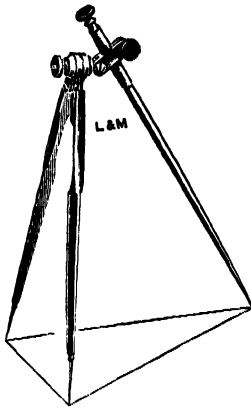


FIG. 3.

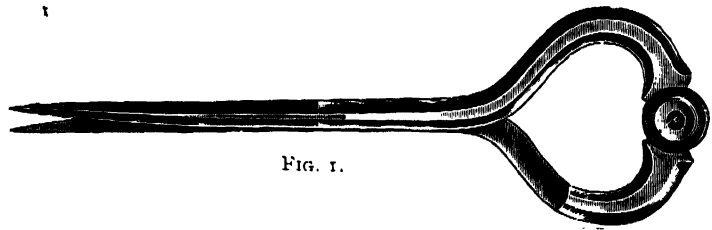


FIG. 1.

Fig. 1.

## One Handed Nautical Divider.

Recommended by the late Captain Lecky in "Wrinkles."

Electrum, steel jointed .. .. .	5 inch.	6 inch.	7 inch.	8 inch.
	<b>Rs. 3</b>	<b>Rs. 4</b>	<b>Rs. 5</b>	<b>Rs. 6</b>

Code words "MAIDAN," "MEGAST," "MAGIAN," "MAZARD."

Fig. 2.

## "Patent" Bisecting Divider.

This Divider gives the exact centre between any two positions, and will be found most useful to navigators and draughtsmen.

8 inch German Silver, in case ... **Rs. 25.**

Code word for telegrams—"ONAGER."

Fig. 3.

## Triangular Divider,

FOR TRANSFERRING POSITIONS.

6 inch Electrum, in leather case, **Rs. 12.**

Code word for telegrams—"VINTNER."

Fig. 4.

## New Parallel Chart Divider (4 Legged)

FOR PLOTTING A  
SHIP'S POSITION  
INSTANTANEOUSLY.

German Silver, in leather case; beautifully

made and accurately adjusted, **sector-jointed throughout.** This instrument consists of two separate dividers combined in a top head-joint, and all four points can be worked parallel to each other, or if desired each divider can be worked separately. It will thus be seen that any four points of the Compass can be marked out simultaneously. The advantages to be gained by the use of this instrument will be readily understood by any ship's officer.

PRICE, in leather pocket case ... **Rs. 30.**

Code word for telegrams—"OROPHANE."

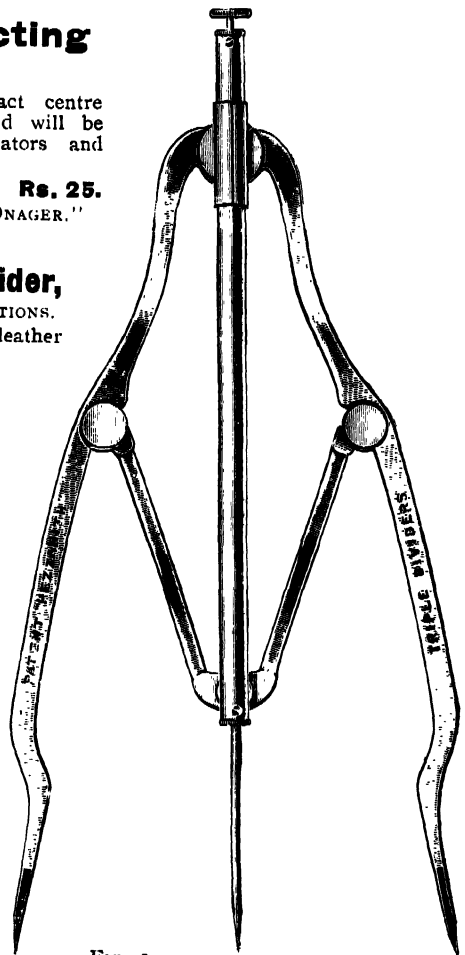


FIG. 2.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# HALF SET COMPASSES.

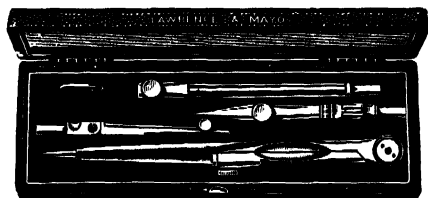


FIG. 1.

Code Word  
for Telegrams.

FIG. 1.—Half set Compasses, steel joint, with ink and pencil points, lengthening bar, and key. Best quality brass,  $5\frac{1}{2}$  in. in case

**Rs. 7-8 "ISTHMUS."**

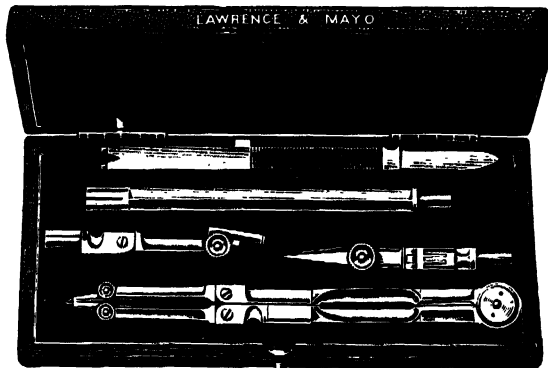


FIG. 2.

FIG. 2.—Superior quality Half set Compasses, needle points, and double knee-jointed, with ink and pencil points, lengthening bar, and knife key. Best quality German silver, in case,  $4\frac{1}{2}$  in.

**Rs. 20 "BALNEARY."**

Do. d.o. 6 in. **Rs. 22 "BARONIAL."**

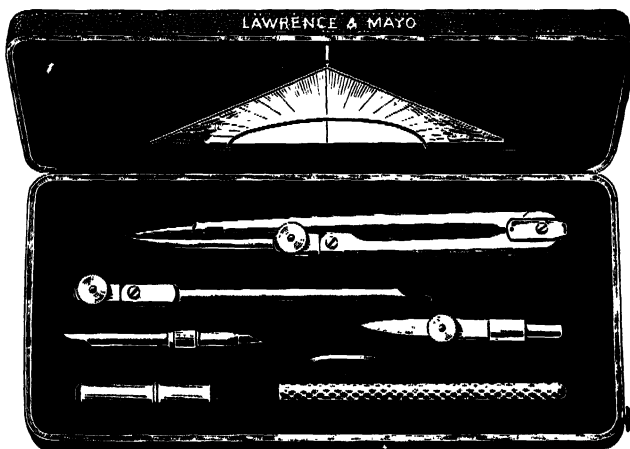
Code Word  
for Telegrams.

FIG. 3.

FIG. 3.—The Student's or College Pocket Half Set Compasses, containing  $4\frac{1}{2}$  in. brass compasses, with pen and pencil points, hinged lengthening bar, box of leads, cardboard protractor and holder to take pen or pencil, in case ... **Rs. 4 "BANDIT."**

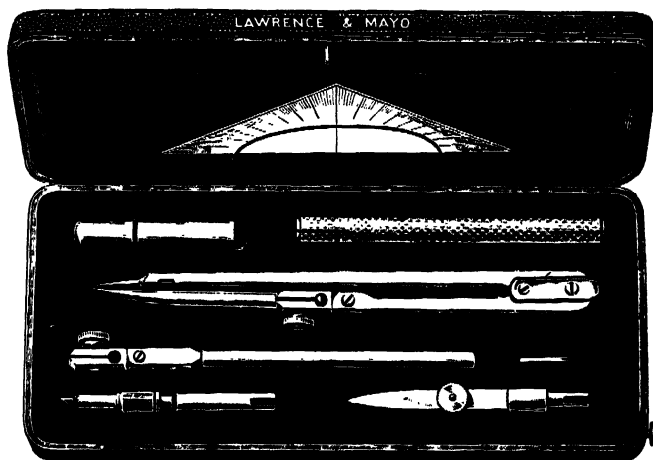
Code Word  
for Telegrams.

FIG. 4.

FIG. 4.—The Service Pattern Pocket Half Set Compasses, containing 5 in. brass compasses, with pen and pencil points, hinged lengthening bar, box of leads, cardboard protractor and brass holder for pen or pencil, in case ... **Rs. 5 "BATTLEMENT."**

Code Word  
for Telegrams.

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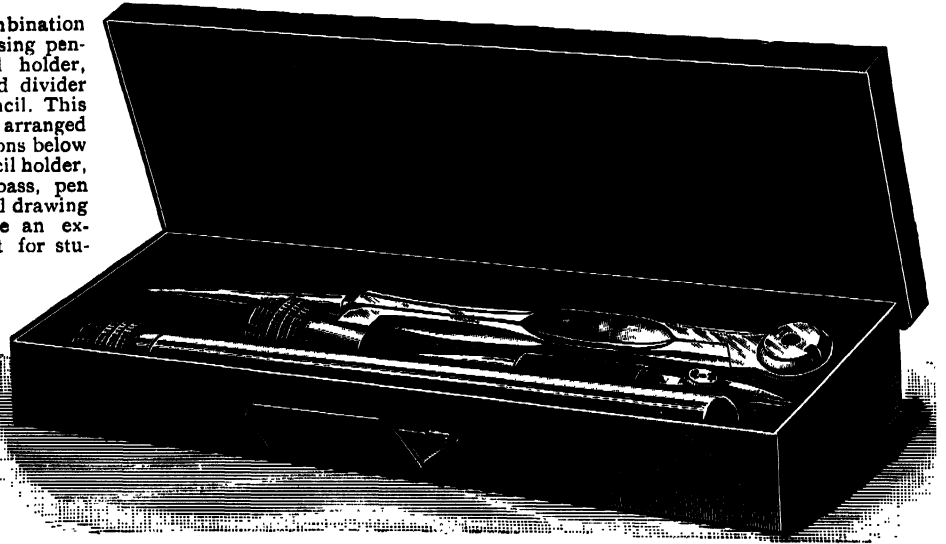


# PATENT COMBINATION COMPASS SET.

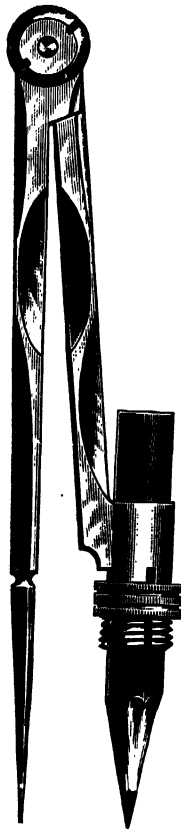
The Patent Combination Compass Set comprising pencil compass, pencil holder, combination pen and divider point and piece of pencil. This combination can be arranged as the five illustrations below to form a perfect pencil holder, prickler, pencil compass, pen compass, divider, and drawing pen, and will prove an exceedingly useful set for students' schools, &c.

Price of the Patent Combination Compass Set complete, in black japanned case as illustrated, **Rs. 3.**

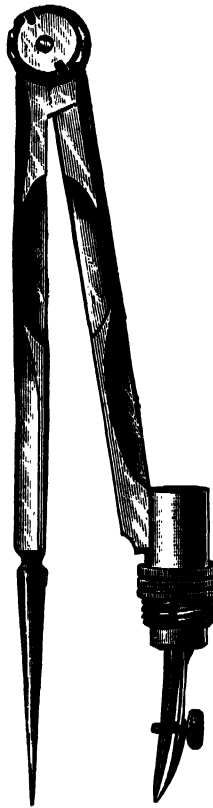
Code word for telegrams—  
"DEPUTATION."



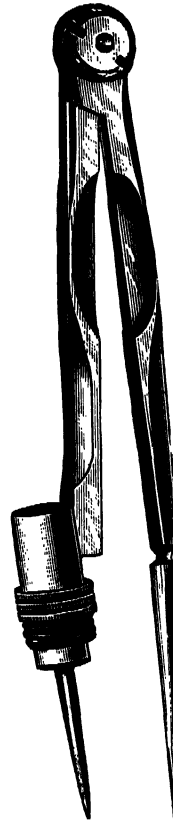
PRICKER



PENCIL COMPASS



PEN COMPASS.

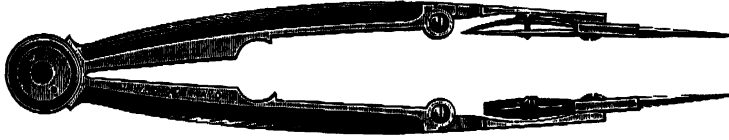


DIVIDERS.



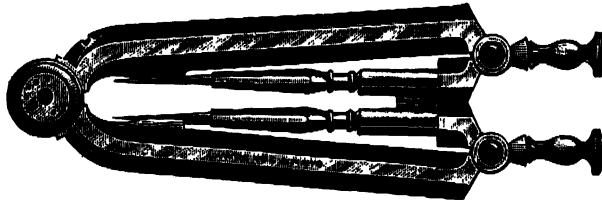
DRAWING P

# POCKET COMPASSES, &c.

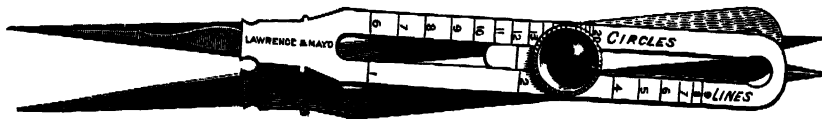


Code word for  
Telegrams.

1. Napier Compass, with ink and pencil points to revolve, superior quality electrum, in morocco case ... .. **Rs. 22** ... "NAPIER."
2. Napier Divider, no ink or pencil point, superior quality electrum, in morocco case ... .. **Rs. 12** ... "DIVIDER."



3. Pillar Compass, forming pocket set of instruments, ink and pencil points to draw out, superior quality electrum, in morocco case ... .. **Rs. 25** ... "PENCIL."



4. Proportional Compass, 6 inch, fully divided, superior quality electrum, in morocco leather case ... .. **Rs. 25** ... "COUNTER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## BEAM COMPASSES.

1. Beam Compasses, to fit any lath, with patent B needle points, superior quality electrum, in morocco leather case, **Rs. 22** .. Code word for Telegrams, "BEAM."
2. Beam Compasses, to fit any lath, with points to carry needles, superior quality electrum, in morocco leather case .. .. **Rs. 20**  
Code word for Telegrams, "NEEDLE."

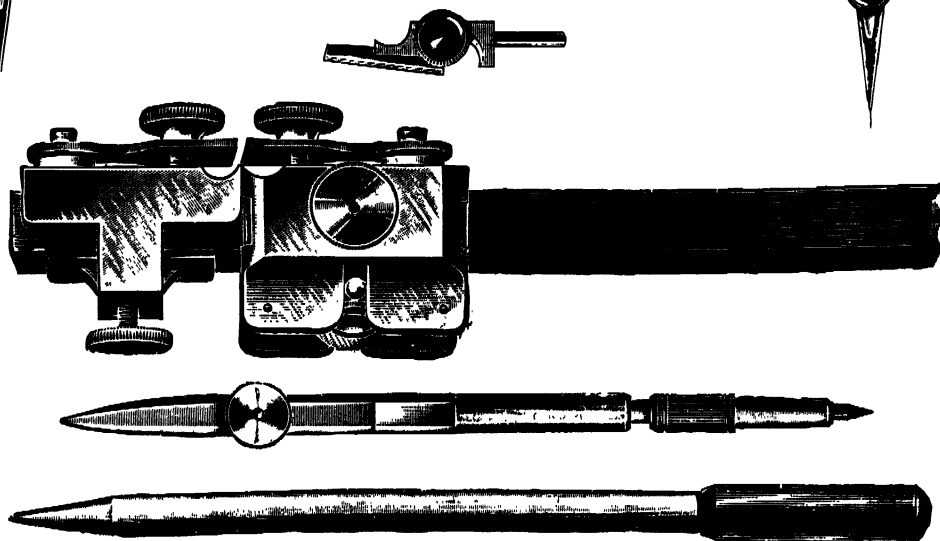
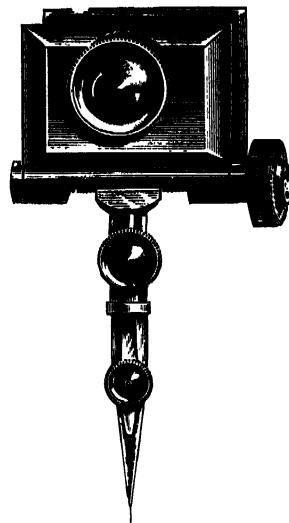
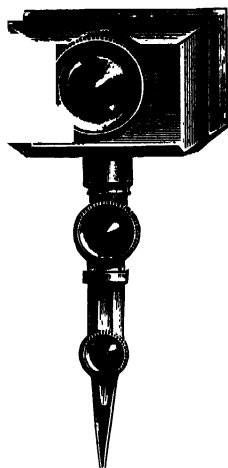


FIG. 3.

Code Words  
for Telegrams.

FIG. 3.—Beam Compass, for drawing large circles, with reversible pen and pencil point, and 20 inch rod. The movement is particularly smooth and easy. A little movement of the thumb against the milled wheel will quickly and accurately shift the head to the distance required, superior quality electrum, in leather case .. ..

**Rs. 15** "DELEGATE."

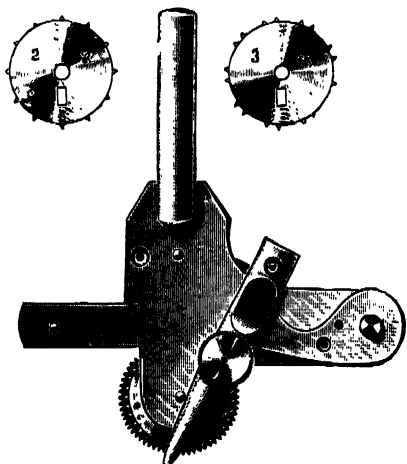


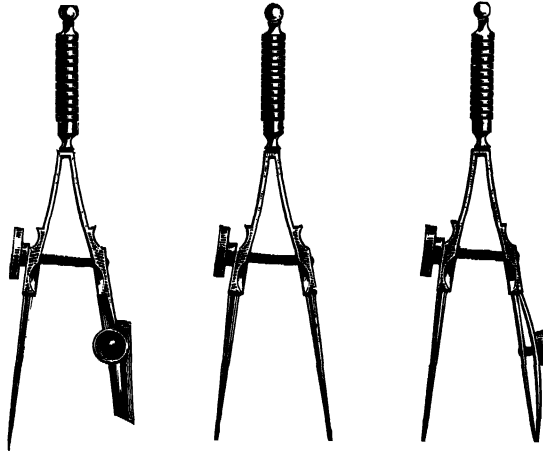
FIG. 4.

FIG. 4.—Dotting Pen (to fit in Beam Compass, Fig. 3), with interchangeable wheels to make three different dottings. In leather case .. ..

**Rs. 9** "DELUGER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# SPRING BOWS.



- |    |  |               |    |            |
|----|--|---------------|----|------------|
| 1. | Spring Bows, set of three, ink, pencil, and divider, superior quality, in case | <b>Rs. 12</b> | .. | "Bow."     |
| 2. | Do. do. do. with points to carry needles, superior quality, in case .. ..      | <b>Rs. 15</b> | .. | "CARRIER." |
| 3. | Do. do. do. with patent B needle points, superior quality, in case .. ..       | <b>Rs. 18</b> | .. | "PATENT."  |

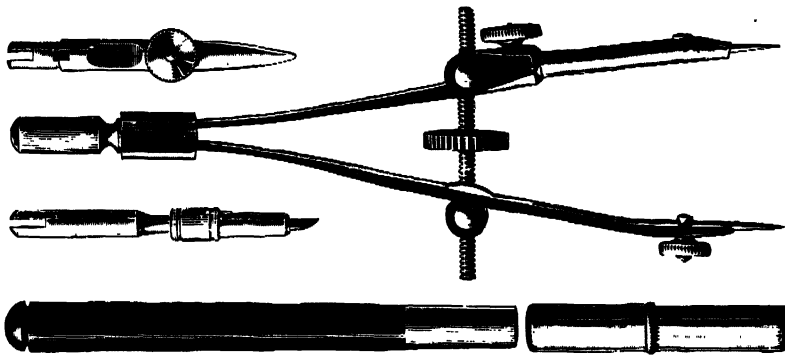


FIG. 4.

Fig. 4.—Steel Spring Bow with needle points, cross joint, pen and pencil, holder for same, box of leads and spare needles. In leather case .. .. **Rs. 12.** .. "DECURION."

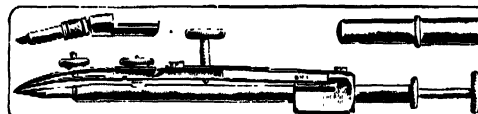


Fig. 5.

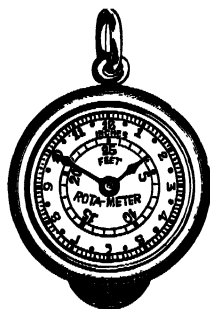
Fig. 5.—Rotating Compass,  $4\frac{3}{4}$  inches long, for drawing very small circles. The pen revolves round the centre spindle which rests on the paper so that when the milled head is turned, it draws with its own weight. With pen and pencil points and box of leads, in leather case .. .. **Rs. 9.** .. "DEMOCRAT."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
 67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# Rota-Meters and Opisometers.

## The Rota-Meter.



This useful little instrument is capable of many of the uses of an ordinary measuring tape. It will measure with accuracy to the eighth of an inch and record up to 25 feet, either on a straight or curved line; it will also measure the circumference of solid bodies, of regular or irregular form. It is invaluable to Architects, Surveyors, Cyclists and others in ascertaining distances upon Maps. It is made as illustrated, to be carried either in the pocket or appended to the watch chain. To use it, turn the rolling wheel until the two hands are pointing exactly to 12 on the dial, then place the rolling wheel upon the line or article to be measured with the pointer at the commencement of the line, move the meter along, allowing the rolling wheel to traverse the distance required to be known; it will then be seen, by referring to the dials, that the length is there shewn in feet and inches. Curved or serpentine lines can be accurately measured, and boundaries upon maps.

Distances from place to place upon maps can be easily ascertained by rolling the wheel *backwards* upon the *scale* of the map until the hands upon the dial return exact to zero, and counting the number of lengths, or parts of lengths of the scale, which the roller covers in bringing the hands to zero.

PRICE, **Rs. 4-8.** Code word for Telegrams—"ROTAMETER."

Can also be supplied with an ivory handle for desk and office use.

PRICE, **Rs. 6.** Code word for Telegrams—"METRIC."

## Opisometers.

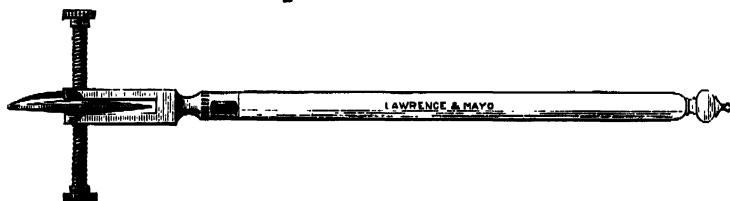


FIG. 1.

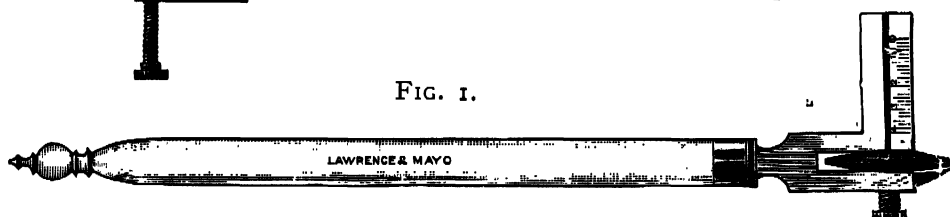


FIG. 2.

FIG. 1—Opisometers, or Map Meters, for measuring curve lines, roads or plans, &c., superior quality electrum, in case.

PRICE, **Rs. 4-8.** Code word for Telegrams—"OPISOMETER."

FIG. 2.—Opisometer, improved pattern, divided into feet, inches, and tenths, superior quality electrum, in case.

PRICE, **Rs. 15.** Code word for Telegrams—"MAP."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# DRAWING PAPERS, TRACING PAPERS AND DETAIL PAPERS.

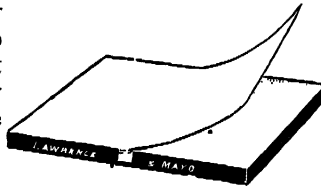
## Whatman's Hand-Made Natural Drawing Papers.

	Inches.	Per Sheet.	Per Quire.	Telegraphic Code Word for One Quire.
Imperial ... ..	30½ x 22½	.. <b>Rs. 0.8</b>	... <b>Rs. 7</b>	... "TRAPEZE."
Double Elephant	40½ x 27	... <b>Rs. 1</b>	... <b>Rs. 15</b>	... "TRESTLE."

## Whatman's Solid Sketch Blocks, "Thick Paper."

(Each containing 24 Sheets.)

The Blocks consist of a number of sheets of paper, compressed so as to form a solid mass, each sheet of which is to be separated by inserting a knife underneath the uppermost one, and passing it round the edge.



Sizes. Inches.	Code Word.
7 x 5	<b>Rs. 2</b> "KENTISH."
14 x 10	<b>Rs. 5</b> "KINETIC."

## Continuous Cartoon Cartridge Papers.

				Telegraphic Code Word for One Roll.
White Cartoon, thin	36 inches wide,	per roll of 12 yards,	<b>Rs. 3</b>	"TEMPLER."
" " stout	54 " "	" " "	<b>Rs. 12</b>	"TANKARD."

**Continuous Cartridge Paper with Imitation Whatman's Surface.**  
57 inches wide, per roll of 12 yards, **Rs. 10.** Code Word for One Roll—"TURKOIS."

## Sectional Paper.

Sectional Drawing Paper, size of sheet 22½ x 17½, ruled feint, ⅛th and 1/10th inches square on one side only, per quire, **Rs. 3.**

Code Word for One Quire, ruled ⅛th inches square	... ..	"TORMENTOR."
" " " " 1/10th " "	... ..	"TYRANICAL."

## George Rowney & Co.'s Continuous Tracing Paper.

No.			Telegraphic Code Word for One Roll.
1	White, 1st quality, 40 inches wide, per roll of 20 yards,	Rs. 6	"TACKLE."
1B	Blue Tint, " " " " " "	Rs. 6	"TREASURER."
2	White, extra stout, " " " " " "	Rs. 9.0	"TELEPHONER."
2B	Blue Tint, " " " " " "	Rs. 9.0	"TERMAGENT."
4	Blue Tint, thin unglazed, 2nd quality, 40 inches wide, ...	Rs. 4	"TEMPERATE."
7	Blue Tint, stout, 1st quality, 30 inches wide... ..	Rs. 6.8	"TEMPORISER."

## Special Bluish Transparent Parchment.

For drawing or tracing purposes. This material is prepared without any oil, and therefore does not change colour. It is specially suitable for drawings which are to be copied by sensitised papers.

57 inches wide, per roll of 33 yards, **Rs. 22.** Code Word for One Roll—"ABOLISHER."

All drawing papers are very sensitive to, and easily injured by, damp atmosphere and sea air. To prevent spots and mildew they should always be kept in warm, dry rooms, and wherever possible in air-tight cases.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## Tracing Cloths, Sensitised Papers and Linen, and Apparatus for Copying Plans, Drawings, etc.

### SAGAR'S PATENT VELLUM TRACING CLOTH, DULL BACK.

36 inches wide, dull back; per roll of 24 yards	<b>Rs. 22.</b>	Code Word for Telegrams, "UNIVERSITY."
42 " " " "	<b>Rs. 28.</b>	"USURPER."

### DOWSE'S PATENT VELLUM TRACING CLOTH, GLAZED BOTH SIDES.

36 inches wide, glazed both sides, per roll of 24 yards	<b>Rs. 18.</b>	"TECHNICAL."
42 " " " "	<b>Rs. 22.</b>	"TUBULAR."

### SENSITISED PAPER AND LINEN.

**Black lines on white ground. No chemicals required.** (Water bath only).

The papers listed below are **specially prepared for use in the Tropics, and will stand hot climates**, they are developed in water only, **no chemicals being required.**

Positive Sensitised Paper, black lines on white ground, per roll, 11 yards long, 39½ inches wide ... ..	<b>Rs. 10.</b>	Code Word for 1 Roll "ABORIGINAL."
Do. do. do., mounted on white cloth, per roll 11 yards long, 39½ inches wide ... ..	<b>Rs. 22.</b>	"ABRIDGER."
<b>White lines on dark blue ground.</b>		
Negative Sensitised Paper, white lines on dark blue ground, per roll, 11 yards long, 39½ inches wide ... ..	<b>Rs. 7.</b>	"ABJURER."
Do. do. do., very thick, tough paper, per roll, 11 yards long, 39½ inches wide ... ..	<b>Rs. 9-8.</b>	"ACRONICAL."

## PHOTOGRAPHIC PRINTING APPARATUS.

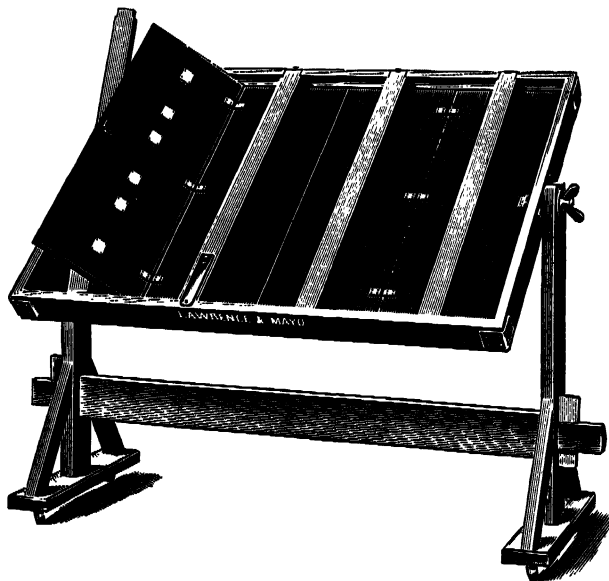
**Printing Frames**—These frames are specially made to stand tropical climates, and will be found greatly superior to the usual country made article, being made from thoroughly seasoned ash, brass bound, and fitted with thick plate glass fronts.

PRICES, including Portable Stands—

No. 1. 54 × 32 inches ...	<b>Rs. 175.</b>
Code word for telegrams, "ACROSTIC."	
No. 2. 42 × 29 inches ...	<b>Rs. 140.</b>
Code word for telegrams, "ACHIEVER."	

## BATHS FOR WASHING PRINTS.

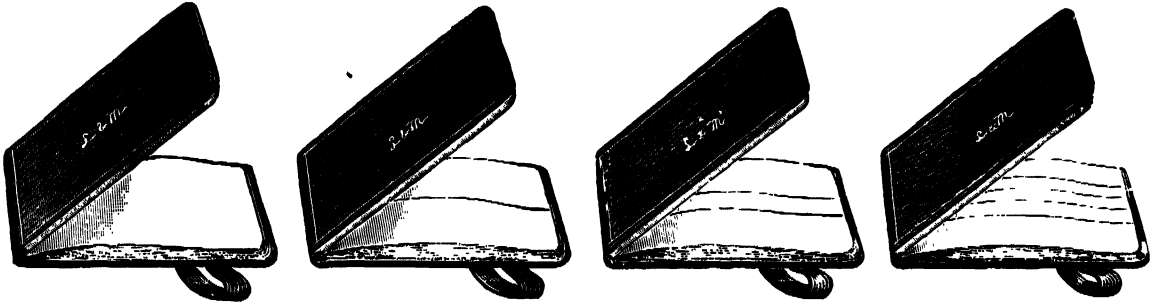
No. 1. Zinc, with brass tap, 54 × 32 inches ...	<b>Rs. 25.</b>	Code Word for Telegrams, "ADULATOR."
No. 2. do. do., 42 × 29 " ...	<b>Rs. 20.</b>	"ADVERBIAL."



**LAWRENCE & MAYO, Manufacturing Opticians,**

67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# Surveyor's Measuring, Levelling, Field and Sectional Books.



## SURVEYOR'S MEASURING AND FIELD BOOKS.

Measuring and Field Books, 6 by 4, plain, 160 pages, superfine paper,  $\frac{1}{4}$  bound.

**Each, 0-6-0. Per dozen, Rs. 4.**

Code word for one dozen, "QUILL."

Measuring and Field Books, 7 by  $4\frac{1}{4}$ , 170 pages, whole bound, rounded corners, elastic band ruled one red line, two red lines, four blue lines or blank.

**Each, Rs. 1. Per dozen, Rs. 11-8.**

Code word for one dozen, one red line, "REDUCER."

" " " " two red lines, "REDUNDER."

" " " " four blue lines, "REFECTARY."

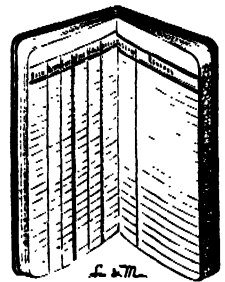
" " " " blank, "REDRESSER."

## LEVELLING BOOKS.

Levelling Books,  $7\frac{1}{2}$  by  $4\frac{1}{2}$ , 160 pages, ruled and printed, whole bound, rounded corners.

**Each, Rs. 1-8. Per dozen Rs. 15.**

Code word for one dozen, "QUOTIDIAN."



## SECTIONAL BOOKS.

Sectional Books, 6 by 4, 194 pages, oblong, limp roan covers, 100 leaves.

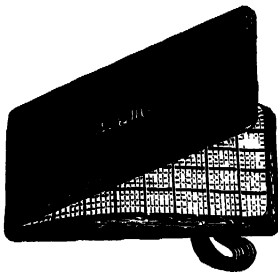
**Each, Rs. 1. Per dozen, Rs. 11.**

Code Word for one dozen, "ONDINE."

Sectional Books, 8 by 5, 194 pages oblong, limp roan covers, 100 leaves.

**Each, Rs. 1-8. Per dozen, Rs. 17.**

Code word for one dozen, "ORIGINER."



**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



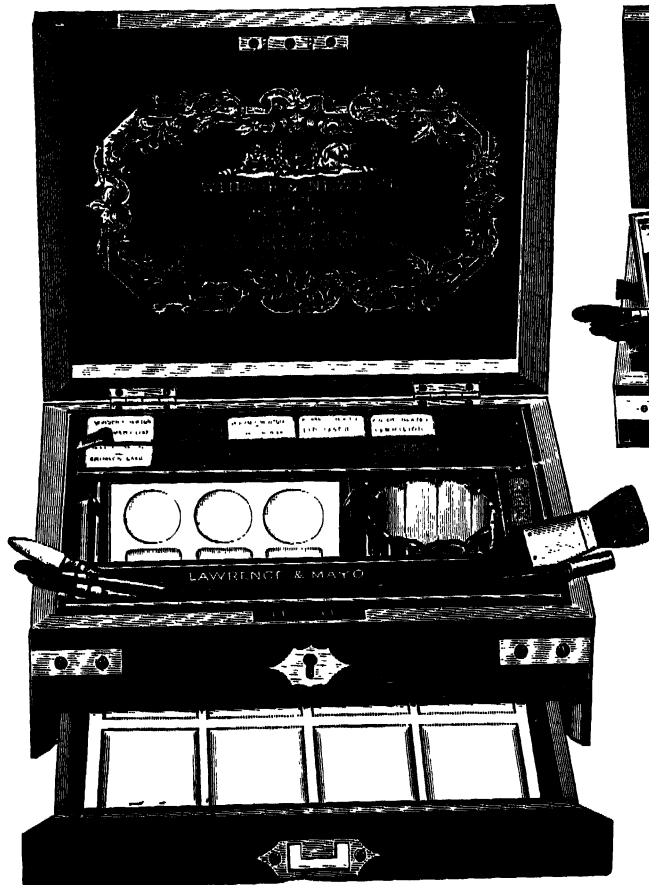
**Winsor & Newton's Colour Boxes.***Fitted with whole Cake Water Colours.**For MILITARY MEN, ENGINEERS, SURVEYORS, ARCHITECTS, &c.*

Fig. 1.

Fig. 1.—Winsor & Newton's First-Class Colour Box, mahogany, brass bound, with drawer, lock and key, containing Burnt Sienna 1, Cobalt 1, Gamboge 1, Emerald Green 1, Burnt Umber 1, Light Red 1, Crimson Lake 2, Prussian Blue 2, Neutral Tint 2, Black and White Chalk, Indian Ink, 1 each 8 Slope and 3 Slope Tiles, 12 Siberian Hair Brushes, 1 Sky Brush, 1 Shell each Gold and Silver, Crayon Holder, Brush Rest, Water Glass and 2 Pencils, and Rubber.

PRICE, Rs. 30. Code word for Telegrams—"MACAROON."

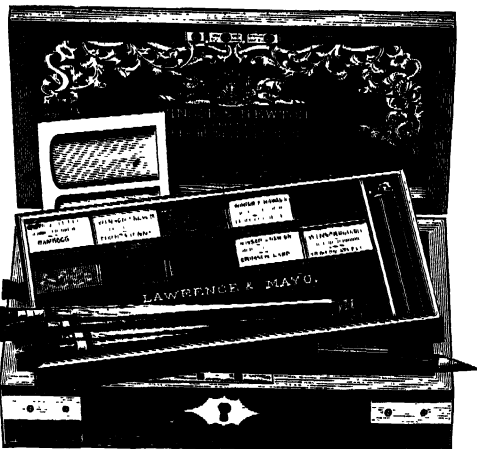


Fig. 2.

Fig. 2.—Winsor & Newton's Second-Class Colour Box, mahogany, brass bound, containing the following Colours: Neutral Tint 1, Cobalt 1, Light Red 1, Gamboge 1, Emerald Green 1, Prussian Blue 2, Crimson Lake 2, Burnt Sienna 1, Indian Ink, 3 Division Slant Tile, 8 Siberian Hair Brushes, Pencil, and Rubber.

PRICE, Rs. 18.

Code word for Telegrams—"MAGNOLIA."

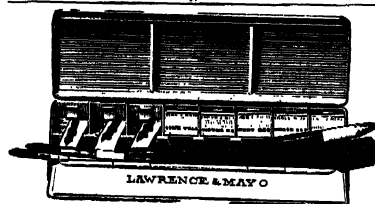


Fig. 3.

Fig 3.—The Pocket "Service" Paint Box.

*Specially Prepared by Messrs. Winsor & Newton for Lawrence & Mayo.*

Containing Five Colours, viz., Red, Green, Blue, Yellow and Brown, 1 Stick Indian Ink, 3 Crow Quill Pens with Holder, Stump for Shading, and 2 Sable Brushes, all fitted into a good japanned case, the lid being enamelled white for use as a palette, and two finger rings being attached to bottom of case.

PRICE, Rs. 9-8.

Code word for Telegrams—"MAGICIAN."

**Fig. 4.—The "Service" Set of Coloured Crayons.**

Box containing 3 Blue, 2 Red, and 1 each of Green, Black, Yellow, and Brown; also a Nickelled Protector Holder.

PRICE, Rs. 1-8. Code word for Telegrams—"MANIKIN."

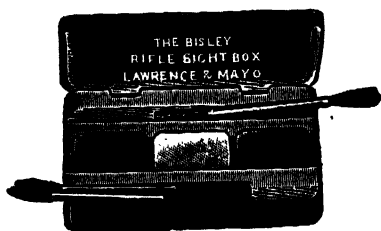


FIG. 5.

PRICE, Rs. 1. Code word for Telegrams—"KITLAP."

**Rifle Sight Colouring Box.**

Fig. 5. The "BISLEY" colour box, japanned tin box, containing 3 pans of black and white specially prepared water colours and 3 camel hair brushes.

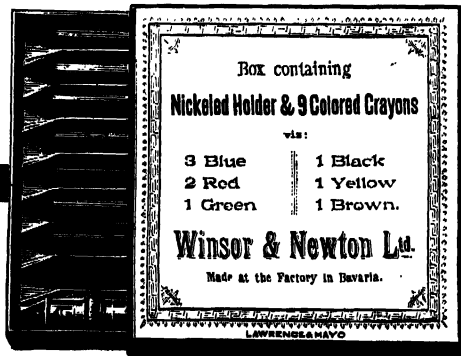
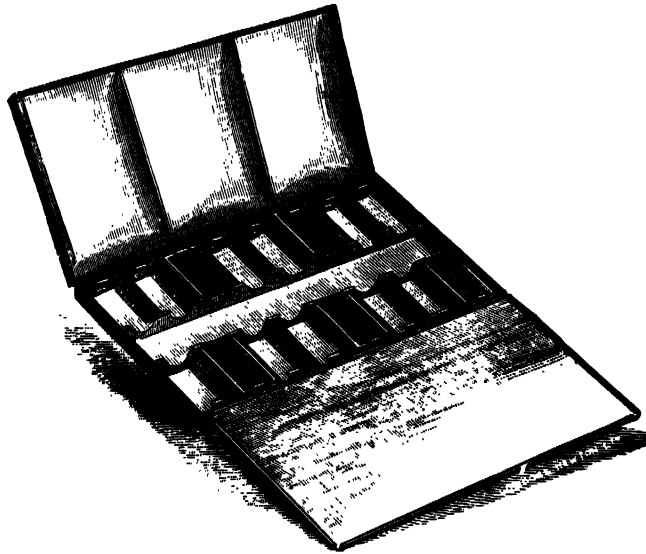


Fig. 4.

## Winsor & Newton's Patent "Spring" Japanned Tin Box,



Containing the following Moist Water Colours in china pans:—Gamboge, Yellow Ochre, Raw Sienna, Burnt Sienna, Light Red, Vermilion ( $\frac{1}{2}$ ), Indian Red ( $\frac{1}{2}$ ), Crimson Lake ( $\frac{1}{2}$ ), Alizarin Crimson ( $\frac{1}{2}$ ), Cobalt, Prussian Blue, Payne's Grey, Vandyke Brown and Brown Pink.

The pans of Colour are fastened by the employment of a V-spring in each partition of the Box (which method was secured to Messrs WINSOR & NEWTON, Ltd., under Letters Patent in Great Britain, the principal Kingdoms in Europe, and in the United States of America); they are thus held firmly, and the long-felt inconvenience of cementing the china pans to the box, and of removing them when empty, is avoided.

The improvement is a valuable one to Artists, as any colour in the box can be at once changed to suit requirements, and the pans can be moved from one position to another at pleasure.

PRICE ... .. **Rs. 12.**

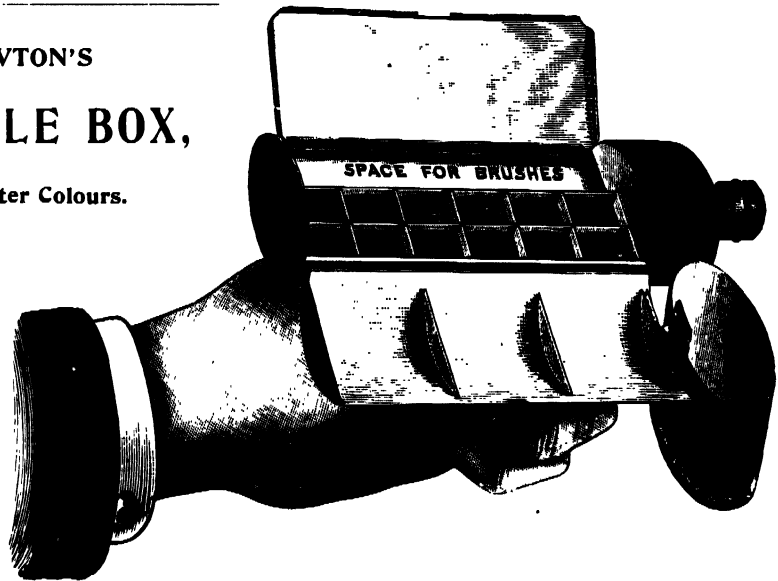
Code Word for Telegrams—"NAPKIN."

## WINSOR & NEWTON'S WATER BOTTLE BOX,

Fitted with Moist Water Colours.

Containing the following 12  
Colours:—

Gamboge, Yellow Ochre,  
Raw Sienna, Burnt Sienna,  
Vermilion, Light Red, Crim-  
son Lake, Brown Madder,  
Cobalt, Indigo, Vandyke  
Brown and Brown Pink.



THE ABOVE BOX CLOSED.

PRICE .. .. **Rs. 7.**

Code Word for Telegrams—"NOSTRUM."

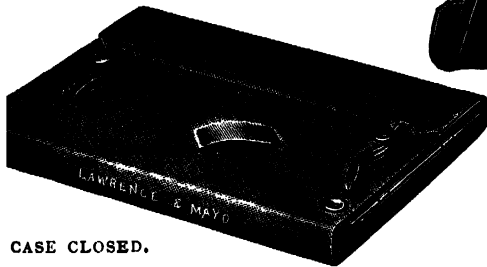


**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

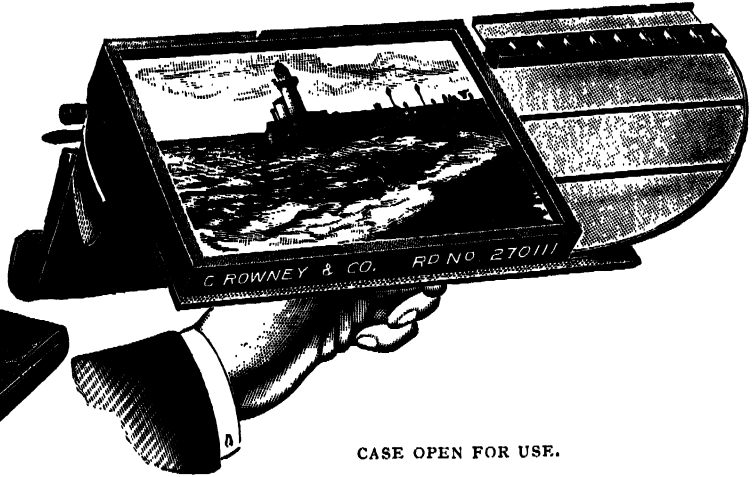
## ROWNEY'S SKETCHING CASE.

INCLUDING COLOURS,  
RUSHES AND PENCIL.

Without Increase of Ordinary  
Thickness.



CASE CLOSED.



CASE OPEN FOR USE.

This case, from its great convenience and portability, folding into a space of only 12 inches long, 8½ inches wide and 1 inch thick, and weighing complete under 24 ounces, is particularly adapted to the use of Artists and Amateurs desirous of having the materials at hand for a hasty Sketch without being encumbered with the weight of an ordinary box.

The case contains a 12-leaf Whatman Block, 10 inches by 7 inches, and a Pocket for loose Sketches, Pencil, Two Sable Hair Brushes, and Twelve Colours, viz.:—Permanent Yellow, Yellow Ochre, Raw Sienna, Vermilion, Light Red, Crimson Alizarin, Burnt Sienna, Burnt Umber, Madder Brown, Prussian Blue, French Ultramarine, and Hooker's Green No. 2.

Price, Fitted Complete, **Rs. 12.**

Code word for Telegrams, "INDOLENT."

## ROWNEY'S OIL SKETCHING CASE.

This case weighs only half as much as a French Pochade Box containing similar size Panels.

Three or four Wet Sketches can be carried at a time.

The Palette may be set before starting.

This Apparatus is the only one yet offered to the Artist suitable for Sketching Animals or any passing effect that must be rapidly drawn, and is the only case made that can be used with any comfort when the Artist is in a standing position.

Price, including four Birchmore Boards, size 10 inches by 7 inches, tin dipper, twelve oil tubes, viz.:—McGuilp, Flake White, Yellow Ochre, Raw Sienna, Permanent Yellow, Light Red, Vermilion, Crimson Alizarin, Burnt Sienna, Burnt Umber, Ivory Black, and French Ultramarine; a 3-inch Palette Knife, one each 2, 4 and 6, "Bright's" Hair Brushes, a No. 3 Sable, and a No. 4 Badger.

**Rs. 12.**

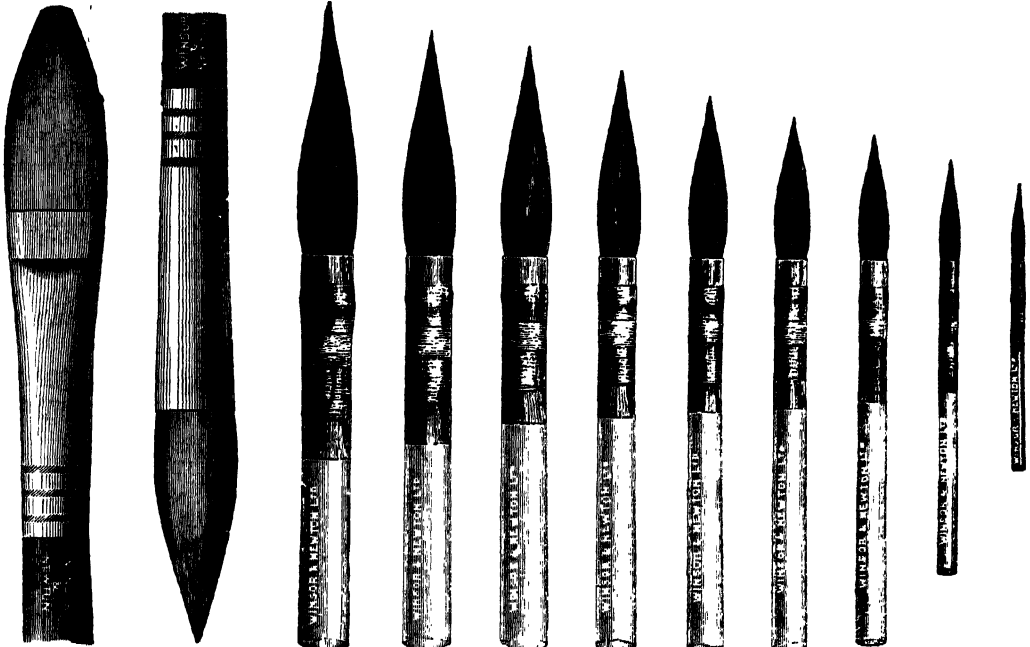
Code word for Telegrams, "INDULINER."



**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# WINSOR AND NEWTON'S BRUSHES FOR PAINTING IN WATER COLOURS.

Finest Red Sable Hair in Quills. Tied with Coloured Silks and Gold Wire.



**Wash or Sky Brushes.**

Wash or Sky Brushes made of Dyed Sable Hair, in Nickel Ferrules, round or flat ... each **Rs. 3.**  
Small ditto, round or flat each **Rs. 2-8.**

**Large Swan.**

**Middle Swan.**

**Small Swan.**

**Extra Small Swan.**

**Extra Goose.**

**Goose.**

**Small Goose.**

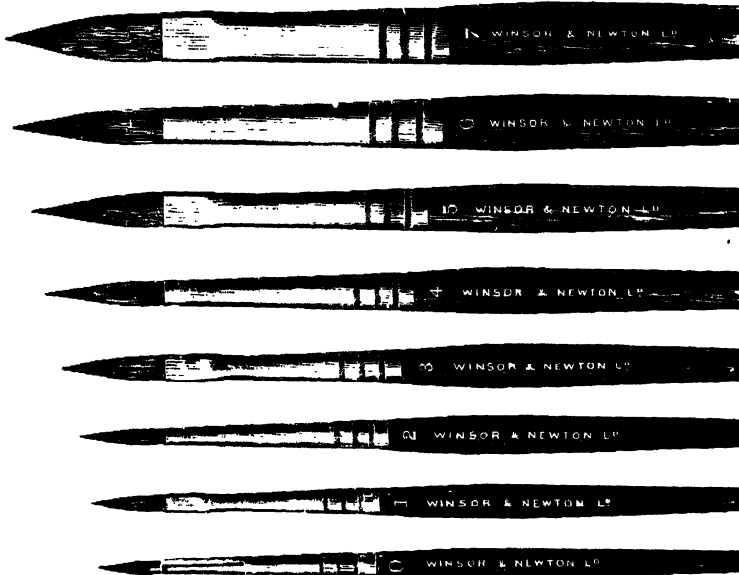
**Duck.**

**Crow.**

	(COLOUR OF SILK)	Each.
Crow ...	Blue ...	0-4
Duck ...	Magenta ...	0-8
Small Goose ...	Green ...	0-12
Goose ...	Pink ...	1-0
Extra Goose ...	Amber ...	1-4

## In Long Quills.

	(COLOUR OF SILK)	Each
Extra Small Swan ...	Blue ...	2-8
Small Swan ...	Magenta ...	3-0
Middle " ...	Green ...	4-0
Large " ...	Pink ...	5-0



**Finest Red Sable Hair  
with Albata Ferrules**

**And 6-inch Polished  
Ebony Handles.**

No.	Each Rs.
0 & 1 Flat or Round	0-12
2 " "	0-14
3 " "	1-0
4 " "	1-4
5 " "	1-12
6 " "	2-0
7 " "	2-4

## WINSOR & NEWTON'S Waterproof Drawing Inks,

For Architects, Designers, etc.

**BLACK (INDIAN INK) and 24 COLOURS, viz. :—**

Brick Red.	Olive Green.	Sea Green.
Brown.	Orange.	Sepia.
Burnt Sienna.	Payne's Grey.	Slate.
Carmine.	Pink.	Turquoise.
Emerald.	Plum.	Ultramarine.
Grass Green.	Prussian Blue.	Vermilion.
Indigo.	Purple.	Violet.
Lemon.	Scarlet.	Yellow.

General Drawing Ink (not Waterproof).

1 oz. BOTTLES, **Rs. 0-12.**



## WINSOR & NEWTON'S Hexagon Cake Water Colours,



SIZE OF CAKES.

**FOR USE IN DRAUGHTSMEN'S, ENGINEERS' AND RAILWAY OFFICES.**

**Rs. 1 each.**

Burnt Sienna.	Indigo.	Raw Sienna.
Burnt Umber.	Intense Brown.	Ultramarine.
Chrome Yellow.	Lamp Black.	Vandyke Brown.
Emerald Green.	Neutral Tint.	Venetian Red.
Gamboge.	Payne's Grey.	Vermilion.
Hooker's Green.	Prussian Blue.	Yellow Ochre.
Indian Red.		

**Rs. 2 each.**

Crimson Lake.	Indian Yellow.	Scarlet Lake.	Sepia.
Cobalt ...	... ..	... ..	<b>Rs. 3 each.</b>
Carmine ...	... ..	... ..	<b>Rs. 4-8 each.</b>

## Winsor & Newton's Best Nankin Indian Ink.

*The Illustrations are the sizes of the Inks.*



Hexagon Ink, No. 2.

PRICE PER STICK, **Rs. 2-4.**

Code word—"NOVELIST."



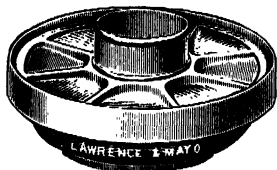
No. 3a, Super Super Ink.

PRICE PER STICK, **Rs. 1-2.**

Code word—"NUGGET."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# ARTISTS' CHINA WARE.



## CIRCULAR SLANT, CUP AND BASIN.

For Architects' Offices, &c.

Circular Slant, with Loose Cup and Basin, 7 inches in diameter,

**Rs. 2-8.**

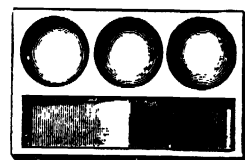
Code word for Telegrams—"GRAMPUS."

## INDIAN INK AND COLOUR TILES.

5 inches by  $3\frac{1}{2}$  inches.

**Rs. 1.**

Code word for Telegrams—"GRANARY."



## ARCHITECTS' CABINET SAUCERS FOR KEEPING COLOURS MOIST WHEN OUT OF USE.

In Nests of Six.

$3\frac{1}{4}$  inches in diameter.

Per Nest, **Rs. 1-8.**

Code word for Telegrams—"GRANITE."

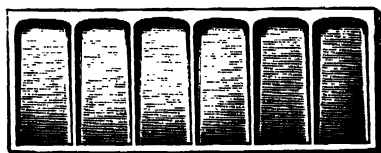
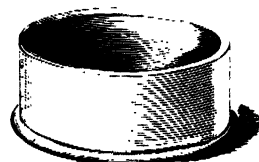
## CHINA TINTING CUPS.

(These Cups are not liable to upset.)

2 inches in diameter.

Per Dozen, **Rs. 1-8.**

Code word for Telegrams—"GRIFFIN."



## DIVIDED SLANT TILE.

Six Divisions.

8 inches by 3 inches

**Rs. 1.**

Code word for Telegrams—"GUDGEON."

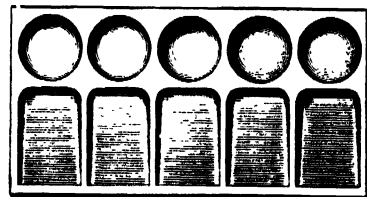
## SLANT WELL TILES.

With five Wells and Slants.

$7\frac{1}{2}$  inches by 4 inches.

**Rs. 1-4.**

Code word for Telegrams—"GRID."



**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# **I. W. Faber's Compass, Sketching, & Designers' Pencils.**

PLAIN CEDAR.



FIG. 1. 4 IN. THIN.



FIG. 2. 5 IN. MIDDLE.



Extra thin.

Thin.

Middle.

Thick.

- FIG. 1.—Faber's Compass Pencils, unpolished cedar, not stamped, 4 inch, extra thin, thin, middle .. .. one degree  
 FIG. 2.—Faber's Compass Pencils, unpolished cedar, stamped plain, No. 2, 3, 4, 5 in., extra thin, thin, middle, thick .. .. 3 degrees

Per dozen  
**0-8-0**Code word for one dozen.  
"BAILIFF"**0-12-0**

"BAGPIPE."

## **A. W. Faber's Compass Pencils.**

FINEST QUALITY.



FIG. 3.



Extra thin.

Thin.

Middle.

Code word.

- FIG. 3.—Faber's Compass Pencils, finest, round, red polished, stamped in gold, H, HH, HHH, HHHH, 5 inch, extra thin, thin, middle .. .. 4 degrees

Per dozen.  
**Rs. 2.**for one dozen  
"BACONIAN."

## **A. W. Faber's Everpointed Sketching Pencil.**

WITH RICH BLACK LEAD.



FIG. 4.

- FIG. 4.—Faber's Everpointed Sketching Pencil, octagon, extra thick black lead, black polished, stamped in gold, 4½ inches long .. ..

Each.  
**0-8-0**Code word.  
"BABBLER."

### **LEADS FOR ABOVE.**

- Extra Thick Sketching Lead, black, 2½ inches long, 3 in a box .. ..

Per Box of 3.  
**0-12-0**Code word.  
"BADGER."

## **A. W. Faber's Designers' Pencil.**

IN METAL HOLDER.



FIG. 5.



FIG. 6.

This new Designers' Pencil will be appreciated by Artists, being specially adapted for bold outlining, and generally to take the place of charcoal. The Lead is of a soft degree and gives off freely. It can also be used for stumping.

- FIG. 5.—A. W. Faber Designers' Pencil, hexagon nickel holder, with extra thick soft black lead .. ..

Each.  
**0-8-0**Code word.  
"BALANCER."

### **LEADS FOR ABOVE.**

- FIG. 6.—Extra thick black lead, hexagon, 4½ inches long, 3 in a box .. ..

Per Box of 3.  
**Rs. 1.**Code word.  
"BELLICOSE."

**A. W. FABER'S NEW DRAUGHTSMAN'S PENCILS,**

For Mechanical Drawing. Made of the finest Siberian broad leads, natural polished, stamped in gold.

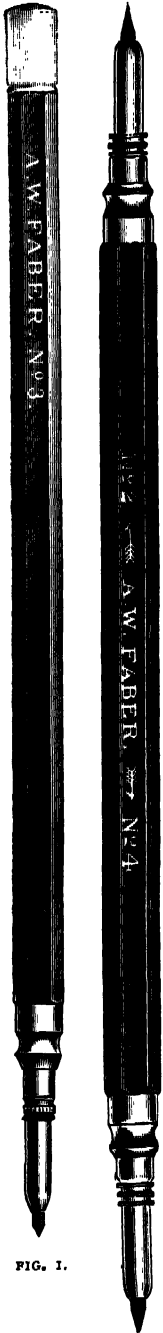


FIG. 1.

FIG. 2.

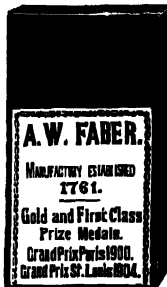


FIG. 3.

A. W. FABER'S Hexagon Draughtsman's Pencils with broad or flat lead have been specially introduced for the purposes of technical or mechanical drawing. The advantages of the broad over the square lead will be obvious to everyone engaged in this description of work. Instead of the usual needle point, a chisel point is given these leads. The lead is more easily sharpened, the points are stronger, sharper, and keep their fine edge longer, obviating the necessity of frequent pointing. Moreover, in drawing lines, the lead can be held close to the rule, thus ensuring a greater amount of accuracy.

Stamped in gold, H, HH, HHH, HHHH and HHHHHH.

Each dozen pencils is packed in a slide box and includes one pencil specially sharpened, to show the kind of point that should be given them.

Price, per box of 1 dozen, **Rs. 3-8.**

Code Word for Telegrams: "SIBERIAN."

**A. W. FABER'S PATENT ARTISTS' PENCILS.**

WITH MOVEABLE LEADS FOR DRAWING AND OFFICE USE.

**Fig. 1—Faber's Patent Artists' Pencils,** with moveable leads, hexagon, red polished, stamped in gold,  $6\frac{1}{2}$  inches long, with leads of any degree from 1 to 6.

Price, each, **0-8-0**, per dozen, **Rs. 5.**

Code Word for 1 dozen: "MEDUSIAN."

**Fig. 2—Faber's Patent Double Pointed Artists' Pencils,**  $6\frac{1}{2}$  inches long, with moveable leads, hexagon, red polished, stamped in gold, double pointed, with 2 leads, No. 2 and No. 4.

Price, each, **0-12-0**, per dozen, **Rs. 8.**

Code Word for 1 dozen: "MACTATOR."

**FABER'S LEADS FOR PATENT ARTISTS' PENCILS, Fig. 1 & 2,**

And for use with Pentagraph, Eidograph, and Planimeter.

**Fig. 3—A. W. Faber's Artists' Leads,**  $5\frac{1}{2}$  inches long, 6 in a box. Nos. 1, 2, 3, 4, 5, 6. 6 degrees.

Price, per box, **0-12-0**, per dozen boxes, **Rs. 8.**

Code Word for 1 dozen boxes: "MACHINATOR."

**THE "KOH-I-NOOR" CHART PENCIL**

The "Koh-I-Noor" British Graphite Hexagon Chart Pencils (manufactured by L. & C. Hardmuth), contains leads of the highest quality, prepared specially soft for chart use. They are yellow polished and stamped in gold.

Price, per dozen, **Rs. 3.**

Code Word for 1 dozen, "GOSSEMER."

 $\frac{1}{2}$  SIZE.

**Hardmuth's Specially Prepared, Grey Pliable India Rubber** for Draughtsmen and Engineers. This rubber will be found to erase easily and without injury whatsoever to either charts, tracing paper, or any other delicate drawing material used.

One size only, 4 pieces to the pound.

Per piece **Rs. 1-0.**

Code Word for 1 piece, "GROINITE."

Per pound, **Rs. 3-12-0.**

Code Word for 1 pound, "GUMMITE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



# DE LA RUE'S "ONOTO" Patent Self-Filling Fountain Pen

(LONDON MADE THROUGHOUT),

With Shut-off Valve, so that the Pen can be carried in any position without fear of leakage. Fitted with 14 carat gold nib, iridium pointed.

**Specially suitable for Military Men, Engineers, Surveyors, Architects, etc.**



FIG. 2.

## Advantages Claimed for De La Rue's Fountain Pens.

- That they are made throughout in their own workshops in London.
- That only the finest materials and workmanship are used in their production.
- That every pen is individually examined and tested before being sent out, and its soundness guaranteed.
- That broken parts can be replaced and repairs easily effected.
- That the ink-capacity of their pens is very much greater than that of any other competing pens. The trouble of re-filling is thus reduced to a minimum.
- That, as Makers of Ink as well as of Fountain Pens, the perfect adaptation of the one to the other is guaranteed.
- That DE LA RUE'S FOUNTAIN PENS **include Patented Improvements, and Developments of great value, not to be found in the productions of other makers.**

**INSTRUCTIONS FOR FILLING.**—Remove the cap, and unscrew the head **H** of the pen till it is clear of the body. Withdraw the head to the position shewn in Fig. II., next page. Now dipping the nib in ink till the end of the pen-carrier is well covered, press the head home. Screw the head home on to the body, shake or wipe away any superfluous ink adhering to the pen-carrier, and the pen will be found to be completely filled with ink.

**INSTRUCTIONS FOR SHUTTING OFF AND REGULATING.**—When the head is screwed home on the body, the ink is shut off. When the pen is required for use, the head should be unscrewed from  $\frac{1}{4}$  to  $1\frac{1}{2}$  turns. The more the head is unscrewed, the more ample will be the flow of ink. If it is only required to write a few words, the ink adhering to the nib will be sufficient, and the head need not be unscrewed.

**INSTRUCTIONS FOR CLEANING.**—Fill and empty the pen a few times in succession with clean cold water. Warm water softens the vulcanite and should not be used.

*See next page for full description of the mechanism of the "Onoto" Self-filling Fountain Pens.*

FIG. 1

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The "ONOTO" Patent Self-Filling Fountain Pen.

## DESCRIPTION OF THE MECHANISM.

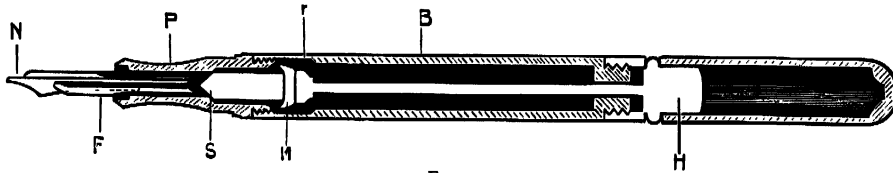


FIG. 1.

FIG. 1. shows a section of the pen with the working parts exposed to view.

**The "ONOTO" PATENT SELF-FILLING PEN has the following distinct characteristics:—**

1. The Shut-off and Regulating Valve.
2. The Self-filling arrangement.

The SHUT-OFF AND REGULATING VALVE is formed by the vulcanite rod which runs the whole length of the pen, and is terminated at one end by the head **H**, and at the other end by the plug **S**. When the head **H** is screwed home on the body **B**, the plug **S** impinges firmly on the shoulder in the pen-carrier **P**, and consequently closes the ink and air ducts of the feed. In this condition the body is hermetically sealed, and the pen may be carried in any position without fear of leakage.

Upon unscrewing the head slightly, the plug **S** is withdrawn, and ink is allowed to flow to the feed. The more the head is unscrewed the wider is the regulating valve opened. It will be found that by only very slightly opening the valve the flow of ink will be so small as to almost instantaneously dry on the paper; whereas if the head be unscrewed a turn and a half, the flow will be as full as that obtained with the common steel nib and ink-well.

## THE SELF-FILLING ARRANGEMENT.

On examining Fig. 1 it will be seen that a piston **M** is mounted on the rod of the shut-off valve near the lower end of the body. This piston is made to fit the bore of the body **B**. In its normal position, when the pen is in use for writing, the piston occupies an enlarged recess (**r**) in the body, and either ink or air are consequently able to flow past it.

If the pen be empty, and the head **H** be unscrewed till it is clear of the body, it may be drawn back as shown in Fig. 2.

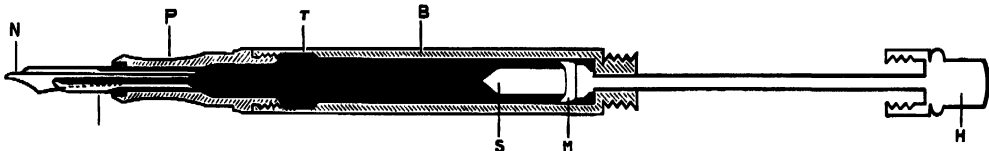


FIG. 2.

Upon pressing the head forward again, the piston will act after the manner of a bicycle pump, and drive the air before it. Since the upper end of the body is air-tight, it follows that a vacuum will be formed behind the piston. This vacuum will be maintained till the piston reaches the recess **r**, when it will be suddenly released, and the fluid immediately surrounding the end of the pen-carrier will rush in to fill it. If this operation, of pressing home the piston, be carried out when the end of the pen-carrier is dipping in ink, it follows that upon the end of the stroke being reached, the pen will be filled.

## PRICES.



FIG. 1, page 168.—The "Onoto" Patent self-filling Fountain pen, ordinary size, 5½ inches long when closed, with leather case .. ..

**Rs. 10** "ONOTO."

FIG. 2.— Do. do. do. Dwarf or watch pocket size, 4½ inches long when closed, with leather case .. ..

**Rs. 10** "DWARF."

FIG. 3.— Do. do. do. Giant size, 5½ inches long when closed, with leather case .. ..

**Rs. 12** "GUNWALE."

Blue Black writing inks specially adapted for the "Onoto" Fountain pens .. .. per bottle

**O-6-0** "INKERMAN."

Refill Nibs for the "Onoto" Fountain Pens .. .. each

**Rs. 5**

The "Onoto" Fountain pens can be supplied with Nibs in all points. Please specify the kind required when ordering.

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

Code Word  
for Telegrams.

# ANEROID BAROMETERS.

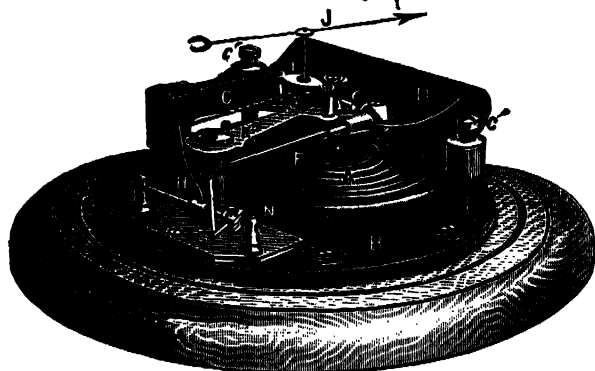


FIG. 1.

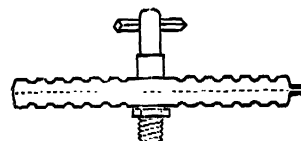


FIG. 2.

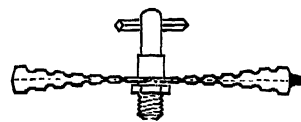


FIG. 3.

THESE Barometers have now borne the test for many years of proof and trial, and their great merits and advantages over other kinds of Barometers, for many purposes, fully recognized.

As "Weather Barometers," the Aneroid has almost superseded the use of the Mercurial Barometer, for, its action being purely mechanical, it cannot be easily deranged.

The Atmosphere surrounding the earth may be regarded as an "Ocean" of air, extending upwards from the sea level of the earth's surface about ten miles; its greatest density is nearest to the earth's surface, by reason of having to support the weight of its whole depth, and gradually becoming less dense as the distance from the earth increases. This law of decrease in pressure being known, it is used as a means of measuring the height of hills and mountains.

In order to convey a correct idea of the mechanical and physical structure of the Aneroid, an illustration of its movement and action is here given, and the detail of its construction explained by the reference letters.

The word "Aneroid" is a Greek compound, expressing, "without fluid," and the illustration here given, Fig. 1, clearly shows the general construction of the movement with its elastic metallic box, called the "Vacuum Chamber," A, upon which the pressure of the atmosphere produces the effect hereafter described.

This chamber is constructed with two circular discs of thin German silver, corrugated on each surface, and firmly soldered together at the edge, forming a close box shewn at Fig. 2; from the bottom a screwed centre-piece projects, by which it is attached to the base-plate, and from the top a central pillar, carrying a steel knife edge piece to rest upon the surface of the mainspring when under tension.

At the edge of the box a piece of soft metal pipe is inserted and soldered, through which the air from the chamber is exhausted by an Air-pump, and close sealed while the vacuum is maintained.

As will be seen by reference to Fig. 3, the effect of this exhaustion is, to cause the top and bottom discs to close together by the pressure of air upon the outside surfaces, which, upon an ordinary size chamber is equal to a force of about 60 lbs.

The base of the movement is a strong metal plate of circular form, B, to this plate the vacuum chamber A is firmly fixed by a screwed nut upon its centre projecting through the base plate.

An iron bridge or carriage piece, C, spans the chamber, resting upon the base plate by means of the two pointed screws, c' c', the object of these screws being to finally regulate the tension upon the chamber A.

To the bridge C, is fixed the mainspring D, which being forced down by mechanical means sufficient to insert the knife edge piece E, when released, lifts the upper part of the chamber drawing the two discs asunder, thus forming a perfect balance with the power of the main-spring opposing the atmospheric pressure upon the vacuum chamber.

Any variation in air-pressure will now be shewn by a movement up or down of the elastic chamber, a decrease in pressure allows the main-spring to overcome the power of the vacuum, and the action is upwards, any increase of air-pressure produces the contrary result.

The main lever F, attached to the main-spring, is actuated by the movement of the chamber, which action is multiplied by the length of the lever. This is attached to a second short lever, G, and is again attached to a third long lever, H, from which a fine chain extends to the centre of the movement, passing around a central arbor or spindle, I, upon which the indicating hand J, of the Barometer is fixed, having previously a horizontal motion, and parallel to the dial a projecting arm K

## THE ANEROID BAROMETER—continued.

carrying two small pillars, with a cross-piece, L, support the central arbor or spindle. The short lever, G, projects from a regulator, M, and is provided with an adjusting screw, N, this being capable of lengthening or shortening the lever, provides an adjustment to the graduated scale on the dial, also, at the extremity of the bridge at O, an adjusting screw passes through the base-plate, by which the indicating Hand of the Barometer can be set to the correct position upon the Dial.

The graduations upon the Dial of an Aneroid of this class, by good makers, are carefully compared with the readings of a Standard Barometer; this operation being done under the glass receiver of an air-pump, the comparative readings can easily be seen.

### Practical Advantages of the Aneroid Barometer.

This Instrument, owing to its portable form, shews great sensitiveness in responding to changes in the pressure of the atmosphere (denoting changes in pressure much more quickly than the Mercurial Barometer), is to-day in more general use by observers of meteorological changes than any other form of Barometer.

It can be shipped with perfect safety, and carried in any position without danger of derangement; it is not at all liable to get out of order, and is not easily broken.

### How to Use the Aneroid Barometer.

The divisions upon the scale of an Aneroid Barometer represent inches and fractions of an inch of atmospheric pressure; this scale being determined by comparison with a mercury column, as explained above in the last clause under "construction."

The words "Stormy," "Fair," "Rain," &c., upon the dial are simply relative, as it does not follow that the weather conditions indicated by these words will necessarily exist when the indicating hand of the Barometer points to them. The meaning, for example, when the hand points to the word "Fair," is that the atmospheric pressure at that time is favourable to fair weather. In forecasting the weather there are several conditions other than atmospheric pressure which must be taken into consideration, namely, the direction and force of the wind, the humidity of the air, and, most important of all, a comparison of the daily Barometer reading with the indicated pressure of several days preceding.

This necessitates, with a careful observer, the keeping of a daily record for making such comparison. A single observation of the Barometer, without reference to the conditions prevailing at definite intervals preceding, is liable to be misleading; the important thing to know is—Has the rise or fall been a gradual one, or has it been rapid? If the Barometer is stationary, how long has this condition existed? Whether prognostications from Barometer observations are based on a knowledge of all these conditions, and never from a single observation. Generally speaking—

"A gradual but steady rise indicates settled fair weather.

"A gradual but steady fall indicates unsettled or wet weather.

"A rapid rise indicates clear weather with high winds.

"A sudden fall indicates a sudden shower or high winds, or both.

"A stationary Barometer indicates a continuance of existing conditions, but a slight tap on the Barometer face will likely move the hand a trifle on the dial and indicate whether the tendency is to rise or fall."

### To Set an Aneroid Barometer.

An Aneroid Barometer may be out of adjustment, so far as not agreeing with the reading of a Mercurial Barometer, and will give accurate measurements of the amount of change in atmospheric pressure. It is more satisfactory, however, to the observer, if his instrument be in adjustment with the mercury column, and in the event they do not agree, the Aneroid may be adjusted by turning the small screw opposite the opening in the back of the case until the indicating hand on the dial coincides with the height of the mercury column.

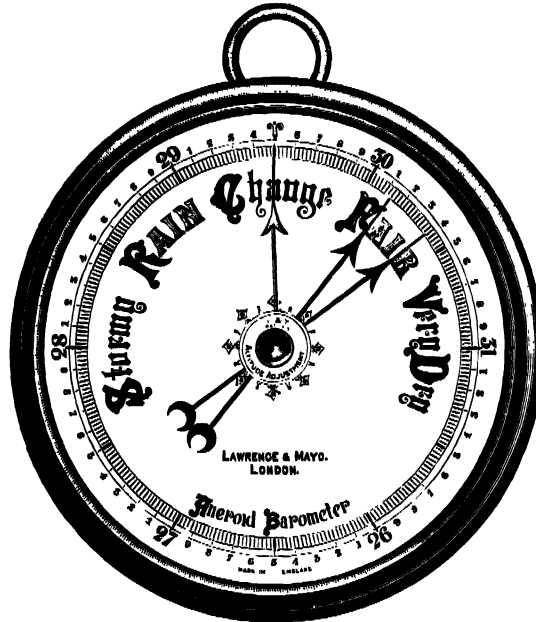
Set the Barometer by turning the milled head attached to the glass face until both hands point to the same scale division. As the hand attached to the face remains stationary, the direction as well as the extent of the change occurring between observations will be indicated by the relative relation of the movable to the stationary hand. If, after setting, the hands at the next observation still coincide the Barometer is "stationary." If the blue hand has moved to the right the Barometer is "rising." If it has moved to the left the Barometer is "falling." The extent of the rise or fall being the distance in fractions of an inch between the two hands upon the dial.

It is, however, necessary, whenever an opportunity offers, to compare the readings of an Aneroid with a Standard Mercurial Barometer, as there is sometimes a settlement of some of the metal parts and springs which alter the position of the indicating hand. This can be easily set correct by turning the adjusting screw which passes through the bottom of the movement.

# ANEROID BAROMETER,

With Patent Altitude Adjustment.

PRICE, Rs. 75.



Code word for Telegrams,  
"ALTITUDE."

This device consists of an auxiliary hand (coloured red) adjustably attached to the pressure hand and moving with it. The object being to show, at the same time, the actual atmospheric pressure at the altitude where used and the corresponding sea level pressure.

When a Barometer is taken from sea level to a higher altitude the column will fall because of the decreased weight of the atmosphere. This fall is about one inch for each 1,000 feet ascent.

By reason of the varying pressure at different altitudes it is necessary for the purpose of making comparisons over large areas to reduce all readings to sea level basis, hence the Government weather reports, giving Barometer readings in all important centres, are on sea level basis. The prime object of this altitude adjustment device is to give in the same instrument continuous readings at the altitude where it is used and the corresponding reading at sea level. For example, the altitude at Jeypore is 1,431 feet above sea level. The pressure at this altitude corresponding, for example, to 30 in. at sea level would be 28.85, and the red hand should accordingly be moved to the right a distance of 1.50 scale inches from the pressure hand. A Barometer so adjusted before sending, on reaching Jeypore (assuming, that at the time of first observation the pressure at sea level be still 30 in.) the pressure hand will point to 28.85 and the red hand to 30 in.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## The Aneroid Barometer with Patent Altitude Scale.

How to adjust the Aneroid Barometer with altitude scale. Remove the bezel which holds the glass by pulling steadily upwards. When this is removed with the glass, the red hand is to be moved to the right as many inches or fractions of an inch as the altitude in which the instrument will be used is thousands of feet or fractions of a thousand above sea level.

This can easily be accomplished by holding the blue hand stationary, and moving the red hand either by the finger, or any pointed article such as a pencil. It will then be seen that the blue hand points to the atmospheric pressure at that particular altitude, and the red hand shows the pressure at sea level. (See illustration.)

Care should be exercised not to use any force in this operation, so that the mechanism of the Aneroid is not disturbed. The bezel and glass can then be replaced and need not again be disturbed while used at the same altitude.

The following directions give the fraction of an inch, in which the red hand should be moved to the right upon the dial for each successive thousand feet of elevation at which the Barometer will be used above sea level.

ABOVE SEA LEVEL.	MOVE RED HAND TO THE RIGHT.	ABOVE SEA LEVEL.	MOVE RED HAND TO THE RIGHT.
500 feet	0.5 scale inches.	4,000 feet	4.1 scale inches.
1,000 "	1.1 "	4,500 "	4.6 "
1,500 "	1.6 "	5,000 "	5.0 "
2,000 "	2.1 "	5,500 "	5.5 "
2,500 "	2.6 "	6,000 "	6.0 "
3,000 "	3.1 "	6,500 "	6.5 "
3,500 "	3.6 "	7,000 "	7.0 "

## STATIONS IN INDIA, BURMAH AND CEYLON.

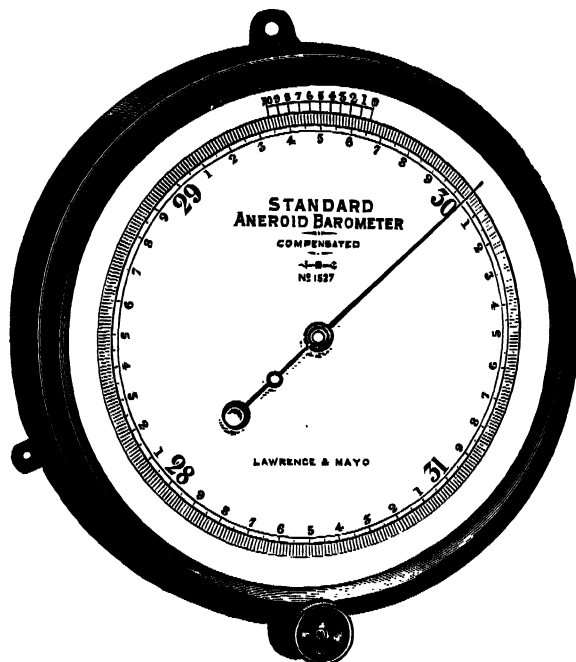
Shewing their latitude and altitude above sea level.

NAME.	LATITUDE.	ALTITUDE IN FEET ABOVE SEA LEVEL.	NAME.	LATITUDE.	ALTITUDE IN FEET ABOVE SEA LEVEL.
Allahabad ..	25° 26	309	Kurrachee ..	24° 47	49
Bangalore ..	12 59	2,981	Lahore ..	31 34	702
Belgaum ..	15 52	2,524	Leh (Ladak) ..	34 10	11,503
Benares ..	25 20	267	Lucknow ..	26 50	369
Bombay ..	18 54	37	Madras ..	13 4	22
Calcutta ..	22 32	21	Moulmein ..	10 29	94
Trichinopoly ..	10 50	255	Mussooree ..	30 28	6,881
Colombo ..	6 56	40	Nagpur ..	21 9	1,025
Delhi ..	28 40	718	Peshawar ..	34 2	1,110
Quetta ..	30 11	5,502	Poona ..	18 28	1,840
Jeyapore ..	26 55	1,431	Rangoon ..	16 46	41
Jubbulpore ..	23 9	1,341	Simla ..	31 6	7,048
Hyderabad ..			Chamba ..	32 34	3,005
(Scind) ..	25 25	117			

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

- - THE - -  
**Standard Aneroid Barometer.**



The great difficulty experienced in the transit of **Mercurial Standard Barometers** from London to India, by which many are broken or become deranged so that they are inaccurate, has induced us to construct a **STANDARD BAROMETER** on the Aneroid principle, and we have so far succeeded that we can with great confidence recommend the use of this instrument, which is not likely to derange by transit, and is also the most sensitive and accurate instrument hitherto made. It is capable of giving readings, by the Vernier, to  $\frac{1}{1000}$  of an inch, the most minute variation of atmospheric pressure is seen at a glance much more readily than the reading of a Mercurial Standard.

These Barometers are all tested by comparison with a verified standard of "Kew" verification.

The case of the Barometer is bronzed metal, the dial, graduated to  $\frac{1}{100}$  of an inch, and subdivided by the Vernier to  $\frac{1}{1000}$  of an inch.

The mechanical movement of this instrument is of special construction.

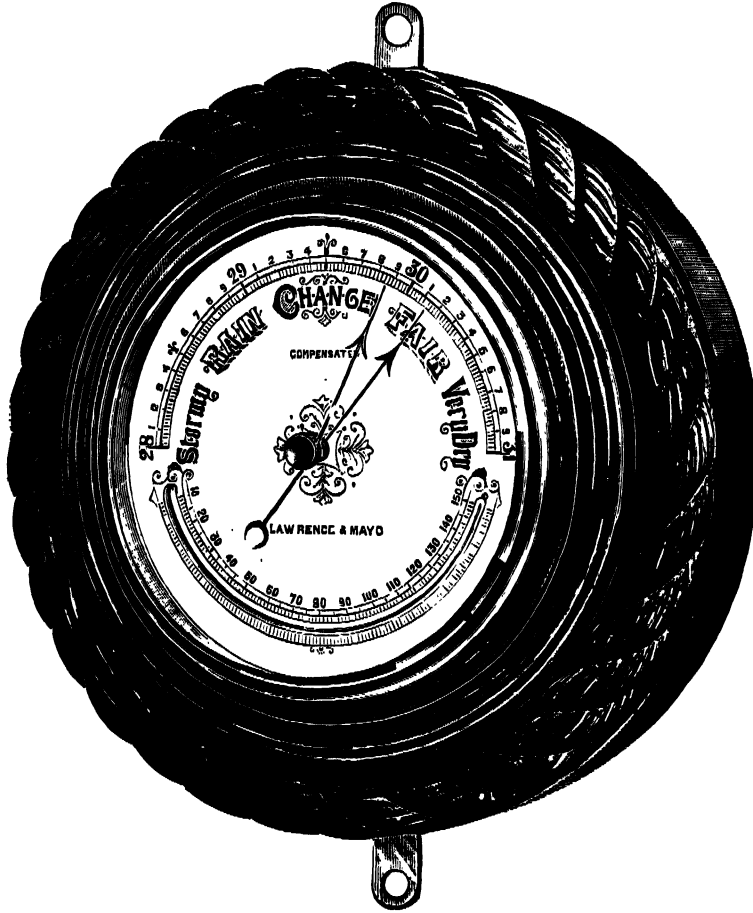
PRICE, **Rs. 200.**

Code word for Telegrams—"FLORIN."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# ANEROID BAROMETERS.



## Carved Oak "Cable" Pattern Aneroid.

This very useful form of Barometer is suitable for hanging in a Room, Hall, Vestibule, or on a Yacht. It has a fine engraved and silvered dial, with a Thermometer attached. The Barometer is compensated for temperature, and is a very reliable Instrument.

PRICE, **Rs. 55.**

Code word for Telegrams—"FINGER."

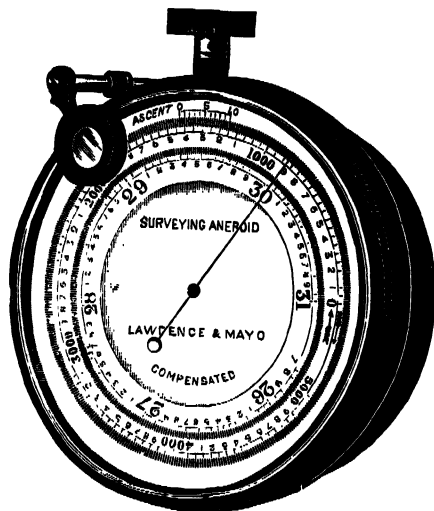
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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**



# Surveying and Mining Aneroid.

Giving Readings to Single Feet of Altitude.



This instrument has been designed and constructed specially for the use of Surveyors and Engineers, for the purpose of readily ascertaining slight variations in gradients, levels, &c. For approximate Surveys and Levellings, for Roads, Railways, Canals, Water Courses and Mines, it is invaluable, as its readings can be easily and rapidly taken.

Besides extreme sensitiveness, the speciality claimed for the instrument is an arrangement of the Scale of Altitudes which admits of *subdivision by a Vernier*, hitherto impracticable owing to the Altitude Scale in ordinary use being a gradually diminishing one, to which a Vernier could not be applied.

In the present instrument the action has been so arranged as to give accurate readings upon a *regular Scale of Altitudes*, the Barometrical Scale of inches having been made progressive, to afford the correct relative readings with the Scale of Altitudes, this arrangement, therefore, in no way interferes with its use as an ordinary Barometer.

For Mining purposes, the entire circle of the dial is graduated to represent 6 inches of the Mercurial Column, *i.e.*, from 27 to 33 inches. This scale will register about 2,000 feet *below* sea level to 4,000 feet *above*. The divisions of the Altitude Scale represent 10 feet measurements which can again be subdivided by the Vernier to single feet; the Vernier Scale is moved by a rackwork adjustment, and a magnifying lens which rotates upon the outer circumference of the instrument facilitates the reading of minute quantities.

For Surface Surveying the Scales can be made for any altitudes—5,000, 6,000, 10,000, 15,000, and 20,000 feet respectively.

The instrument is provided with a solid leather sling case, thus making it sufficiently portable for all practical purposes.

## DIRECTIONS FOR USE.

In using the Surveying Aneroid to obtain the difference of level of any two stations or positions, it is only necessary to place it *horizontally* at one of the two stations, adjust (by means of the rack motion) the *Zero* of the Vernier until it coincides with the point of the indicating hand, and read off the number of feet indicated by the Altitude Scale and Vernier; then remove the instrument to the other station and place it in the same position; adjust the *Zero* of Vernier as before, and the difference of the two readings gives the difference of level.

## EXAMPLE.

Reading of Scale of feet at Upper Station	..	..	..	..	..	1,027 feet.
Ditto ditto Lower Station	..	..	..	..	..	785 "
Difference of Level	..	..	..	..	..	242 "

**Prices.**—Stout bronzed metal case, silvered metal dial 5 inches diameter, Vernier scale, adjusted by rackwork motion; Reading Lens arranged to traverse the entire circle, Altitude Scale to 10,000 feet, compensated for temperature; in solid leather sling case .. .. **Rs. 140.**

Code Word for Telegrams—"MINER."

**Ditto, same as above, with Altitude Scale to 15,000 feet .. .. Rs. 150.**

Code Word for Telegrams—"LEVEL."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

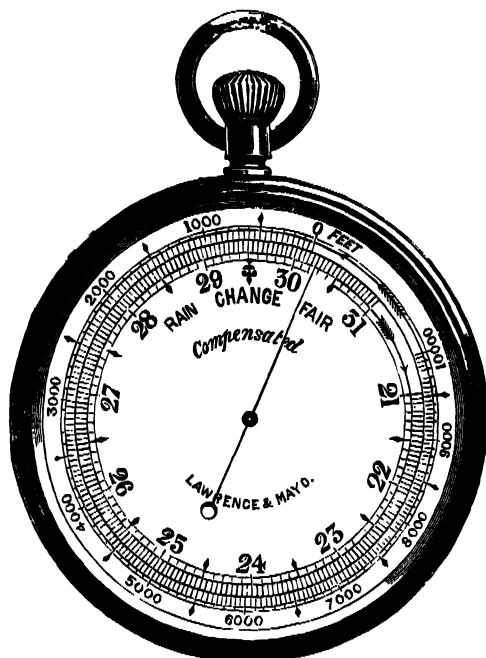
# POCKET & SURVEYING ANEROIDS.

## MILITARY AND ENGINEERING ANEROID BAROMETER.

Silvered metal dial,  $2\frac{1}{2}$  inch diameter, 10,000 feet, compensated, with keyless action to altitude scale, leather sling case.

Price, **Rs. 55.**

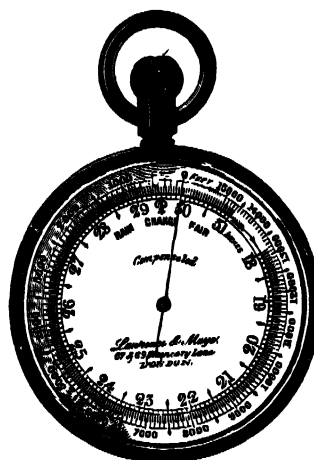
Code word for Telegrams—"ANEROID."



## MOUNTAIN ANEROID BAROMETER.

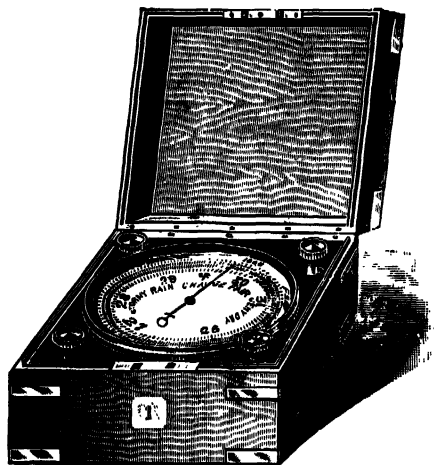
Registering to 15,000 feet.

These useful instruments, besides giving indications of changes in the atmospheric pressure and the accompanying changes of weather, are most interesting companions to travellers in mountainous districts, as by means of the altitude scale, the height of any point up to 15,000 feet can be ascertained. The instrument is compensated for temperature, and, as illustrated, has a keyless attachment for turning the altitude scale. Watch form, bronzed metal case,  $1\frac{1}{2}$  inches diameter.



Price, **Rs. 65.**

Code word for Telegrams—"BAROMETER."

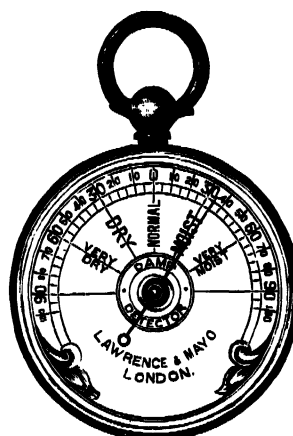


## CHRONOMETER PATTERN ANEROID.

For mountain measurement, or for nautical use, in oak brass bound case.

Price, **Rs. 90.**

Code word for Telegrams—"CHRONOMETER."



## LAWRENCE & MAYO'S IMPROVED DAMP DETECTOR.

This useful little instrument quickly detects the slightest degree of dampness in beds or clothing, and will be found invaluable to tourists and travellers. It is simple in construction and strongly made.

**INSTRUCTIONS FOR USE.**—Expose the instrument to the air of an ordinary room for about ten minutes; then, from the back, set the hand to the word "normal" on the dial. It can then be placed in the bed or clothing and will immediately denote any degree of moisture existing.

Price complete in Leather Case, **Rs. 5-8.**

FULL SIZE.

Code word for Telegrams—"DIAPHANE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# BAROMETERS, Etc.

FOR TOURISTS AND TRAVELLERS.

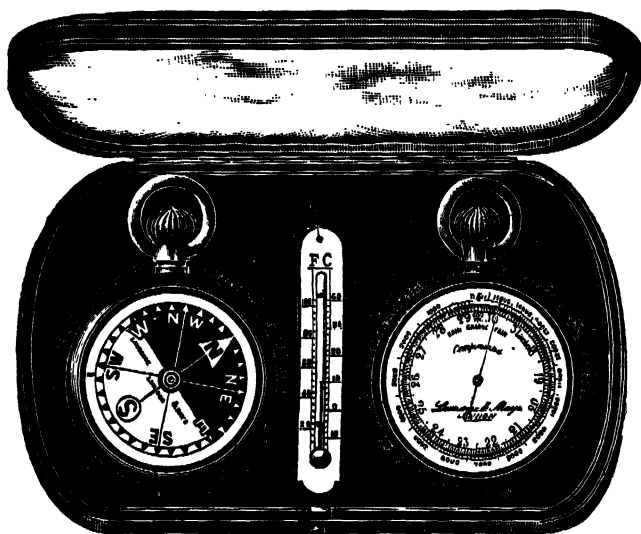


FIG 1.

FIG. 1.—The "LIVINGSTONE" Set, comprising Watch-form Aneroid Barometer Keyless Altitude Scale, 15,000 feet, compensated, in bronze metal case, Ivory Scale Thermometer, full size Watch-form Keyless Compass with Singer's Pearl dial, in bronze metal case, the three instruments fitted in morocco case as illustrated.

PRICE, **Rs. 75.**

Code Word—"TOURIST."

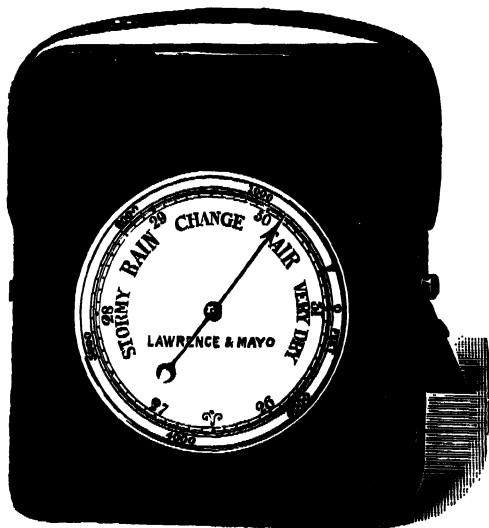


FIG 2.

FIG. 2. — Carriage Pattern Aneroid Barometer, bronze metal case, in morocco case.

PRICE, **Rs. 25.**

Code Word—"METALLIC."

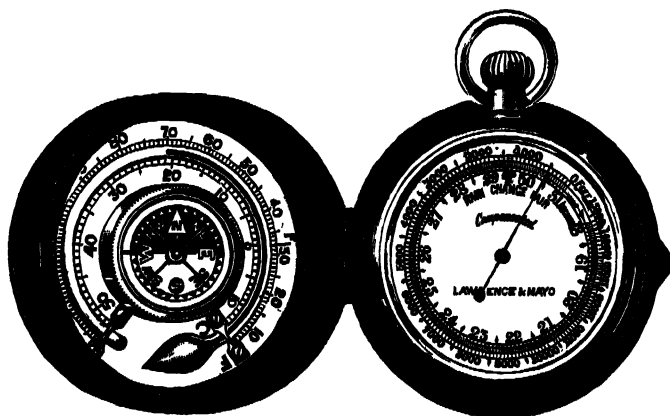


FIG 3

## THE MOUNTAINEER'S COMPANION.

FIG. 3.—First quality compensated Aneroid Barometer, bronze metal case, keyless action to Altitude scale, 15,000 feet, Singer's pearl dial Compass and Ivory Scale Thermometer fitted into lid of morocco case.

PRICE, **Rs. 85.**

Code Word—"COMPANION."

LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# Woolaston's Hypsometric Apparatus.

For the determination of Altitudes by the temperature of the boiling point of water.

The apparatus consists of a boiler set on a tripod under which is placed a spirit lamp. Above the boiler and fixed to it is a telescopic tube through which passes the steam escaping from the boiler. In this tube the thermometer is placed, held at a certain height by a rubber disc which prevents any steam escaping and so that the divisions or degrees may be seen. The thermometer (which is certified with a Kew National Laboratory Certificate) is divided from  $80^{\circ}$  to  $110^{\circ}$  Centigrade, and each degree is subdivided to tenths to accurately gauge the boiling point. By referring to the tables and with a little calculation the altitude of any mountain can be ascertained. The thermometer for taking the temperature of the air (which is also verified with a Kew certificate) is divided from  $10^{\circ}$  below zero to  $50^{\circ}$  Centigrade. The instrument with spare thermometer fits into a portable solid leather case with shoulder straps, and the weight of the apparatus complete is under 3 pounds.

## THERMOMETRIC HYPSONOMETRY.

[Reprinted from "Surveying and Astronomical Instruments," by J. F. Heather, M.A., late of the Royal Military Academy, Woolwich, author of "Practical Plane Geometry," "Descriptive Geometry," &c.]

Water, and even ice, constantly give off steam or aqueous vapour at all temperatures, when exposed to the air; thus we know that if a glass of water be left in a room for some days, the whole of the water will gradually evaporate. This power of water to rise in vapour at all temperatures is called the *elastic force*, or *tension*, of aqueous vapour. It may be measured, when a small quantity of water is placed above the mercury in a barometer, by the depression which the tension of the vapour thus given off is capable of producing in the mercurial column. If we gradually heat the drops of water thus placed in the barometer, we shall notice that the column of mercury gradually sinks, and when the water is heated to the boiling point, the mercury in the barometer tube is found to stand at the same level as that in the trough—showing that the *elastic force of the vapour*, at that temperature, is equal to the atmospheric pressure.

Hence, water boils when the tension of its vapour is equal to the pressure of the superincumbent column of atmosphere; and, consequently, on the tops of mountains, where the atmospheric pressure is less than at the sea-level, water boils at a temperature below the  $212^{\circ}$  of common experience.

A simple experiment to illustrate this fact, consists in boiling water in a globular flask, into the neck of which a stop-cock is fitted. As soon as the air is expelled, the stop-cock is closed, and the flask removed from the source of heat. The boiling then ceases. But, on immersing the flask in cold water, the ebullition recommences briskly—owing to the *reduction of the pressure*, consequent upon the condensation of the steam—the tension of the vapour at the temperature of the water in the flask being greater than the diminished pressure.

Founded on this principle a thermometric instrument has been constructed for determining heights, by noticing the temperatures at which water boils.\*

"For the elevation of great mountain-masses," says Dr. I. H. Hooker, "and continuously elevated areas, I consider that hypsometrical results are as good as barometrical ones; for the general purposes of botanical geography, the *boiling-point thermometer* supersedes the barometer in point of practical utility, for under every advantage the transport of a glass tube full of mercury, nearly 3 feet long, and cased in metal, is a great drawback to the unrestrained motion of the traveller."†

A convenient approximate rule has been given by Lefroy for ascertaining altitude by the boiling point of water, viz.:—

Allow for each degree below  $212^{\circ}$  Fahr. that water boils in a metal vessel, in mean state of barometer (*i.e.*, a little above or below 30 inches in height)—

511 feet for first degree;  
513 " for second "  
515 " for third " &c.

But the errors of thermometric measurements of height are always large, except in the tropics.

\*All other liquids obey a similar law of ebullition; but as the tensions of their vapours are very different, their boiling point varies considerably.

† *Himalayan Journals*, Vol. II.

**Price of Woolaston's Hypsometric Apparatus** with Kew certificate, book of altitude tables (pocket size), complete in portable solid leather case with shoulder straps, as illustrated,

**Rs. 120.**

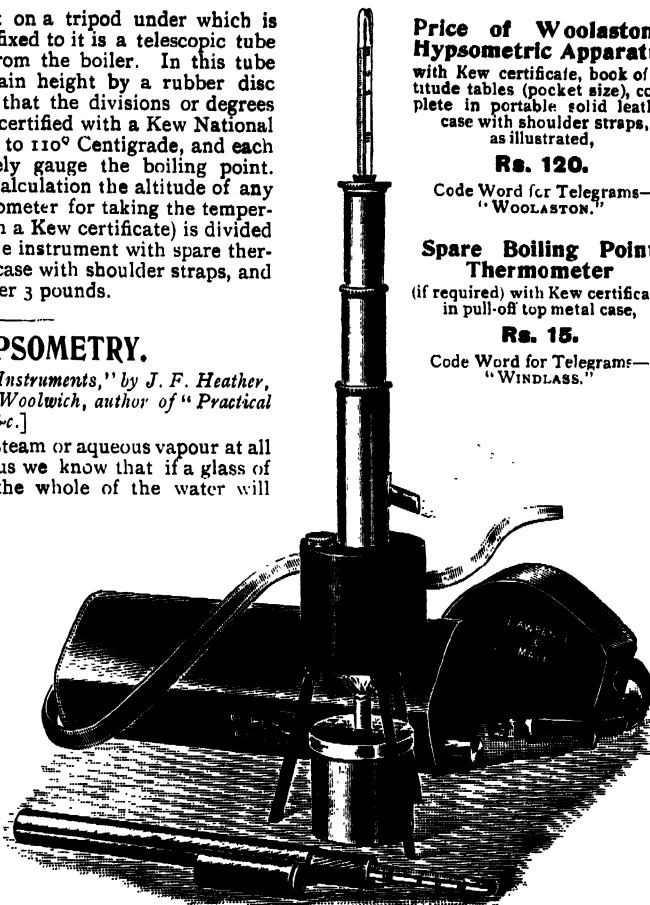
Code Word for Telegrams—  
"WOOLASTON."

**Spare Boiling Point Thermometer**

(if required) with Kew certificate, in pull-off top metal case,

**Rs. 15.**

Code Word for Telegrams—  
"WINDLASS."



# The "WHITE ENSIGN"

## NAVAL PENDANT BAROMETER,

Specially suitable for hanging in Naval Mess Rooms, or for Presentation to Naval Officers, or those interested in the Naval Service.

The "WHITE ENSIGN" NAVAL PENDANT BAROMETER is carved by British Artists in one piece from solid British Oak. The design represents an anchor with dolphins, at the top is a medallion portrait of Lord Nelson, and carved in relief round the Barometer his historical signal, "England expects that every man will do his duty." A silver shield is fitted below the Thermometer for engraving inscription, crest, badge, &c.

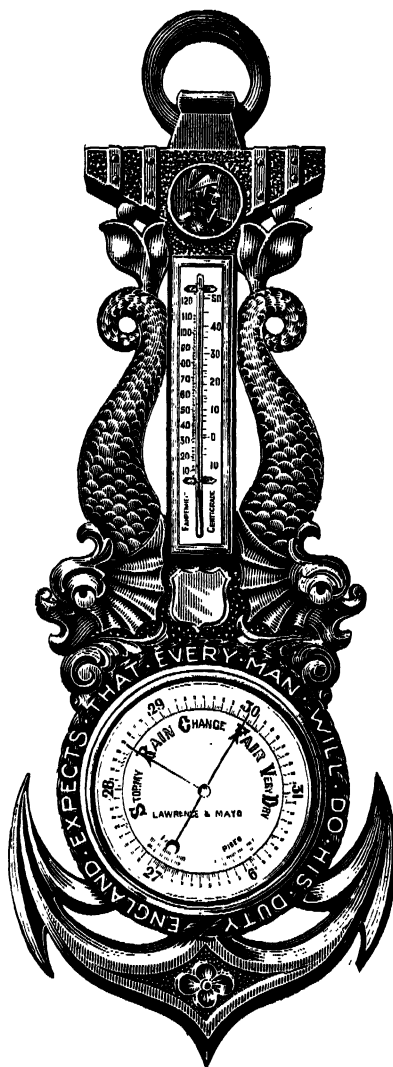
The workmanship throughout is of the highest class, and the Instrument complete represents the high standard of excellence prevailing in the manufacture of British-made meteorological instruments.

**PRICE :**

**Rs. 250.**

Code Words for Telegrams—

"DREADNOUGHT."



**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The "Trojan" Military Pendant Barometer.

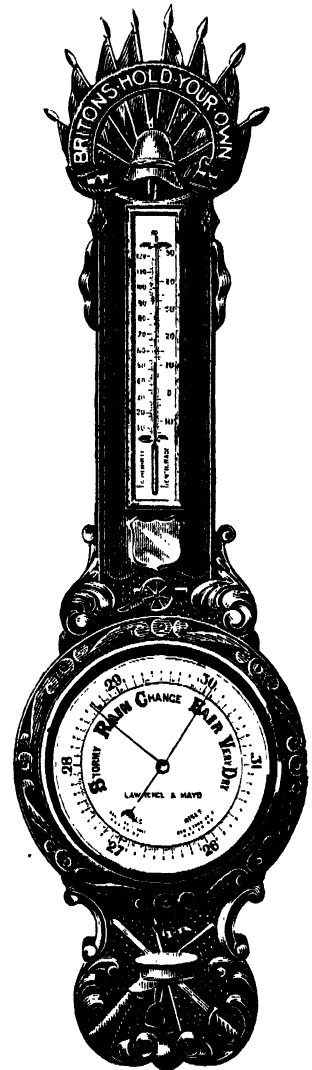
*Specially suitable for hanging in Military Mess Rooms, and for presentation to Military Officers, or those interested in the Military Service.*

THE "TROJAN" Military Pendant Barometer is carved by British Artists in one piece, from solid British oak. The design represents the various arms and accoutrements used in the Military Services, with the motto: "Britons Hold Your Own" carved in relief (as illustrated), a silver shield is fitted below the Thermometer for engraving regimental badge, crest, inscription, etc.

The workmanship throughout is of the highest class, and the complete instrument represents the high standard of excellence prevailing in the manufacture of British-made meteorological instruments.

PRICE, **Rs. 250.**

Code Word for Telegrams: "TROJAN"



**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## Standard and Pediment Barometers.

THE Student's Standard Barometer (Fig. 1) has been designed to meet the requirements of Students and others who find the need of a Barometer which will **give exact readings and cost but a moderate sum.** It appeals especially to Colleges and Schools for demonstration purposes.

The construction is on that of the well-known "Fortin" principle. The level of the cistern mercury is reducible to Zero, in exactly the same manner as in the more expensive forms. The diameter of the mercurial column is  $\cdot 25$  inch, and affords a bold, well-defined reading. The scales, by means of the double Vernier, are capable of being read to  $\cdot 01$  inch and  $\cdot 1$  millimetre. It is mounted on a well-polished, solid mahogany board, with plates for attachment to wall, opal glass reflectors for reading off, and screws for vertical adjustment.

The metal portions are all well bronzed and lacquered, and the scales are silvered brass.

We confidently recommend this Instrument for use as a "Standard" in Colleges and Schools, Private Observatories, and by Gas and other Engineers.

PRICE, complete with Kew certificate,  
**Rs. 175.** Code word for Telegrams—  
"OPERATOR."

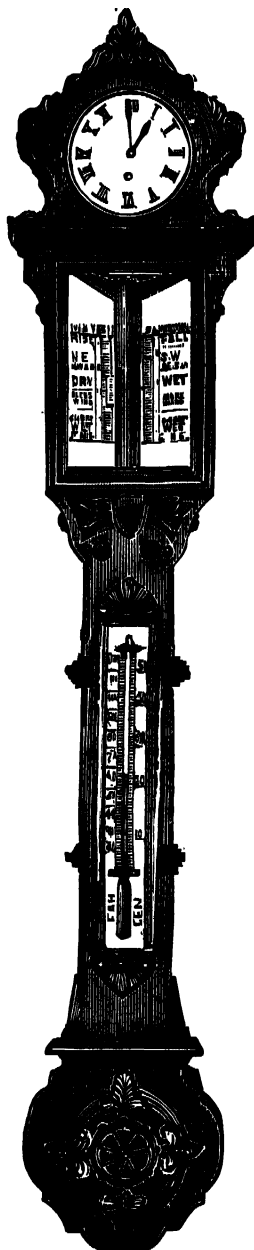


FIG. 2.



FIG. 1.

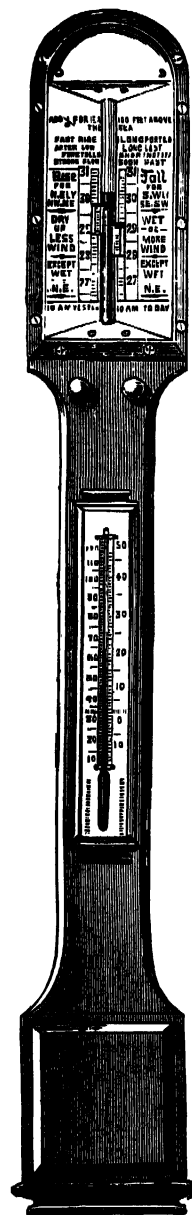


FIG. 3.

Code Word for Telegrams.

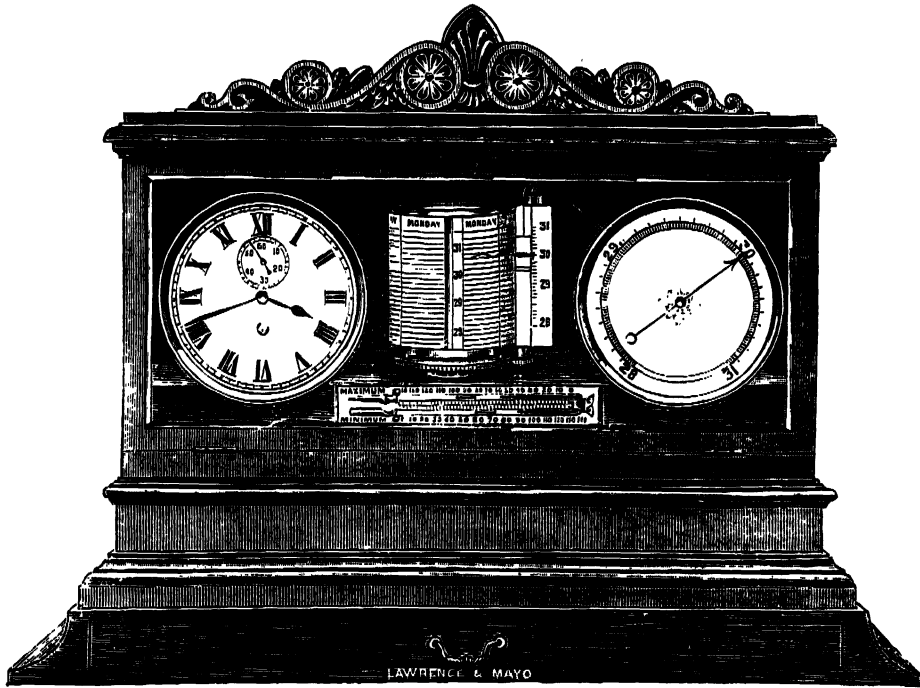
FIG. 2.—Standard Pediment Barometer, with 8-day Clock, in oak frame ... **Rs. 300** "PEDIMENT."

FIG. 3.—Pediment Barometer, in oak frame ... .. **Rs. 150** "REFLECTOR."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# Observatory Recording Barograph,

WITH CLOCK AND THERMOMETER REGISTER.



This Barograph, or automatic Recording Barometer, comprises an eight-day timepiece and an Aneroid Barometer, enclosed in a cabinet with a plate-glass hinged front; between them, and kept rotating by the clockwork, is a metal cylinder, on which is fixed, by means of clips, a chart ruled horizontally, to accord with the inches and tenths of the Barometric scale, and vertically to, represent in bold lines the seven days of the week, and in finer lines the hours of the day. Between the cylinder and the Aneroid is a column supporting a pencil in connection with the Aneroid movement. As the hand of the Barometer rises and falls, this pencil is brought into a corresponding position with regard to the chart on the cylinder, and at every quarter-hour is caused to make a dot on the chart. By this means a complete record is made of all variations of pressure, both night and day, and not only the amount of the variation, but the rate at which it takes place and the particular time of its occurrence—all most valuable and indeed necessary information to the scientific observer. A registering thermometer, fixed to the base, records the maximum and minimum temperature, and a drawer at the base contains unused charts, and a division for the used charts to be kept as records.

This instrument, by its size and appearance, forms a very prominent and handsome ornament for Clubs, Public Rooms, and Libraries, and from its superior design and workmanship can be relied on as a true time keeper and recorder.

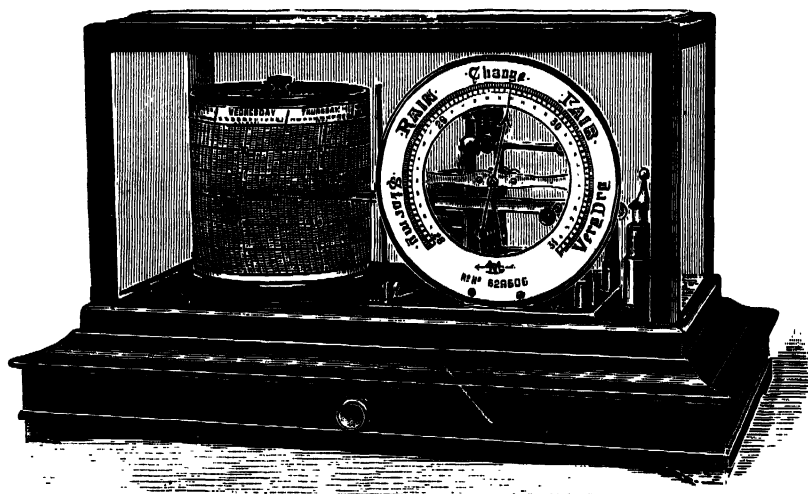
**PRICE, Rs. 550**

Code word for Telegrams—"NAVIGATOR."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**



# THE BAROGRAPH OR SELF-RECORDING BAROMETER.



*Oak or Walnut Frame, with Stout Bevelled Plate Glass all round, and Drawer under base fitted with two divisions for used and unused Charts.*

This instrument records in ink, upon a Chart attached to a revolving drum, the changes of atmospheric pressure, and is particularly interesting in that one can see at a glance what changes have taken place during periods when personal observation has not been convenient; the direction of the advancing line gives also a fair indication of coming changes, and the position of the pen on the divided Chart gives the correct time.

As will be seen by the illustration, in addition to the ordinary Chart Drum, the instrument is provided with a **Barometer Dial**, thus combining in one a thoroughly reliable Recording Barometer, and a first quality Household Barometer.

The action of both dial-hand and recording arm is simultaneous, the same movement controlling the two. The Chart on the drum giving a record of the variations of the Barometer, whilst the dial shows the present readings. The movement is of first-class workmanship throughout, and **Compensated for temperature.**

## INSTRUCTIONS FOR USE.

Having removed the cover from the Instrument, first throw the pen off the Cylinder carrying the Chart by turning the lever in the base plate.

Wind the Clock by the attached key, holding the Cylinder firmly in position in the left hand—the covered hole *near* the key gives access to the Regulator of the Clock movement, and should be kept closed.

To place the Chart in position, turn the milled-head nut at the top of the retaining spring band (which is hinged at the bottom), the catch at the upper end being released it will fall downwards; remove the used Chart (if there is one on the Cylinder), and put a new one into position, being careful that its edge rests on the projecting rim at the bottom of the Cylinder; one end of the Chart should overlap the other, and the junction come where the retaining spring-band, when replaced, will hold the paper firmly to the Cylinder.

Fill the pen with the prepared ink, draw a piece of paper lightly and carefully across the nibs, to see that the ink will flow.

Turn the lever in the base plate, and allow the return of the pen to the face of the Chart. The pressure of the pen upon the Chart should be as light as possible—only sufficient to ensure the pen marking distinctly with the ink. This pressure can be regulated by turning the milled-head screw at the other end of arm which carries the pen.

The Cylinder with Chart must then be turned upon its centre until the pen points to the *correct* time.

To set the pen to the correct reading of a Standard, turn very gently the milled-head nut marked "Set Pen," and the arm carrying the pen will be depressed or elevated accordingly.

The change of Chart should be made on Monday morning, between the hours of 7 and 12—this period being duplicated on the Chart for the purpose.

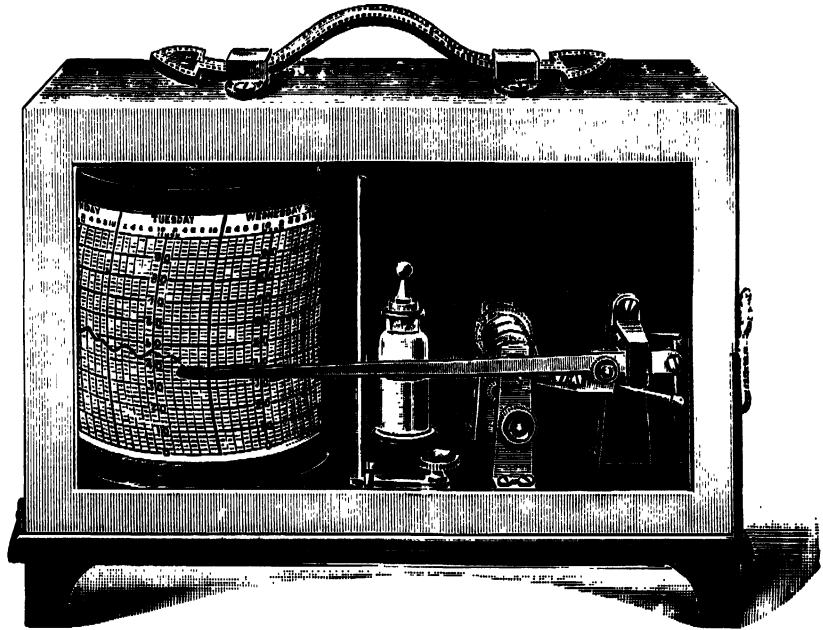
**PRICE, including 2 years' supply of Charts, Rs. 130.**

Code Word for Telegrams—"BAROGRAPH."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## THE THERMOGRAPH OR SELF-RECORDING THERMOMETER.

THE THERMOGRAPH is an instrument designed and arranged to record, upon a chart, the various changes in the temperature that occur, and as the chart, being encircled upon a drum, which revolves by a clock movement to correct time, the particular time at which any change occurs can then be seen, as well as the number of degrees of increase or decrease in temperature. The action of the instrument is produced by the expansion or contraction of metal bars made in the form of a quadrant, or, of a spiral form. These bars are formed of two metals of different expansive properties, and, by a change in temperature, becomes curved either *inwards* or *outwards* according to the direction in which the change occurs, increase or decrease. This action is multiplied through a series of levers, eventually raising or lowering the arm which carries the recording pen, and the diagram is marked upon the chart as it revolves.



IN ENAMELLED IRON FRAME WITH COPPER HINGED COVER.

### DIRECTIONS FOR USE.

Having removed the cover of the instrument, first throw the pen off the Cylinder, carrying the Chart, by turning the milled head nut in the base-plate.

Wind the clock by the attached key, holding the Cylinder firmly in position in the left hand.

To place a Chart in position, remove the used Chart (if there is one on Cylinder), and put a new one into position, being careful that its edge rests on the projecting rim at the bottom of the Cylinder; one end of the Chart should overlap the other, and the junction comes where the retaining spring-band, when replaced, will hold the paper firmly to the Cylinder.

Fill the pen with the prepared ink, draw a piece of paper lightly and carefully across the nibs to see that the ink will flow.

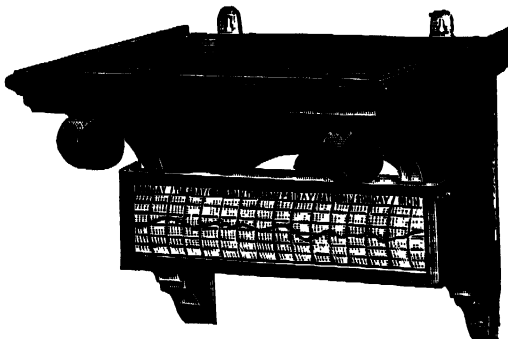
Turn the milled-head in the base-plate and allow the return of the pen to the face of the Chart. The pressure of the pen upon the Chart, *should be as light as possible*, only sufficient to ensure the

pen marking distinctly with the ink. This pressure can be regulated by turning the milled-head screw at the other end of arm which carries the pen.

The Cylinder with Chart must then be turned upon its centre, until the pen points to the correct time.

To set the pen to the correct reading of a Standard Thermometer, turn very gently the milled-head screw, which is placed on top of the central bridge, and the arm carrying the pen will be depressed or elevated accordingly.

The change of Chart should be made on Monday morning between the hours of seven and twelve—this period being duplicated on the Chart for the purpose.



Bracket for Barograph or Thermograph with Chart Box for shewing previous week's chart or record.

**Price, Rs. 25.** Code word for Telegrams—"DRAGON."

**Price, including 2 years' supply of Charts, Rs. 120**

Code word for Telegrams, "DECOMATOR."

# RAINFALL.

THE capacity of air to retain moisture, or the quantity of moisture which a given column of air will hold, increases with temperature until saturation is obtained; hence it follows, that with any reduction of temperature, from whatever cause, precipitation must take place from the inability of the air to sustain the amount of aqueous vapour it has absorbed, the result is the rain which we receive upon the earth, first being formed in small globules and falling to the earth by gravitation, formed into larger drops as one unites with another, their increase of weight causing the more rapid fall and overtaking in their descent other small drops, so that from the greater height of clouds, rain-drops fall larger to the earth.

The equivalent in weight of one inch upon the surface, is one hundred tons to the acre.

To measure the amount of rainfall, recourse is had to the Rain Gauge; these are made in different forms, as here described, one and all registering by the same principle, but some forms possessing advantages over others.

A Rain Gauge should not be set on a roof, a slope, or a terrace, but upon a level piece of ground, and in a clear space, so that it will not be sheltered by trees, shrubs, or buildings. The Gauge should be placed as near level as possible, and fixed in such a way that it would not be overturned by a strong wind. In using the measuring glass it should be held quite level, so that the surface of the water is level, and a true reading obtained from the graduation on the glass to which it is in contact.

## THE "MONSOON"

### Registering and Recording Rain Gauges.

#### REGISTERING 200 INCHES OF RAINFALL.

The great advantage which these gauges possess, is, that no measurement of the rainfall has to be made. The quantity of rain being registered on the dial, the reading can be taken at any time convenient to the observer.

The rain falls upon the surface of the collecting funnel and passes down through a small pipe, falling into a balance BUCKET, known as a "Tilting Bucket."

When the amount of rain, equal to 100th of an inch, has fallen, the Bucket tilts over on the laden side, discharging the rain into a receiver. The continuing rain then passes into the opposite side of the bucket, which again tilts when the same quantity has passed into it, and this action continues while the rain is falling.

The motion of the bucket operates a mechanical arrangement by which the indicating hand upon the dial registers the correct amount.



FIG. 1.

Fig. 1 *The "NIAGARA,"* Registering Rain Gauge.

The outer circle of graduation upon the dial registers ONE INCH of rain for the entire circle, subdivided into 100ths of an inch. The SECOND dial continues the count up to 10 inches, and the THIRD dial continues the count up to 200 inches of rainfall.

**Price, Rs. 110.**

Code word for Telegrams—"NIAGARA."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The "SERPENTINE"

## Registering and Recording Rain Gauge.

Registering 200 inches of Rainfall.

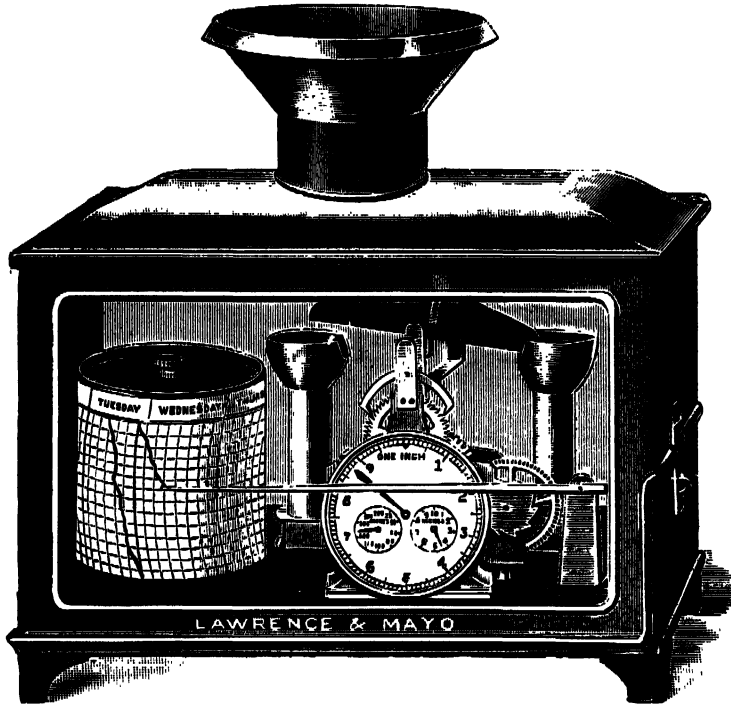


FIG. 2.

**Fig 2. The "SERPENTINE" Recording Rain Gauge.**

This Instrument is constructed upon the same principle as Fig. 1, but in addition has the Recording Chart fixed upon a cylinder with clockwork mechanism causing the cylinder to revolve once a week. The chart is constructed to show ONE INCH of rain for its entire depth. The recording Pen commences its mark at the top of the chart and moves downwards as the rain falls. When the Pen reaches the bottom line of the chart—one inch—it is automatically released and rises at once to the top of the chart, and continues to fall while rain is falling. Each inch and parts of inches can then be seen upon the chart, and, upon the DAY and HOUR at which the rain-fall occurred.

The amount of rain-fall can also be seen upon the dial which is constructed to show ONE INCH of rain for the entire outer circle. The SECOND dial continues the count up to 10 inches, another THIRD dial continuing to count up to 200 inches of rain-fall.

**Price, Rs. 250.**

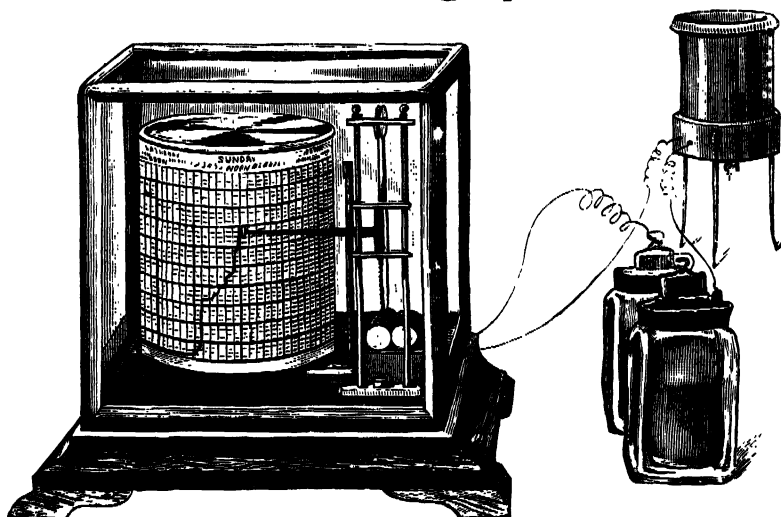
**Full instructions for renewing charts is given with each instrument.**

Code word for Telegrams—"SERPENTINE."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## The "Wilson" Electric Self-Recording Rain Gauge or "Pluviograph."



**T**HIS Rain Gauge has been designed to meet what has been found to be a want among Meteorological Observers, viz., an Instrument which will accurately register or record the rainfall, and this Register or Record followed by the observer in the shelter of the house or Meteorological Station. The actual rate of rainfall for any given period may be followed easily as the pen leaves an indelible record of the day and hour on which the rain occurs, the quantity which falls, and the rate at which it descends.

**The Self-Recording Rain Gauge or "Pluviograph"** consists of the Receiver, set of Batteries and Recorder portion, on a polished oak base, and plate glass and oak cover. All the attention this rain gauge requires is to re-wind the clock once a week, usually before noon on Monday, replace the used chart by another, and see that the pen is well supplied with ink. The chart shews one inch of rainfall from bottom to top in 50ths of an inch, but the pen is actuated as each 1-100th is completed, and therefore moves twice in each sub-division on the chart. When an inch of rain has descended the pen is automatically released and falls to zero.

**Price, Complete with Batteries, Rs. 350.**

Code Word for Telegrams "MONSOON."

**LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# RAIN GAUGES.

## HOWARD'S RAIN GAUGE.

5 inch.

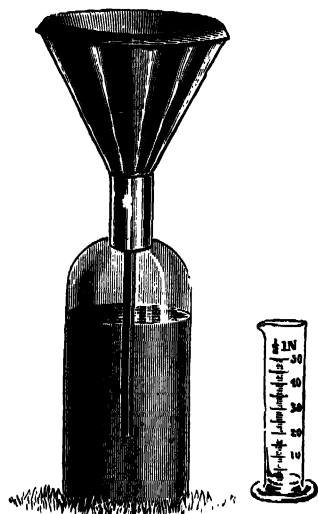


FIG. 1.

## GLAISHER'S RAIN GAUGE.

8 inch.

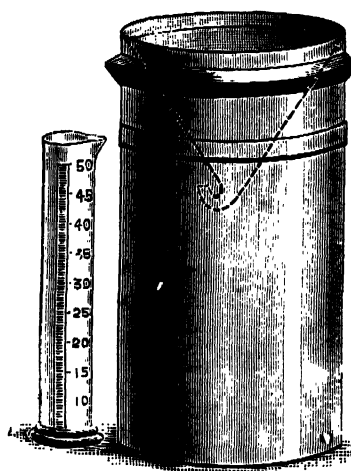


FIG. 2.

## TROPICAL RAIN GAUGE.

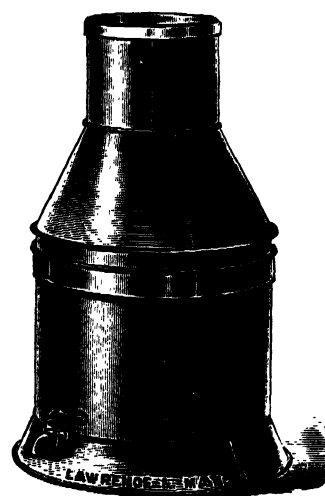


FIG. 3.

## PEDESTAL RAIN GAUGE.

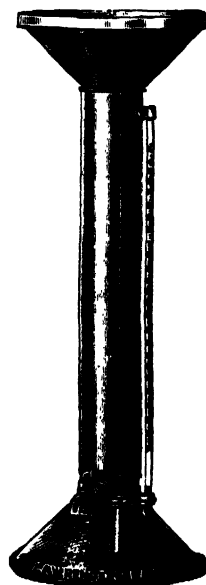


FIG. 4.

FIG. 1.—Howard's Rain Gauge, 5 inch, copper funnel, glass receiver, and graduated measure ... ..	<b>Rs. 8-8</b>	Code Word for Telegrams. "HOWARD."
FIG. 2.—Glaisher's Rain Gauge, 8 inch, in copper with brass edge receiver and graduated measure ... ..	<b>Rs. 28</b>	"GLAISHER."
FIG. 3.—Glaisher's Rain Gauge for Tropical rainfall, with large receiver and tap ... ..	<b>Rs. 55</b>	"TROPICAL."
FIG. 4. - Pedestal Rain Gauge, 12 inch, copper, complete with graduated tube, amount of rainfall is shown without using a measure ... ..	<b>Rs. 60</b>	"SHADOW."
Extra Tubes for Pedestal Rain Gauge ... ..	<b>Rs. 4</b>	"MINNOW."
Extra Gauge Glasses for Howard's Rain Gauge, $\frac{1}{2}$ inch scale ... ..	<b>Rs. 2</b>	"MEADOW."
do. do. 1 inch scale ... ..	<b>Rs. 3</b>	"KEELSON."
do. do. for Glaisher's Rain Gauge $\frac{1}{2}$ inch scale ... ..	<b>Rs. 2</b>	"MANDRIL."
do. do. 1 inch scale ... ..	<b>Rs. 3</b>	"LAPSTONE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# ANEMOMETERS.

For Registering Pressure and Velocity of Wind and Air Currents.

FIG. 1.

## "BIRAM'S" ANEMOMETER.

For registering the velocity of currents of air in Mines, Tunnels, &c., by means of a light fan, the revolutions of which are recorded on a dial in the centre of the instrument.

This instrument—placed in the passage of a mine—registers automatically the rate at which the air is travelling through it, and a simple observation will detect any slackening of the current arising from obstruction of the ways or want of attention at the ventilating furnace or fan wheel.

Size 3 inch diameter, reading to 1,000 feet, **Rs. 50.**

Code word for Telegrams, "ANEMOMETER."

Size 6 inch diameter, reading to 1,000 feet, **Rs. 60.**

Code word for Telegrams, "AMPERE."

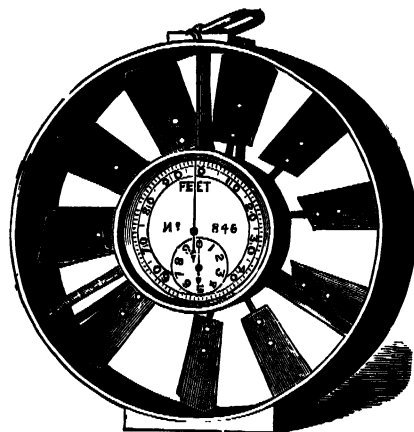


FIG. 1.

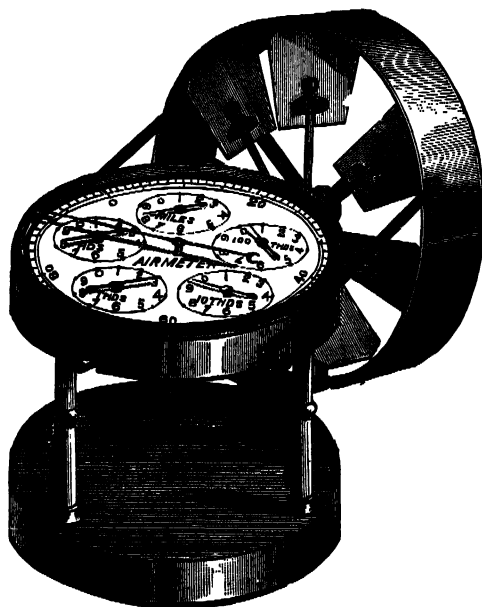


FIG 2.

FIG. 2.

The Portable 6 Dial **AIR METER**, for the measurement of currents of air through Mines, Tunnels, Sewers, and the ventilators of Hospitals, Public Buildings, &c. The indications are obtained by means of a delicately poised fan-wheel, the recordings being commenced by the long hand, which traverses the extreme outer circumference of the main dial for the passage of 100 feet of air. The enumeration is continued up to 10,000,000 feet (say 1,894 miles), by a series of smaller dials as shown in the illustration. A "Disconnecter," projecting from the band of the instrument, opposite the fan-wheel, serves to throw the mechanism out of gear and arrest its action when required.

The instrument is packed, with the usual Universal jointed socket holder, in a polished mahogany case.

PRICE, **Rs. 70.**

Code word for Telegrams—"ANCHOR."

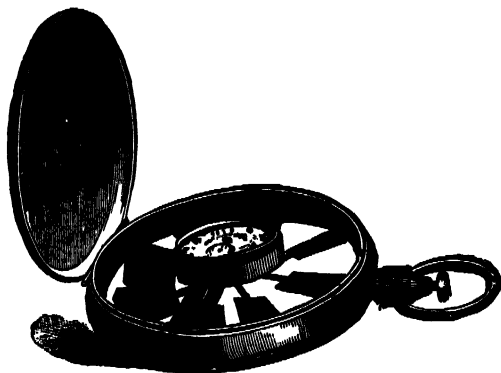


FIG 3.

FIG. 3.

## POCKET ANEMOMETER.

Two Inches Diameter.

This is a most useful and portable instrument for Engineers and others requiring to ascertain the strength or velocity of air currents.

PRICE **Rs. 65.**

Code word for telegrams—"ATOM."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## ANEMOMETERS AND WIND VANES.

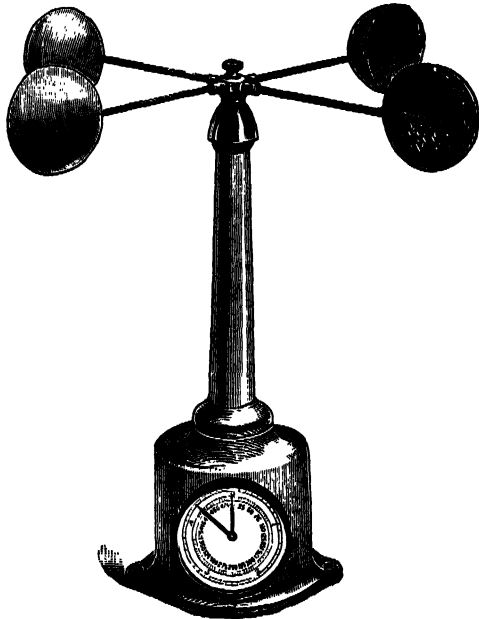


FIG. 4.

FIG. 4.—ROBINSON'S ANEMOMETER Improved and Simplified.—The improvement consists—1st—In a re-arrangement of the works which admits of the column carrying the arms and cups rising from the CENTRE instead of from one CORNER, as in the models now in use; and, 2ndly, in an arrangement by which the enumeration is effected by two hands which can be moved to "Zero" on the commencement of an observation, thus obviating the necessity of taking a reading of the present condition of the Index before proceeding to make a fresh observation.

PRICE, **Rs. 75.**

Code Word for Telegrams—  
"ERMINE."

FIG. 5.—ROBINSON'S ANEMOMETER with Wind Vane attached.

This Anemometer corresponds in every way with the description

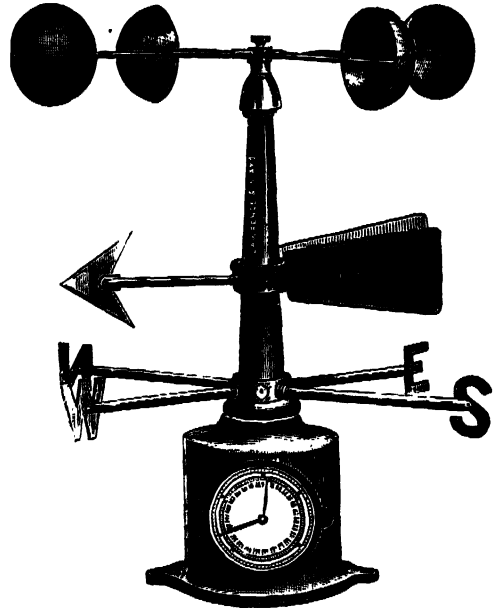


FIG. 5.

given for Fig. 4, but has the addition of the Wind Vane, by which the *direction* of the wind can be seen at a glance.

PRICE, **Rs. 105.**

Code Word for Telegrams—  
"FEATHER."

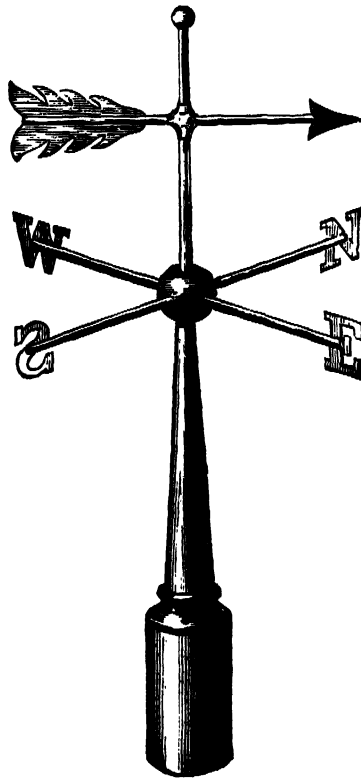


FIG. 6.

FIG. 6 is an illustration of an ordinary **WIND VANE**, which indicates the direction in which the wind is blowing. It is 4 feet in height and made of copper, and forms a good terminal or finish to the roof, or pinnacle of a building. The pillar of Vane is japanned blue, arrow and letters, yellow.

PRICE, **Rs. 75.**

Code Word for Telegrams—"VANE."

These Vanes can be made more handsome and larger. For these, special designs and estimates would be supplied.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



## The "Observer" set of Meteorological Instruments.

The "**Observer**" Set of Meteorological Instruments comprises all those which are essential to establish a record of statistics of the most important points in Meteorology, *i.e.* Atmospheric Pressure, Temperature, Hygrometry and Rainfall.

The importance of this subject cannot be too forcibly impressed upon all those whose occupation or vocation render them dependent upon, or greatly affected by, Atmospheric Influences.

By a careful notice of the indications of these Instruments, added to personal observations, a fore-knowledge is obtained, by which much may be done to avert damage and loss, their use by the Agriculturist and Horticulturist being almost a necessity, while to all the study is most interesting.

This Set has been arranged and produced at a price far lower than ever before attempted, so as to place it within the reach of the many, and this economy is not at the expense of efficiency, as we guarantee them to be accurate and well-made instruments.



The following instruments are contained in a portable strongly made Cabinet, in which is arranged a place for each instrument:—

1.—An **Aneroid Barometer**, Metal Frame, 5-in. Enamel Dial.

2.—An **8-in. Boxwood Bevel Edge Thermometer**, F. and C. Scales.

3.—A **Maximum and Minimum Registering Thermometer** (Six's form), in Weather Protecting Case, with Magnet.

4.—A **Rain Gauge**, Japanned Funnel, with turned Brass Edge, 5-in. diam., Glass Bottle Receiver, and Graduated Glass Measure.

5.—A **Wet and Dry Bulb Thermometer** (Mason's Hygrometer), on Boxwood Scale in Metal Weather Protecting Case.

6.—A **Record Calendar** for 12 Months, with Indication Columns for each Instrument.

PRICE, Complete with Cabinet, **Rs. 95.**

Code word—"OBSERVER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# Directions for using the Observer Set of Meteorological Instruments.

The Barometer and Thermometer speak for themselves, but a few words in regard to the other Instruments will not come amiss.

## THE MAXIMUM AND MINIMUM REGISTERING THERMOMETERS. (SIX'S FORM.)

This form of Thermometer is for registering extremes of heat and cold by means of a steel index prevented from falling by a hair fastened around it, to act as a spring, moving in the spirit in each of the side tubes.

The scale on the left hand, for indicating minimum temperatures, is a descending one, the zero being at the top; while the right-hand scale for maximum temperatures is an ascending one, having the zero at the bottom.

When setting the Instrument the indices are brought into contact with the mercury by passing a small magnet down the outside of each tube. Then, should a rise of temperature take place, the spirit in the one bulb expands, forcing down the mercury in the left-hand tube, and causing it to rise in the right, which it does also partly by its own expansion. The reverse of this occurs when a diminution of temperature takes place; contraction in all the contained fluids results, and the registering mercury ascends in the left hand column, pushing the index before it, where it remains until re-adjusted for the next observation.

## RAIN GAUGE.

A Rain Gauge should not be set on a roof, a slope or a terrace, but upon a level piece of ground and in a clear space, so that it will not be sheltered by trees, shrubs or buildings. The Gauge should be placed as near level as possible, and fixed in such a way that it would not be overturned by strong wind.

In using the Measuring Glass, it should be held quite level, so that the surface of the water is level and a true reading obtained from the graduation on the glass to which it is in contact.

When very heavy rains occur, it is desirable to measure at once on their termination, and return the water to the Gauge, unless there is a doubt as to the Gauge holding all there may fall before the hour of the day at which the amount is measured—in that case, the quantity of water measured from the Gauge should be written down, and that amount added to the subsequent measurement.

The amount of rain measured, should always be written down before the water is thrown away.

**Snow.** The best way to measure the rain-fall by the depth of the snow, is to select a place where the snow has not drifted, invert the Funnel of the Gauge, press it down through the snow to the surface of the ground, give the Funnel a turn and it will lift up the snow within its circumference; this should then be melted into the Gauge and measured.

## Wet and Dry BULB THERMOMETER, or MASON'S HYGROMETER.

This instrument is devised for determining the amount of moisture in the atmosphere, ascertaining the relative humidity, and forecasting the probability of frost.

**The construction** consists of two thermometers as nearly alike as possible in range of scale, mounted on either side of a block of polished wood, with a cistern for water between. The Thermometer marked **dry** is exposed to the air; the other, marked **wet**, has its bulb surrounded by a piece of wicking, which passes down into the opening in the cistern, acting as a wick, and keeping the bulb of the Thermometer constantly moist. As evaporation causes a loss of heat, the wet bulb Thermometer will read lower than the other, provided there is any degree of dryness in the air. When the air is very dry, the difference in their readings will be great; if moist, the difference will be proportionately less, but if the air is fully saturated both Thermometers will read alike, as there can then be no evaporation.

**Dew is formed** by the radiation of heat from the surface of trees, plants, etc., consequently reducing the temperature of the air near the immediate surface of such objects to the point of complete saturation, causing moisture to be deposited. The Hygrometer therefore becomes of the greatest value to the farmer and the florist, since in the hands of an intelligent observer the formation of frost can be foretold with certainty, enabling him to take steps to prevent damage to delicate plants exposed to the air. In the Greenhouse it is most useful, as also in the household for maintaining a degree of healthful humidity.

## TO CONVERT THE READING OF ONE THERMOMETER SCALE INTO THOSE OF ANOTHER, OBSERVE THE FOLLOWING RULES:—

1.—To convert Fahrenheit degrees into those of Centigrade, subtract 32, divide by 9, and multiply by 5. For example, take the boiling point Fahrenheit,  $212^{\circ}$ ;—

$$212 - 32 \div 9 \times 5 = 100.$$

The boiling point Centigrade.

2.—To convert Fahrenheit degrees into those of Reaumur, subtract 32, divide by 9 and multiply by 4.

3.—To convert Centigrade degrees into those of Fahrenheit, divide by 5, multiply by 9, and add 32.

4.—To convert Reaumur degrees into those of Fahrenheit, divide by 4, multiply by 9, and add 32.

5.—To convert Centigrade degrees into those of Reaumur, divide by 5, and multiply the quotient by 4.

6.—To convert Reaumur degrees into those of Centigrade, divide by 4, and multiply the quotient by 5.

---

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# Solar and Terrestrial Radiation Thermometers, Thermometer Screens and Stands.

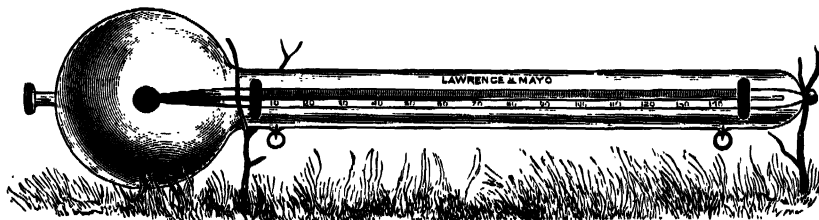


FIG. 1.

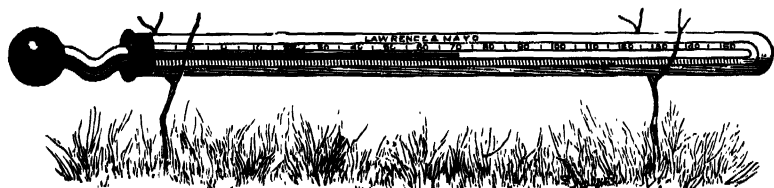


FIG. 2.

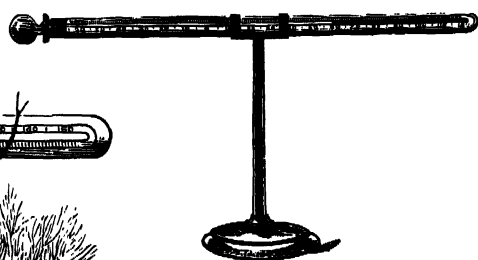


FIG. 3.

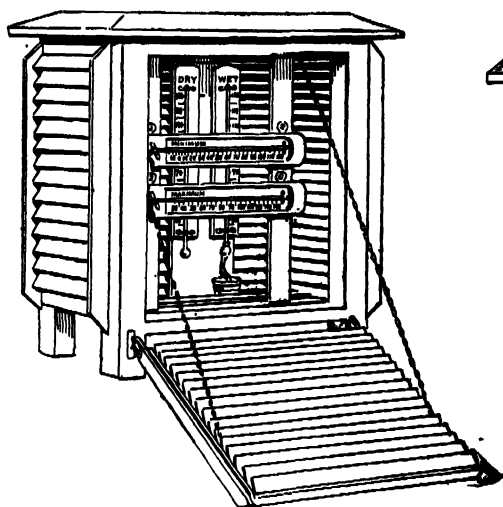


FIG. 4.

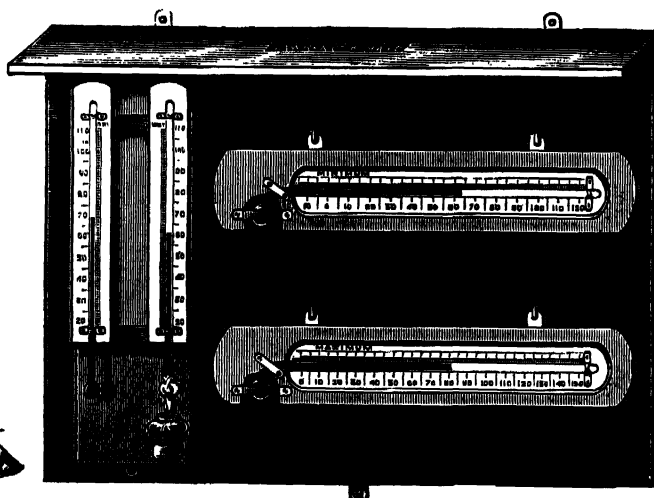


FIG. 5.

Code word for  
Telegrams.

- FIG. 1. Solar Radiation Thermometer, to accurately ascertain the extreme heat in the sun's rays, self-registering, black bulb in vacuo ... **Rs. 20. "SOLAR."**  
 ,, 2. Do. do. do. do. in open air ,, **22. "ELEPHANT"**  
 ,, 3. Terrestrial Radiation Thermometer, self-registering on brass stand ,, **25. "COMET."**  
 ,, 4. Stephenson's screen to hold standard maximum and minimum Thermometers, and Mason's Hygrometer ... .. ,, **60. "SCREEN."**  
 ,, 5. Thermometer Screen to hold standard Thermometers ... .. ,, **10. "HOLDER."**

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# Maximum & Minimum Registering Thermometers.

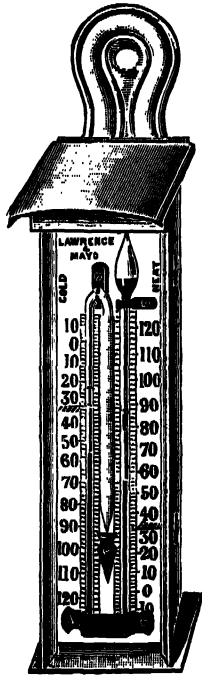


FIG. 3.

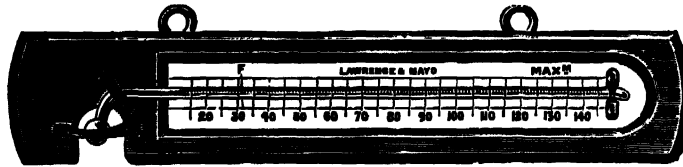


FIG. 1.

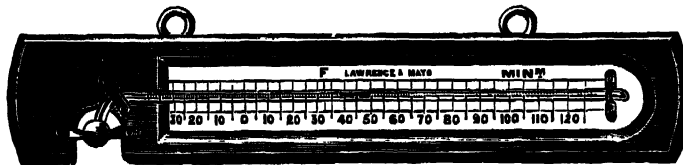


FIG. 2.

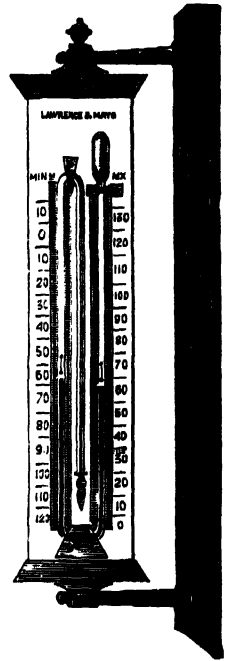


FIG.

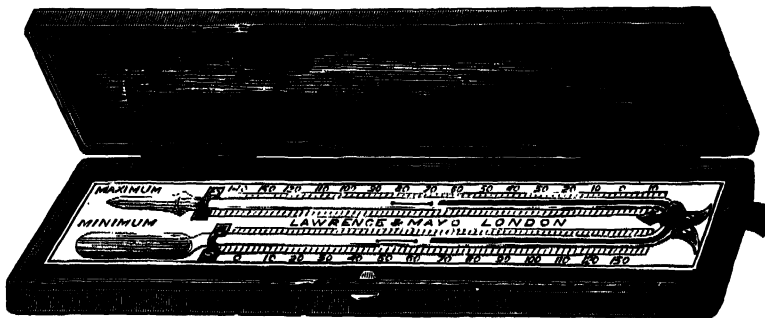


FIG. 5.

FIG. 1.	Standard Maximum Thermometer, opal scale, engine divided tube, mahogany frame ... ..	Rs. 20	"MAXIMUM."
" 2.	Standard Minimum Thermometer, Do. do. ... ..	" 20	"MEASURE."
" 3.	Six's Maximum and Minimum Thermometer, 10 inch boxwood scale ... ..	" 10	"MERCURY."
" 4.	Six's Maximum and Minimum Thermometer, 12 inch opal glass scale, on bracket with pivots for fixing against window ... ..	" 35	"BRACKET."
" 5.	Traveller's Pocket Maximum and Minimum Thermometer, mounted on ivory scale, in morocco leather case ... ..	" 25	"TRAVELLER."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# Thermometers and Hygrometers.

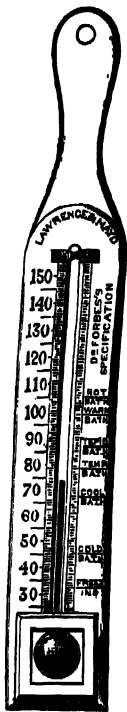


FIG. 1.

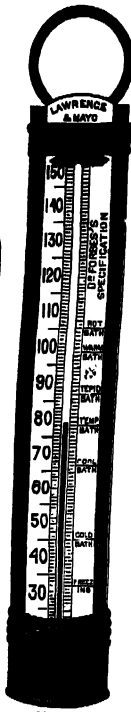


FIG. 2.

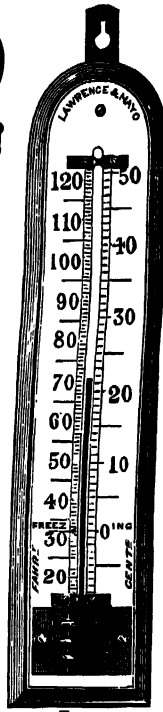


FIG. 3.

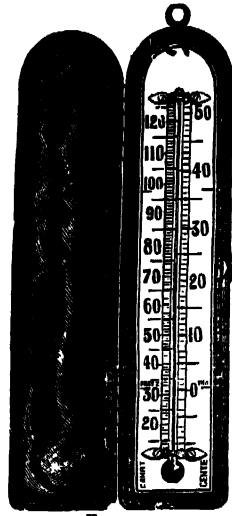


FIG. 4.

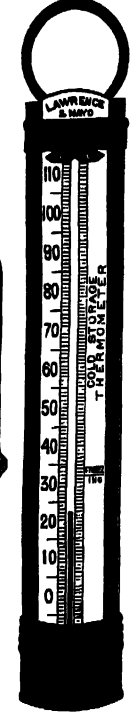


FIG. 5.



FIG. 6.

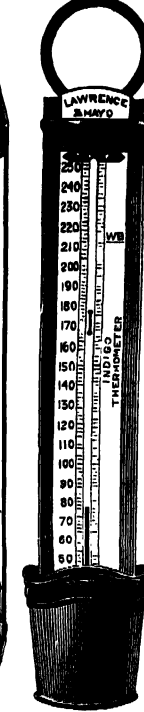


FIG. 7.

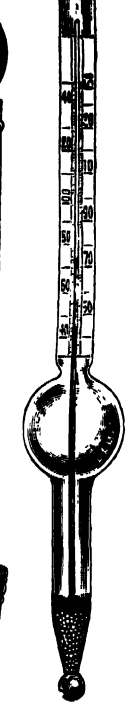
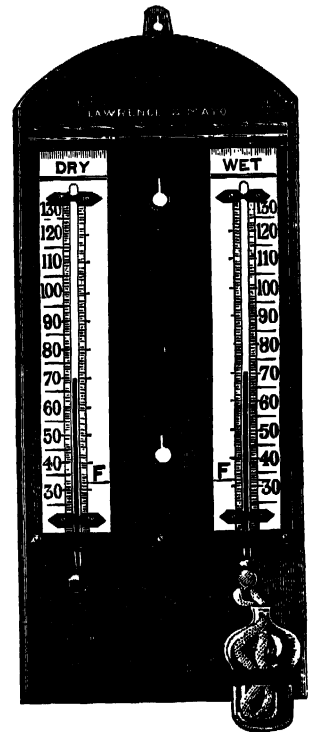
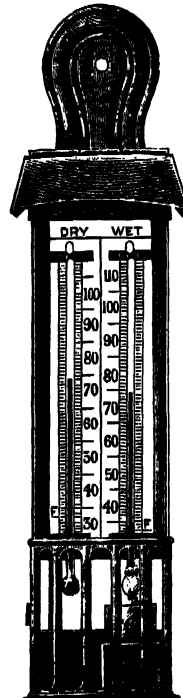


FIG. 8.

Code word for  
Telegrams.

- FIG. 1.—Porcelain Bath Thermometer, 10-inch, with handle ... **Rs. 4** "PORCELAIN."
- FIG. 2.—Do do. do. 10-inch porcelain scale, japanned case **Rs. 3-8** "JAPAN."
- FIG. 3.—Best Hand-painted Porcelain Thermometer, 10-inch ... **Rs. 7-8** "HAND."
- FIG. 4.—Pocket Thermometer, 5-inch ivory scale, in leather case ... **Rs. 12** "IVORY."
- FIG. 5.—Cold Storage Chamber Thermometer for preserving meat, eggs, and all kinds of provisions **Rs. 10** "STORAGE."
- FIG. 6.—Ships' Hold Thermometer, 12 inch, copper case, with conical ends, 32 to 230 ... **Rs. 5** "SALAMANDER."
- FIG. 7.—Indigo Thermometer, porcelain scales 30° to 300° ... **Rs. 15** "INDIGO."
- FIG. 8.—Insulated Thermometer, for Dairy use, scaled for Churning and Cheesing. This Thermometer can be highly recommended to Dairymen and Farmers: it is constructed on improved principles to render it absolutely germ proof and aseptic ... **Rs. 4** "DAIRY."
- FIG. 9.—Solis Glass Chemical Thermometer, scaled for testing caustic soda solution ... **Rs. 5** "KEY."
- FIG. 10.—Mason's Hygrometer, extra wide opal scales, in japanned case ... **Rs. 15** "KING."
- FIG. 11.—Mason's Standard Hygrometer, for registering the amount of Humidity in the air; metal scales, divided tubes, mounted on mahogany frame ... **Rs. 15** "KING."



# Thermometers for Tea Planters.

*Guaranteed London Made and of the Highest Quality.*

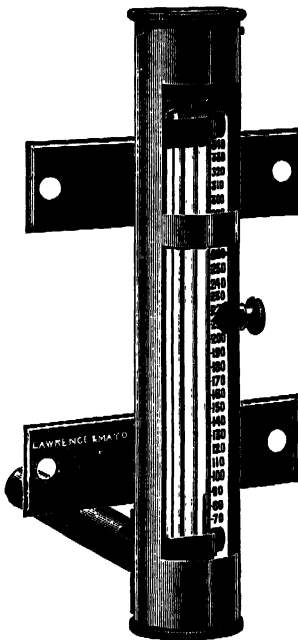


FIG. 2.

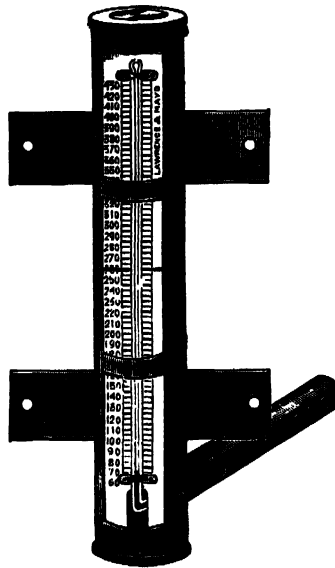


FIG. 1.

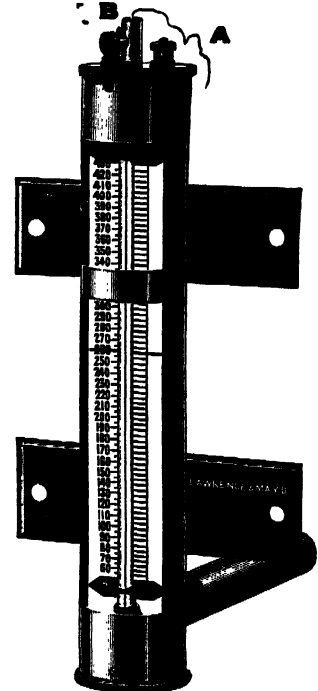


FIG. 3.



FIG. 4.

FIG. 1. Tea Drying thermometers to suit ordinary machine. Lens front tube, sensitive bulb 60-400.  
White porcelain scale very legible ... .. **Rs. 12**  
Code word for Telegrams—"BALOON."

FIG. 2. Lawrence and Mayo's "Monitor" improved recording Tea thermometer. This instrument is fitted with a sliding indicator, which can be set with a magnet at any desired temperature, and the indices will show any rise or fall in temperature that has taken place during absence **Rs. 25**  
Code word for Telegrams—"MONITOR."

FIG. 3. Improved Electric Tea Thermometer. This instrument will ring a bell at any desired temperature. Attach one of the wires from bell to terminal "A" and one from battery to terminal "B," then release thumb screw "C," and adjust platinum wire to the temperature the bell is required to ring at, then tighten screw "C" ... .. **Rs. 30**  
Code word for Telegrams—"FALCON."

FIG. 4. Registering Tray Thermometer. This instrument will record the highest temperature reached in the tray. To re-set same, swing the thermometer sharply bulb downward **Rs. 8**  
Code word for Telegrams—"TRAY."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS, and RANGOON.**

# CERTIFIED SELF-REGISTERING CLINICAL THERMOMETERS.

IN NICKEL-PLATED CASES.



Facsimile of Certificate.

As there are so many unreliable, inferior Clinical Thermometers on the market we are now supplying each of our Clinical Thermometers with a Certificate attesting to its *permanent accuracy* and showing the corrections (if any) to be applied to the observed reading. Each tube is seasoned two years before the scale is engraved, thereby ensuring *permanent accuracy*.

In spite of all the skill which has been brought to bear in the various processes connected with the manufacture of Clinical Thermometers, there is always possibility of error, which, if it occurs, is provided for in the certification. The finished tubes are put through the same series of tests as originally used in determining the test points, but an additional test is made at  $110^{\circ}$ , and any instrumental error is at once detected. The certificate bearing the instrument number, and other marks peculiar to that individual thermometer, is issued, and any error, if found, is noted thereon in tenths of a degree.

*Lawrence & Mayo*

67 & 69, Chancery Lane,  
London, ..... 190...

## (CLINICAL CERTIFICATE)

*This Certifies That Clinical Thermometer marked 6371 No. 1 has a fixed zero point, having been subjected to thorough seasoning before scale was engraved, and will not contract or increase its readings above any point called for by the corrections of this certificate.*

*Lawrence & Mayo*

THERMOMETER READING	CORRECTION
$95^{\circ}$	- 0
$100^{\circ}$	- 0
$105^{\circ}$	- 0
$110^{\circ}$	- 0

*NOTE When the correction is + it must be added to the observed reading and when - subtracted.*

## PRICES.

No. 1.—A plain Clinical Thermometer, 4 ins. long self-registering, with legible and indelible scale, enclosed in a polished nickel-plated case.

**Rs. 3.**

Code word for Telegrams—  
"ORDINARY."

No. 2.—Same as above, but with magnifying lens front.

**Rs. 5.**

Code word for Telegrams—  
"NERVE."

No. 3.—Half-minute Thermometer with magnifying lens front. This Thermometer will take the maximum temperature of the human body in half-a-minute.

**Rs. 7.**

Code word for Telegrams—  
"RAPID."

An extra charge of 4 annas is made on all Clinical Thermometers forwarded by post. For this fee we take all risk of damage during transit.

## DIRECTIONS FOR USING THE CLINICAL THERMOMETER.

Hold the Thermometer between the thumb and first finger, then with short, sharp side-jerks shake the mercury till it appears below the divisions; it is then ready for use. Apply it to the body for (in the case of ordinary Thermometers) from one to three minutes, when the mercury will then have risen to the highest temperature, and will there remain. After noting such temperature shake down the column as explained above. The Thermometer is then ready for the next observation.

# Hydrometers, Saccharometers, Salinometers and Densimeters.

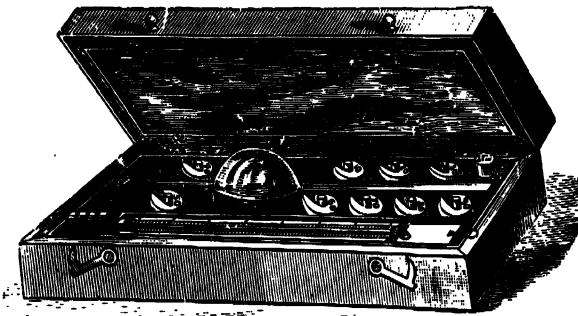


FIG. 1.



FIG. 3.



FIG. 4.



FIG. 6.



FIG. 7.



FIG. 8.

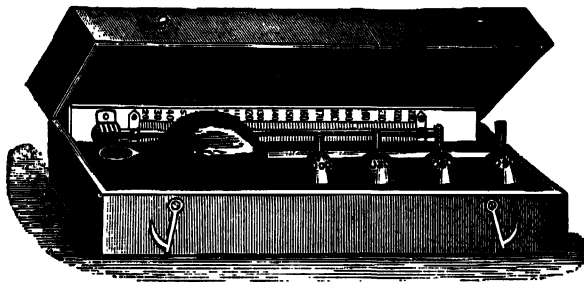


FIG. 2.

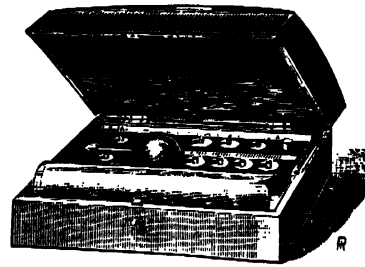


FIG. 1 A.

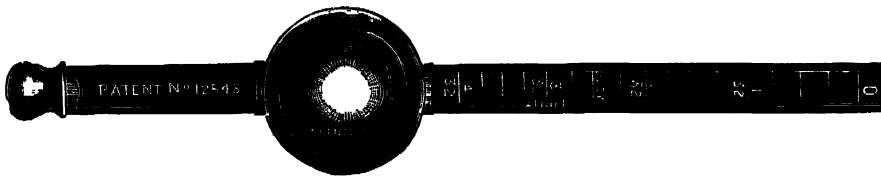


FIG. 5.



FIG. 9.

- FIG. 1.—**Sykes' Standard Hydrometer.** Best make, double gilt, with ivory scale thermometer, comparative and mixing rules, in mahogany case, with book of tables and trial jar, as used by H.M. Customs and Excise ... Do. ... do. ... smaller size, without rules ...
- 1A.—**Miniature Set Sykes' Hydrometer.** Best double gilt, with stout ivory thermometer, trial jar, and magnifying glass in best mahogany snap case, complete with miniature book of tables ...
- 2.—**Bate's Standard Saccharometer.** For testing specific gravity of beer. Best make, double gilt, with thermometer in mahogany case, book of tables, trial jar ...
- 3.—**Glass Hydrometer for proof spirit,** 40 under to 60 over proof, in case ... Do. ... do. ... with thermometer and trial jar, in case ...
- 4.—**Glass Saccharometer,** in case ... Do. ... do. ... with thermometer and trial jar, in case ...
- 5.—**Salinometer.** Royal Navy Pattern (patent), in solid nickel, in tin case ...
- 6.—**Glass Salinometers,** in tin cases ...
- 7.—**Brinometer or Salt Hydrometer,** Ivory scale, 0 to 100 for salt solution. ...
- 8.—**Twaddles' Hydrometer,** mercury poised, No. 1, 0 to 24° ... No. 2, 24 to 43° ... No. 3, 43 to 74° ... No. 4, 74 to 102° ... No. 5, 102° to 138° ... No. 6, 138° to 170° ...
- 9.—**The Densimeter or Petrol Tester,** an invaluable instrument for motorists, with trial jar and tin case ...

Re.	Code word for Telegrams.
45	"HYDRO."
30	"HYDRANT."
45	"EXCISE."
50	"HAMPER."
7	"HARP."
16	"HALTER."
7	"HAWK."
16	"HAWSER."
7	"HARBOUR."
2-8	"HELMET."
3-8	"HERALD."
2-8	"SACKER."
2-8	"SAGITAL."
2-8	"SARGENT."
3	"SALTEN."
3	"SALVABLE."
3	"SANDSH."
2	"DENSIMETER."



## 'Sun-Dials.

The Sun-dial, born in the East some 3,000 years ago, is, after a decline of favour, again in the ascendant. At first a necessity, it gained a poetic and sentimental place in the thoughts of mankind, and was the subject of the skill of artists as well as of mathematicians. Its primitive form was to measure the length of one's own shadow or to use a spear thrust into the ground, the divisions of time being marked with stones, if at all. The Assyrians, so far as we know, were the first to construct dials, and from them the knowledge gradually travelled through Greeks and Romans to Western Europe. There the craft of dialling was brought to perfection and carried by monks and travellers back to the East, especially to India and China.

England and Scotland have always been the home of the Sun-dial in its perfected form, and every garden of any note has its Sun-dial, either mounted on a pedestal or fixed to a wall.

There are many kinds of Sun-dials, the most usual form being the horizontal. For tropical countries where the sun is nearly overhead at noon, the most convenient kind is the equatorial, and this latter has the added advantage that it can be re-adjusted if required to be moved to another location. An interesting addition is a gun-signal attachment which fires a small cannon at noon.

Owing to the rising demand, we are able to place dials on the market at prices hitherto impossible; so that no one need be debarred from their possession on the score of expense. On the other hand we can design special Sun-dials of curious form, or elaborate decoration, which recall the time when they were the hobby of kings, of whom Henry VIII. and Charles II. in particular, were noted for their interest in the art. The largest Sun-dials in the world were constructed by Rajah Jey Singh, at Jeypur, in 1724.



# Instructions for Setting or Erecting Sun-Dials.

**VERTICAL.** Bolt to the wall so that the sides and face are perfectly vertical as shown by a plumb line.

**HORIZONTAL & EQUATORIAL.** This is best done by the sun, with the use of a good watch and a level. If an equatorial dial, first see that the pointer is against the correct latitude graduation on the arc. Note that the top of the pedestal is perfectly level and fill the recess with mixed Portland cement. Place the dial in position and revolve it till it shows the local solar time. Test it again for level and leave it for the cement to set. The best time to set dials is about midday.

They may also be set with a box compass. Proceed as above, placing one side of the box compass against the gnomon, revolving the dial till the sloping face of the gnomon points due S. or N., according as the place is N. or S. of the Equator and allowing of course for the magnetic variation of the place. This method is inconvenient of application with equatorial dials.

**LOCAL SOLAR TIME.** To set a watch to local solar time, first get the standard mean time of the country and set the watch 1 minute fast of this for every  $\frac{1}{4}$  degree the place is East, or slow if West, of the meridian of the standard time. Thus, Bristol being  $2\frac{1}{2}^{\circ}$  W. of Greenwich, local time is 10 minutes slow of Greenwich time, and Calcutta being  $8^{\circ}$  East of Madras, the local time is 32 minutes fast of Madras standard time. This is local mean time. Then refer to the table of the equation of time, given below and on most dials, and against the date will be found a number of minutes marked fast or slow. As the wording states, fast means that clock time (mean time) is fast of solar time, so set back the watch the number of minutes against the date if marked fast, or set forward if marked slow.—Thus on September 21st the clock is seven minutes slow, so set the watch on seven minutes. The result is that the watch is giving local solar time.

**Table of the Equation of Time to the nearest minute.**

JAN. Fast.	MAR. Fast.	MAY. Slow.	AUG. Fast.	OCT. Slow.	DEC. Slow.
1 ..... 4	4 ..... 12	1 ..... 3	11 ..... 5	4 ..... 11	3 ..... 10
3 ..... 5	8 ..... 11		16 ..... 4	7 ..... 12	6 ..... 9
6 ..... 6	12 ..... 10		21 ..... 3	11 ..... 13	8 ..... 8
8 ..... 7	16 ..... 9	<b>JUNE.</b>	25 ..... 2	15 ..... 14	10 ..... 7
10 ..... 8	19 ..... 8	<b>Slow.</b>	28 ..... 1	20 ..... 15	12 ..... 6
13 ..... 9	22 ..... 7			28 ..... 16	14 ..... 5
16 ..... 10	26 ..... 6	5 ..... 2	<b>SEPT.</b>		16 ..... 4
19 ..... 11	29 ..... 5	10 ..... 1	<b>Slow.</b>		18 ..... 3
22 ..... 12		15 ..... 0	1 ..... 0	<b>NOV.</b>	20 ..... 2
27 ..... 13	<b>APRIL.</b>	<b>Fast.</b>	4 ..... 1	<b>Slow.</b>	22 ..... 1
	<b>Fast.</b>	20 ..... 1	7 ..... 2		24 ..... 0
<b>FEB.</b>	1 ..... 4	24 ..... 2	10 ..... 3	16 ..... 15	<b>Fast.</b>
<b>Fast.</b>	5 ..... 3	29 ..... 3	13 ..... 4	21 ..... 14	26 ..... 1
1 ..... 14	8 ..... 2		16 ..... 5	25 ..... 13	28 ..... 2
27 ..... 13	12 ..... 1	<b>JULY.</b>	19 ..... 6	28 ..... 12	30 ..... 3
	15 ..... 0	<b>Fast.</b>	21 ..... 7	30 ..... 11	
	<b>Slow.</b>	5 ..... 4	24 ..... 8		
	20 ..... 1	11 ..... 5	27 ..... 9		
	25 ..... 2	21 ..... 6	30 ..... 10		

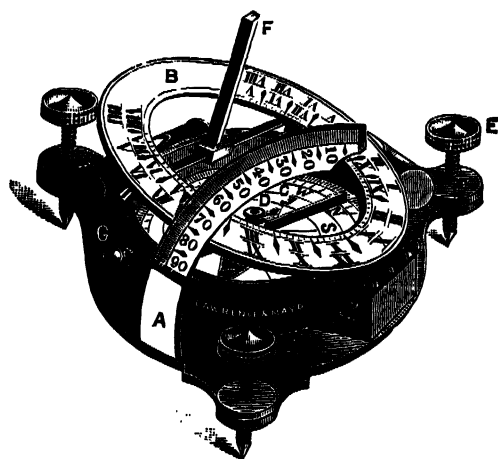
Fast means that the Clock (Local Mean Time) should be faster than the dial. Slow—Slower.

When ordering Sun-Dials the following details should be given :—

**HORIZONTAL & EQUATORIAL.** The latitude of the place of erection as shown on a map—thus, London,  $51\frac{1}{2}^{\circ}$  N. ; Philadelphia,  $40^{\circ}$  N. ; Durban,  $30^{\circ}$  S.

**VERTICAL.** The latitude of the place of erection as above, also the aspect of the wall against which it is to be fixed. This can usually be found exactly from a plan of the house, etc., but if one is not available, place a box compass against the wall and note the magnetic aspect ; then allow for the magnetic variation to find the true aspect. The magnetic variation cannot be given here as it not only differs all over the world, but is also constantly changing.

## THE UNIVERSAL SUN-DIAL.



**T**HIS Sun-Dial is constructed for great portability, having its Hour-circle and Gnomon jointed to fold down when not required for use. It is a form mostly used by travellers, who, when travelling in a known latitude, can, by placing it in the proper direction, obtain correct time from the Sun.

To use the Dial, first set up the Quadrant, A, upon which is graduated 90 degrees of latitude, then raise the Hour-circle, B, upon its joint, to the number of degrees upon the Quadrant, corresponding to the latitude of the place. The Gnomon, F, to be raised upon its joint perpendicular to the plane of the Hour-circle, release the magnetic Compass Needle and when at rest, turn the Dial round until the North Pole of the needle is opposite the degree of magnetic variation of the locality, the Dial will then be in line with the true North.

It is necessary to know the magnetic variation of the Needle of the district in which it is being used.

London has a variation of 16 degrees West, and this amount would answer, practically, for any part of England.

The Dial should be adjusted to stand perfectly level, by using the adjusting screws, E, until the two spirit-levels are central.

The Gnomon should be raised perpendicular to the face of the Dial, from 21st March to the 22nd September, between which time the hour shadow will fall upon the face of the Dial; and, from the 22nd of September to 21st of March, the Gnomon should be reversed (pointing downwards), and the hour shadow will then fall on the inside of the Dial Ring. The joint of the Gnomon is made to fix itself by a spring to either position, upwards or downwards, as required.

## UNIVERSAL. SUN-DIALS.

2½ inch Universal Sun-dial, divided and engraved for both North and South latitudes,  
with three adjusting screws, two levels and best metal dial compass with stop  
needle, complete in morocco case .. .. .  
3½ inch do. do. .. .. .

Rs. 65.  
Rs. 90.

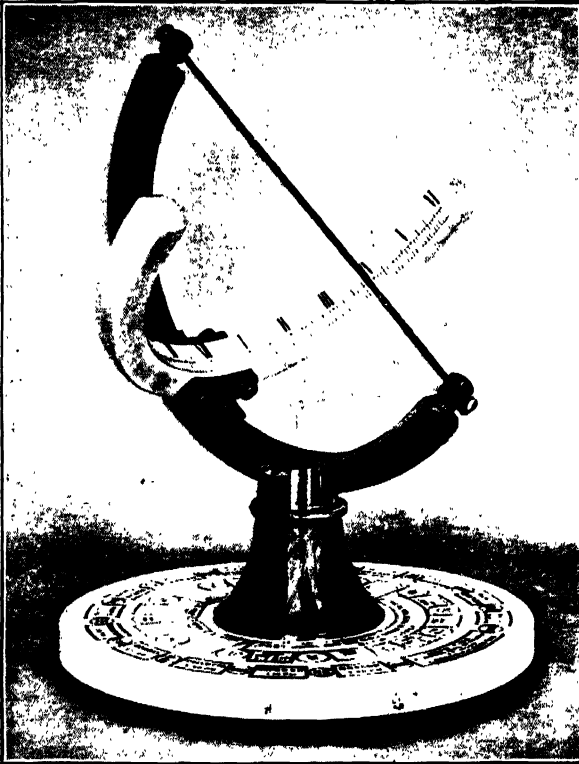
Code word for  
Telegrams.  
"VULCAN."  
"VIXEN."

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# THE EQUATORIAL SUN-DIAL.

Suitable for Gardens, Lawns, Parks and Terraces.



THIS form of Sun-dial possesses certain advantages over the Horizontal form with angular Gnomon. It can be easily set to the exact latitude of the place where it is to be erected, and if required to be moved to another location of different latitude, it can be as easily altered by releasing the clamping screw of the arc and moving it until the degree of latitude agrees with the zero pointer; the clamping screw then to be tightened again.

The Wire Gnomon is thus fixed parallel to the Earth's Polar Axis and the shadow of it traverses at a uniform speed, the graduations upon the Hour-arc, and, being in the form of a *line* only, is very clearly seen.

The porcelain base plate has the Equation of time tables upon it, and is ornamented with the signs of the Zodiac—encircling the whole are tablets giving the mean time at various parts of the world, at *noon* Greenwich mean time.

## Price Complete

with 10½ inch Porcelain base, solid gun-metal frame and support graduated to degrees of latitude and Porcelain Hour

Arc ... .. Rs. 105.

Code word for Telegrams—"GARNET."

# THE ADJUSTABLE BRACKET SUN-DIAL.

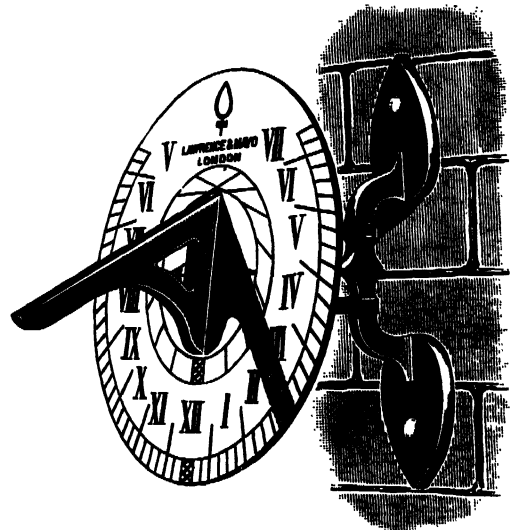
THIS consists of a five inch brass Sun-dial supported in a nearly vertical position by an ornamental bracket having adjustments—for latitude and aspect. It can be affixed to any wall, porch, pillar or tree facing within 60 degrees of South, and owing to the latitude adjustment it is correct for any part of the world between the Equator and Latitude 40 N.

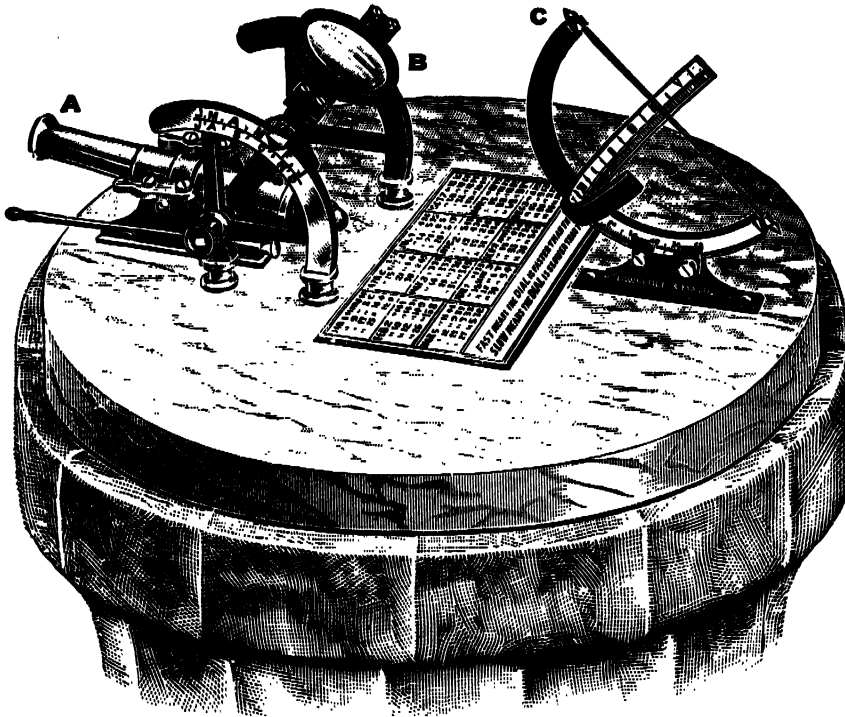
## TO ERECT THE DIAL.

Screw the bracket on to the support, taking care that it is quite vertical. Slacken the screw at the side and adjust the dial to the latitude of the place by means of the engraved scale, then screw up tight again. Slacken the two other screws and swing the dial sideways until it shows Local Solar Time (see page 201), then screw tight and the erection is complete.

Price ... .. Rs. 35.

Code word for Telegrams—"LOCALISER."





## The “GUN” SIGNAL SUN DIAL.

This interesting signal sun-dial, as shewn in the illustration, is so arranged and constructed, that, at the exact hour of noon, the gun is automatically fired. This is attained by an optical and mechanical arrangement, by which, at the moment the sun attains its highest point at noon, the focus of the sun's rays are concentrated on the gun-powder, and acting as a burning glass ignites the powder and fires the gun.

### Description and Instruction for use.

The base of the Dial is a strong marble slab to which the gun (A) is securely fastened. This can be removed from the trunnions each morning to re-load it for the signal, and when re-placed pressed down until the breach touches the marble slab. After loading, the trough in extension of the touch-hole should be filled its entire length with gun-powder. The lens (B) is supported in its frame, which is moveable upon its axis, to regulate to the altitude of the sun during the year, and requires to be adjusted about every week. The milled headscrew releases or clamps the frame when adjusted. The graduations upon the Arc are given for the twelve months of the year, commencing J on the right for January and extending to J on the left for July. The index is to be set each week to  $\frac{1}{4}$  of the distance between the letters of the month. The graduations on the under side of the circle are for the months A (August) on the left to D (December) on the right, thus completing the regulation for the twelve months of the year.

The Sun-dial (C) for ascertaining the exact hour of the day is constructed equatorially so that it can be adjusted to the latitude of the station where it is to be fixed, and, if required to be removed to a place of different latitude, the adjustment is made by releasing the clamping screws and moving the arc until the index coincides with the latitude required. The shadow of the wire Gnomon is then thrown by the sun upon the hour circle and the exact time given by it.

The engraved plate in the centre is the equation of time table, and the amount to be added or subtracted from the shadow reading is given in this table throughout each month of the year.

PRICE, **Rs. 300.**

Code word for Telegrams—"EXCELSIOR."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## “Universal” Sunshine Recorder.

“LET OTHERS TELL OF STORMS AND SHOWERS  
I’LL ONLY COUNT YOUR SUNNY HOURS.”

(The above motto is inscribed on a Sun-dial erected at Sandringham.)



This instrument was originally designed in a rough form by J. P. Campbell, Esq., of Kensington, in 1853; the present form of zodiacal belt being the introduction of Professor Stokes, of Cambridge. This belt is divided into three zones of equal width, by two planes, parallel to, and equidistant from the plane of the Equator. Each of these zones is constructed to receive a strip of flat card, which, following the curve, may without appreciable error be taken to represent the respective zone of spherical surface. The middle zone receiving a straight card serves for about a month at each Equinox. The upper and lower zones answer the same purpose for summer and winter months respectively. When the cards are properly placed within the grooves, their surfaces are always well within the burning power of the sphere. The cards are divided into half-hour spaces, and figured every three hours, and when set to accord with the noon-mark on the belt constitute the instrument an accurate Sun-dial. A magnetic Compass is attached to the base to enable the instrument to be set in the correct position due North and South.

### INSTRUCTIONS FOR USE.

Select some spot from which a clear view all round the horizon can be obtained between the points of sunrise and sunset at Midsummer.

Set the polar axis to the proper latitude by means of the divided limb—and clamp it by the two screws provided for the purpose. Set the instrument, as nearly north and south as can be, by the magnetic compass, making the final accurate adjustment by letting the sun's image at the exact moment of southing fall on the noon-mark on the belt.

Now make the instrument a fixture, insert the proper form of card according to the season, and the instrument is ready to record.

Price of Instrument	...	...	...	...	...	...	...	...	...	<b>Rs. 200</b>
Cards for one year, viz., 150 Summer Solstice, 150 Winter Solstice, 100 Equinoctial										<b>„ 15</b>

Code word for Telegrams—“SUNSHINE.”

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# LAWRENCE & MAYO. SPECTROSCOPES, etc.

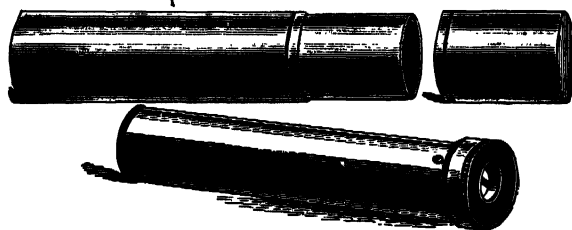


FIG. 1.

## FIG. 1. POCKET SPECTROSCOPE.

Achromatic Lenses, with adjustable slit, in metal case.

This instrument will show many of Fraunhofer's lines, the bright lines of the metals and gases, and the absorption bands in coloured gases, crystals or liquids.

**PRICE, Rs. 35.**

Code word for Telegrams—"CRYSTAL."

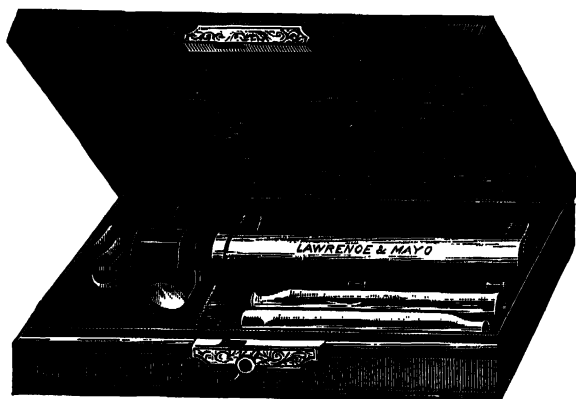


FIG. 2.

## FIG. 2. MEDICAL POCKET SPECTROSCOPE,

with adjustable slit and comparison prism and mirror at side, with two test tubes, complete in leather covered pocket case.

**PRICE, Rs. 60.**

Code word for Telegrams—"MEDICAL."

FIG. 3. PRISM, mounted on stand for use in demonstrating decomposition of light, refraction, &c.

**PRICE, Rs. 12.**

Code word for Telegrams—"OLIVE."

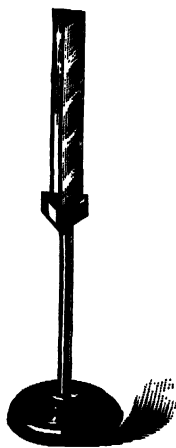


FIG. 3

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# SPECTROSCOPES.



## The College Spectroscope.

This Spectroscope has been specially designed to meet the great demand for a cheap and reliable instrument for demonstrating spectrum analysis to students without loss of time. It consists of a system of prisms of fairly large dispersion mounted in a tube, the focus being adjusted by the button on top. The slit (aperture of which is fixed), is protected from dust by glass, so that the spectrum can always be seen clearly and free from cross lines.

This instrument distinctly shows a number of the Fraunhofer lines, and is supplied with an arrangement for holding Reagent glasses for absorption experiments.

Mounted on wooden stand (as per illustration), which renders it very convenient for handing round a class.

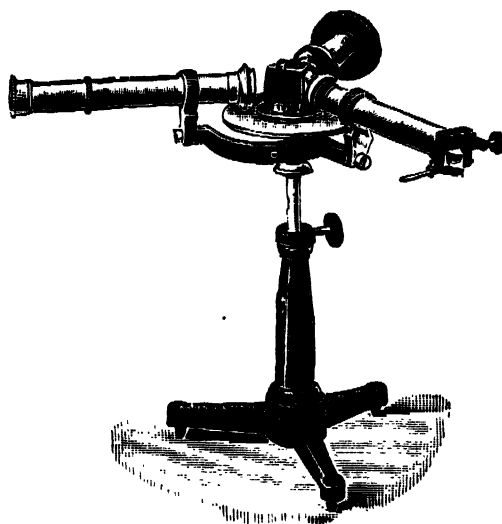
PRICE, **Rs.**

Code word—"SPECTRUM."

## Student's Chemical Spectroscope.

This Instrument is of thoroughly first-class workmanship and quality throughout, and is provided with one prism  $60^\circ$  made from medium heavy flint glass (specific gravity 3.78); this prism is fixed on a brass plate, to which the scale telescope is screwed. Two arms are fitted under this plate for the slit and observing telescopes; the arm supporting the latter can be moved laterally so that the Spectrum can be very conveniently examined—it can be clamped in any position.

The Observing Telescope has an object glass  $\frac{1}{4}$ -in. diameter and  $5\frac{1}{2}$ -in. focus, and magnifies about 5 diameters; the eye-piece is adjustable to focus by hand. The Slit Telescope is the same size as the observing one. The Slit has a micrometer screw, and a comparison prism is fitted, enabling the spectra of two substances to be compared at the same time—dispersion  $4^\circ$ . The Stand is made of cast iron, with arrangement for raising and lowering.



PRICE, **Rs. 140.**

Code word—"CHEMICAL."

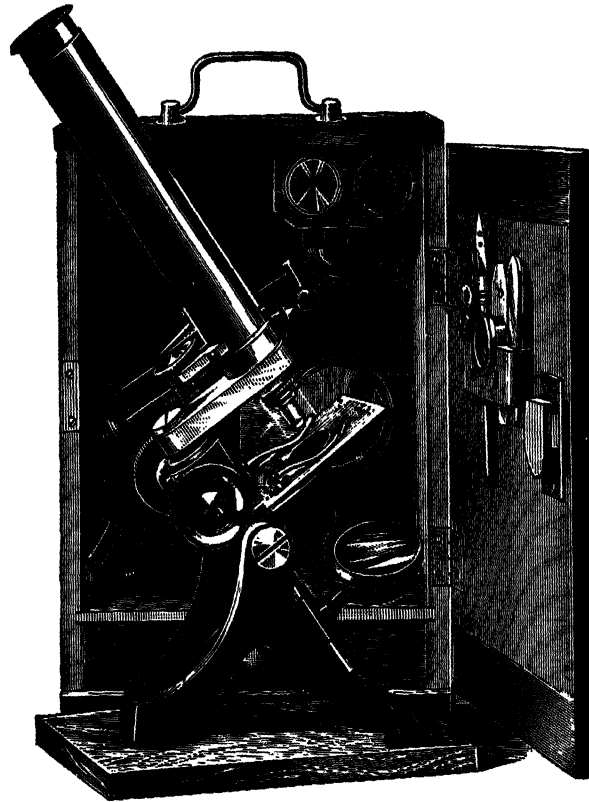
**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**



# THE "STUDENTS" MICROSCOPE

(Society of Arts Pattern.)



A Desirable Instrument for medical students and practitioners, mounted on bronzed brass claw stand, rack and pinion for focussing and separate fine adjustment, fixed stage, with springs to hold the object in position, concave mirror, one-eye piece and triple objectives of 1 inch,  $\frac{1}{2}$  inch and  $\frac{1}{4}$  inch, the magnifying powers of which range from about 75 to 300 diameters, also condensing lens on brass stand, live cage, stage and hand forceps, the whole fitted into a mahogany cabinet with fittings and drawers to hold objects and outer cover of best canvas to protect cabinet.

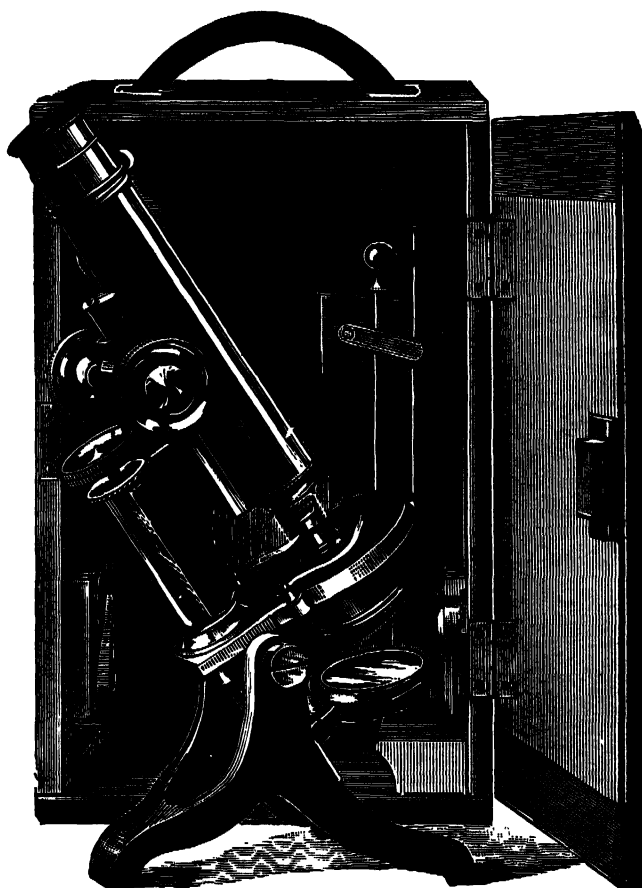
PRICE **Rs. 85.**

Code word for Telegrams—"MAGNIFIER."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

## THE "COLLEGE" MICROSCOPE.



A Handsome Monocular Microscope of brass and bronze, mounted on a substantial bronzed claw stand, fitted with eye-piece, two objectives 1 inch, angular aperture 20 degrees magnifying power 75 diameters, and  $\frac{1}{4}$  inch, angular aperture 75 degrees magnifying power 300 diameters, rackwork, coarse and fine focussing adjustments, fixed stage with spring clips, double mirror, revolving diaphragm, condensing lens on brass stand, live cage and hand forceps, complete in a polished mahogany cabinet with fittings, and drawer to hold objects, also outer cover of best canvas to protect cabinet.

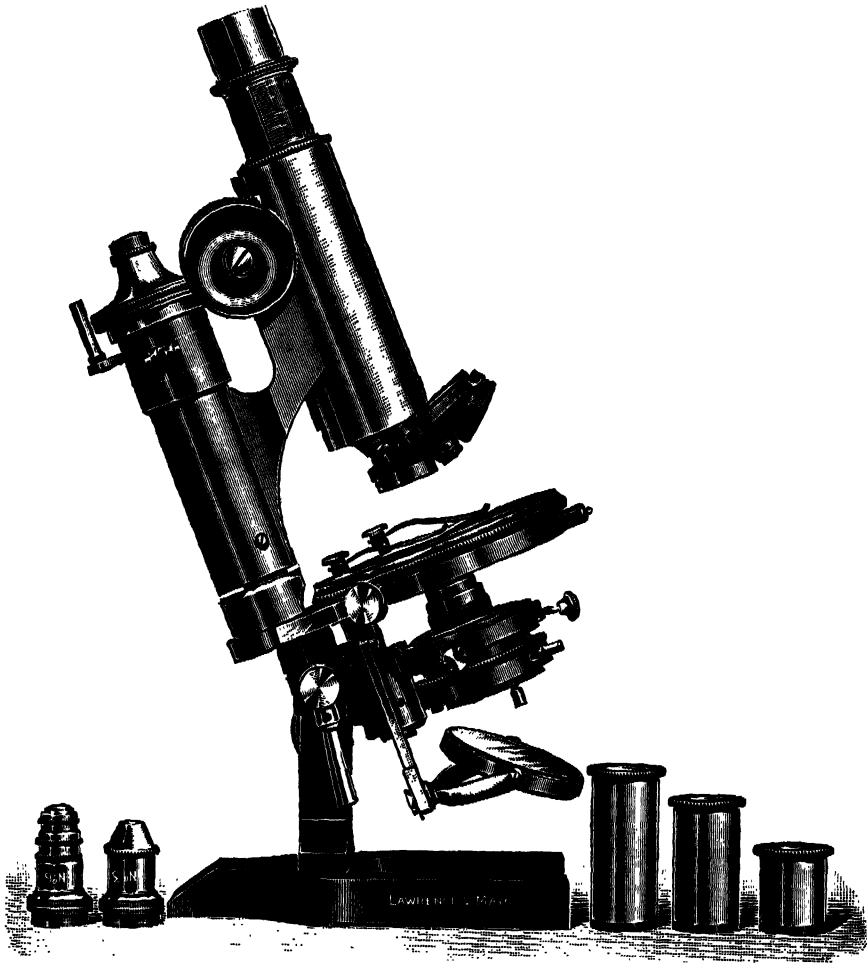
PRICE, Rs. 125.

Code word for Telegrams—"COLLEGE."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The LAWRENCE-REICHERT LABORATORY MICROSCOPE,

[For Medical Practitioners and Advanced Students.]



The above Microscope can be highly recommended. It is eminently suitable for Medical Practitioners and Advanced Students. As an all-round Laboratory Instrument it is probably unequalled. For Specification see Page 211.

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The LAWRENCE-REICHERT Laboratory Microscope

## SPECIFICATION. —

**Stand.**—This has the Continental pattern foot, and is therefore quite portable.

**Coarse Adjustment.**—Diagonal Rack and Pinion, with adjustment for wear and tear.

**Fine Adjustment.**—Reichert's Special Lever Pattern, one of the best fine adjustments made. This fine adjustment is specially recommended by Dr. Dallinger. **It is three times finer** than that fitted to any similar Microscope by other makers.

**Stage.**—Revolving Centering Stage,  $3\frac{1}{2}$  inches diameter, with two screws for centering. These screws can also be used for moving object when using high powers. The Stage is covered with ebonite.

**Substage.**—English Standard size with centering screws.

**Substage Condenser.**—Instead of the ordinary Abbe Condenser, with its well-known disadvantages, an achromatic form is supplied with this instrument, and consequently much better results are obtained. Its Numerical Aperture is 1.30. For use with low powers the top lens can be unscrewed.

### Objectives.—

Focus.	Numerical Aperture.	Magnifications with Eye Pieces.			
		I.	III.	V.	
$\frac{2}{3}$ ins.	... 0.30 ...	50	80	130	
$\frac{1}{4}$ ins.	... 0.85 ...	170	250	380	

**Eye Pieces.**—Three are supplied, Nos. I., III., V.

The quality of these Objectives and Eye Pieces is so good that many fine details usually shown with  $\frac{1}{4}$ -inch Objectives are readily seen with the  $\frac{2}{3}$ -inch one.

**Nose Piece.**—Double.

**Case.**—The Case is a mahogany dove-tailed one, and contains a drawer to hold Eye Pieces and Objectives. It is brass bound to stand the Indian climate.

We have no hesitation in stating that this Instrument is far superior to any other similar one of the same size and cost. The Special Lever Fine Adjustment gives a movement not only three times as fine as that of all other instruments made on the Continent, but it is a most smooth-working motion owing to its excellent design.

**Price of the Lawrence-Reichert Laboratory Microscope as per above specification, Rs. 300.**

Code word for Telegrams—"BACTERIA."

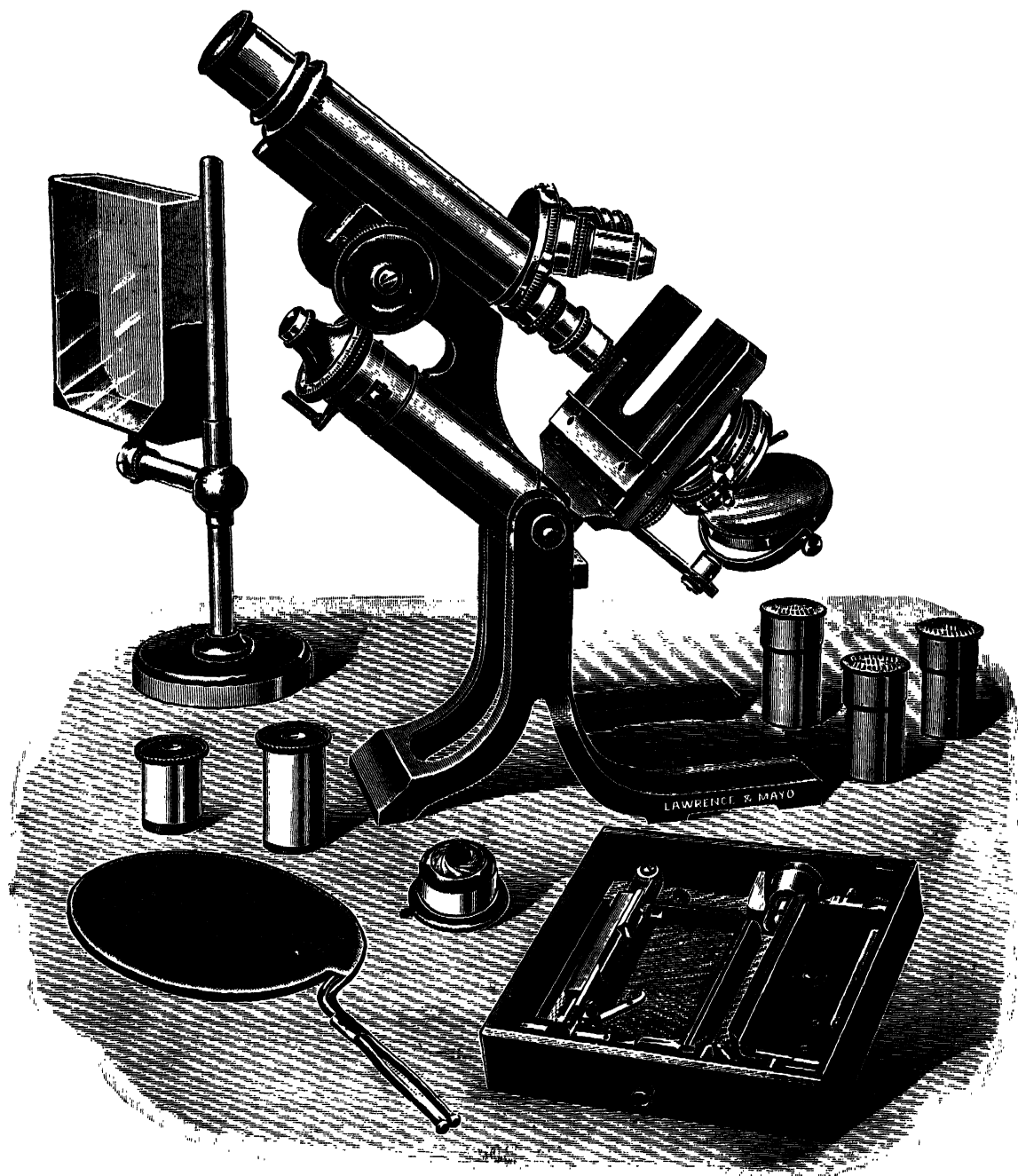
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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON

# The "Dallinger" Bacteriological Outfit.

Designed to meet the requirements of advanced Microscopy.

Manufactured by C. Reichert, Vienna, especially for Messrs. Lawrence & Mayo.



# THE "DALLINGER"

## Bacteriological Microscope

has been designed to meet the requirements of Physicians and others who need a thoroughly efficient instrument with perfect fine and coarse adjustments, full size substage condenser and all the necessary accessories for bacteriological purposes.

### SPECIFICATION.

**Coarse Adjustment.**—Extremely smooth working spiral rack and pinion. Adjustable for wear and tear.

**Fine Adjustment.**—Reichert's latest Micrometer-Lever Pattern. It consists of two Levers of the second order applied to the usual Micrometer screw. By this improvement the Stand is rendered serviceable for high-class work. Each turn of the screw thread is equal to  $\frac{1}{10}$  ins., which is double the degree of sensitiveness of all other Stands of the Continental Pattern of this size. It is, moreover, very steady, and is therefore most efficient for Microphotographic Work. Another improvement consists in the movable pointer which can always be set to zero on the edge of the Micrometer screw, which is fully divided. This enables the thickness of objects to be measured with ease.

**Draw Tube.**—This is fully divided so that any given length of tube can always be found again. It holds standard size eye-pieces.

**Stage.**—Mr. Nelson's Horseshoe Pattern, a great convenience when using oil immersion objectives.

The Foot is a compromise between the English Tripod and the Continental pattern. Notwithstanding the increase in steadiness it is portable and compact. The Body being balanced on its axis renders the instrument very rigid.

**Substage Condenser.**—Instead of the ordinary Abbe Condenser, which is not achromatic and is only of real use for low power work, a new pattern Achromatic Substage Condenser is supplied, and which gives the best results with oil-immersion objectives as well as with  $\frac{1}{8}$ th and  $\frac{1}{4}$ th dry objectives. With the top lens removed it is equally efficient for low powers.

**Substage.**—Is the English Standard size, fitted with centering screws and screw at left-hand side for focussing.

**Mechanical Stage.**—For work with high powers specially with the Oil Immersion Objective the Dallinger Mechanical Stage will be of great assistance, as by its means an object can be more carefully and thoroughly examined. It can be placed in position or removed very quickly.

**Nosepiece.**—The Triple Nosepiece is of the latest dust-proof type. It enables all the objectives from the lowest to the highest to be kept in position ready for use.

**Objectives and Eye-pieces.**—The Objectives all have ample numerical aperture for their respective powers. For instance the structure of muscle is very well shown with the  $\frac{1}{8}$ th objective, though formerly with older type objectives a  $\frac{1}{4}$ th one was required. The definition even with the highest power eye-piece will be found perfectly sharp.

No.	Objectives.	Numerical Aperture.	Eye-piece.	Magnifications with tube drawn out to 6 $\frac{1}{2}$ inches.			
			I.	III.		V.	
3	$\frac{1}{8}$ th	... '30	50	80	...	130	
6	$\frac{1}{4}$ th	... '85	170	250	...	380	
18 $\frac{1}{2}$	$\frac{1}{2}$ th	... 1'20 to 1'25	500	750	...	1,250	

**Light Filter.**—This consists of a Glass Tank mounted on a stand. It should be filled with a saturated solution of Acetate of Copper filtered. The tank is the requisite thickness, but for the eye-sight of some persons it may be necessary to dilute the solution. This light filter was designed by Dr. D. A. Miethe, Professor of Spectral Analysis at Berlin. It is the best at present known, and is used by Dr. Dallinger and Mr. E. M. Nelson (for many years President of the Royal Microscopical Society). The advantage of using a light filter is that the red rays are entirely excluded, and the sharpness of the images obtained is therefore increased, and in addition the light is rendered far more pleasant to work with.

**Hot Stage.**—For certain kinds of pathological research a hot stage is required, and the one supplied with this instrument is the most convenient form. It is provided with a simple condenser, which is efficient also with high powers. A thermometer shows the exact degree of heat.

The Stand with all Accessories is contained in a substantial Mahogany Cabinet, with brass bound edges; an extra drawer is also supplied for specimens, &c.

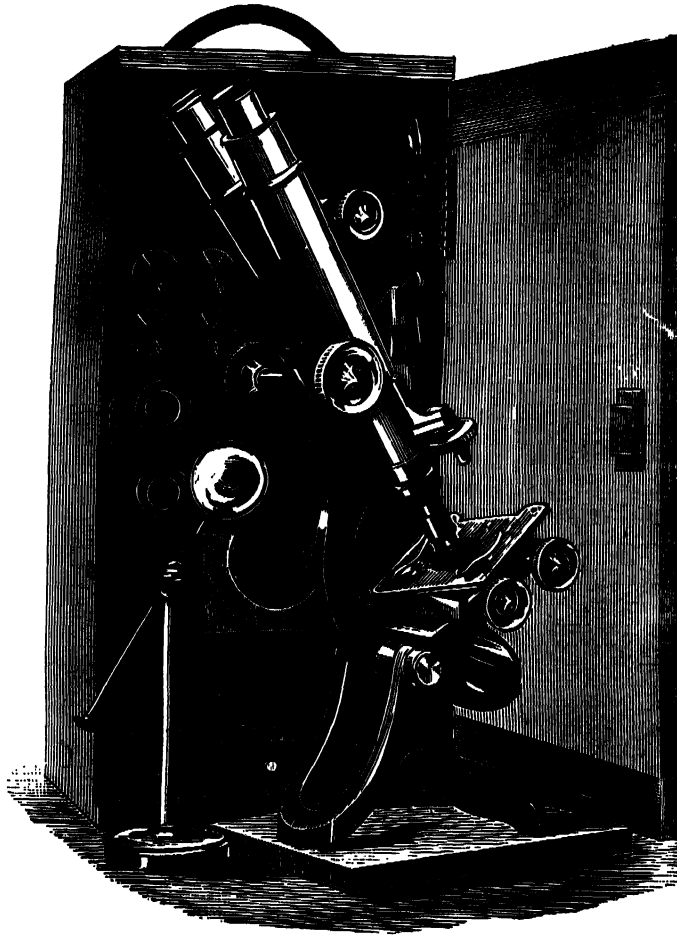
Price of the Dallinger Bacteriological Outfit, complete as per above specification, Rs. 600.

Code word for Telegrams, "OUTFIT."

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LAWRENCE & MAYO, Manufacturing Opticians,  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## THE "HISTOLOGICAL" MICROSCOPE. WITH BINOCULAR BODY.



This is a splendid compound instrument, mounted on a substantial bronzed stand, with rack and pinion adjustment for adjusting eye-pieces with 1 pair each A and B eye-pieces, coarse and fine adjustment, rotating mechanical movable stage with rack and pinion and endless screw, giving a traversing motion of  $\frac{3}{4}$  inch in rectangular directions, wheel of diaphragms, large flat and concave mirrors, 2 inch, 1 inch and  $\frac{1}{2}$  inch English objectives, angle of aperture of the 2 inch (with A eye-piece, 12 degrees), magnifying power with A eye-piece 26 diameters, with B eye-piece 37 diameters; angle of aperture of the 1 inch 20 degrees, magnifying power with A eye-piece 45 diameters, with B eye-piece 75 diameters; angle of aperture of the  $\frac{1}{2}$  inch 75 degrees, magnifying power with A eye-piece 200 diameters, with B eye-piece 300 diameters; large ball and socket joint condenser on brass stand, polariscope, camera lucida prism, spot lens, frog plate, live cage, stage and hand forceps; packed in handsome mahogany cabinet, with fittings and drawers for two dozen objects. The whole enclosed in a well-made canvas cover to protect cabinet.

PRICE, **Rs. 650.**

The above forms as complete and efficient an instrument as can be desired.

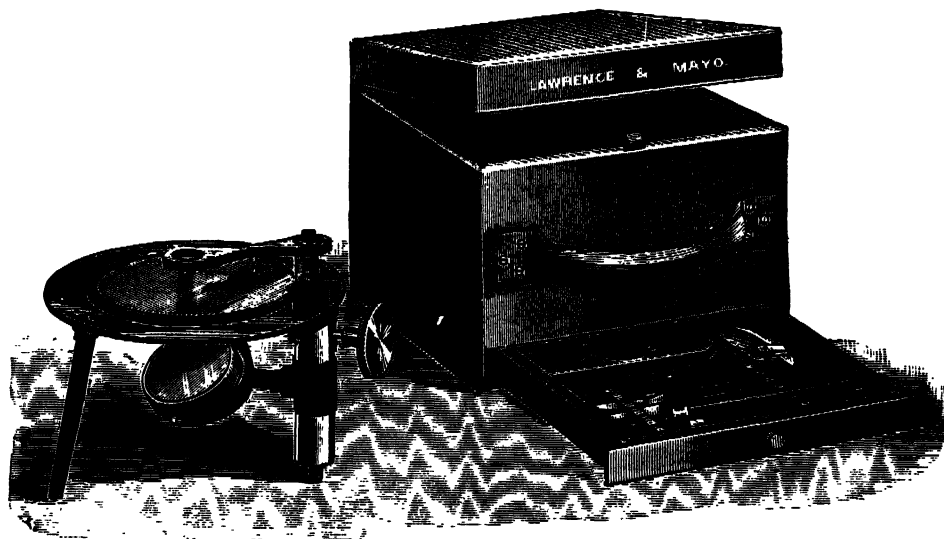
Code word for Telegrams—"MICROSCOPE."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## THE "HARLEY" DISSECTING MICROSCOPE.

The "HARLEY" Portable Dissecting Microscope is specially designed as a working instrument for Medical and Botanical dissection, and will be found in practical use to equal any of the more expensive patterns as regards facility for working the stage, which is made of a circular disc of thick plate glass firmly set in a brass rim and mounted on three brass legs. The instrument is furnished with three powers—2 inch, 1 inch, and  $\frac{1}{2}$  inch, the brass arm which carries these having a rack adjustment; two scalpels, two needles, one pair of forceps and one section lifter. Complete in mahogany case with strong leather handle. PRICE, Rs. 60. Code word for Telegrams—"HARLEY."



## THE "POCKET" MICROSCOPE.



The "POCKET" Microscope is constructed on the principle of the larger instruments, having sliding focussing adjustment and joint to incline at any angle, mirror, two objectives  $\frac{1}{2}$  inch and 1 inch, and tweezers. Packed in best finished leather-covered pocket case, velvet lined.

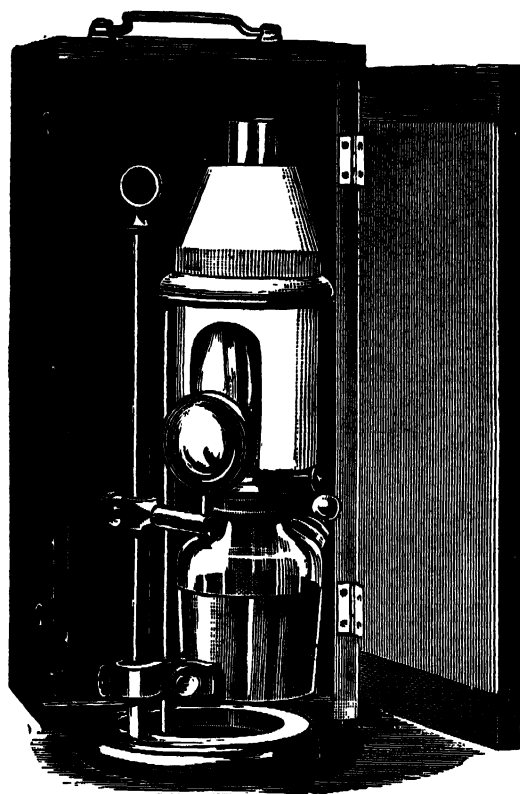
PRICE, Rs. 22.

Code word for Telegrams—"MINIATURE."

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**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**





## MICROSCOPE LAMP.

**M**ICROSCOPE LAMP with separate adjustments for regulating height of the shade and the bull's-eye condenser, mounted on heavy brass stand to prevent liability of upsetting, porcelain shade, and blue tinted glass chimney. Complete in pine wood case - - - - - **Rs. 28.**

Code Word for Telegrams, "CONDENSER."

Extra porcelain shades - each **Rs. 1-12.**

Extra Chimneys - - - - - **0-8.**

### Cabinet for Microscopic Objects.

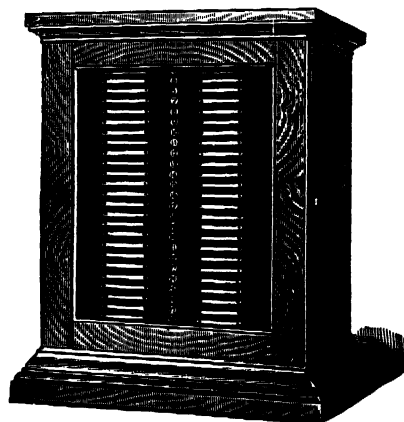
**H**ANDSOME Spanish Mahogany Cabinet, with glass door and lock. Each drawer numbered and furnished with celluloid tablets for description of contents, one drawer, extra deep, to hold mounting materials, &c.

To hold 1,000 objects lying flat - **Rs. 150.**

Code word for Telegrams - "CABINET."

Do. To hold 500 - - - - - **Rs. 120.**

Code words for Telegrams - "COLLAR."

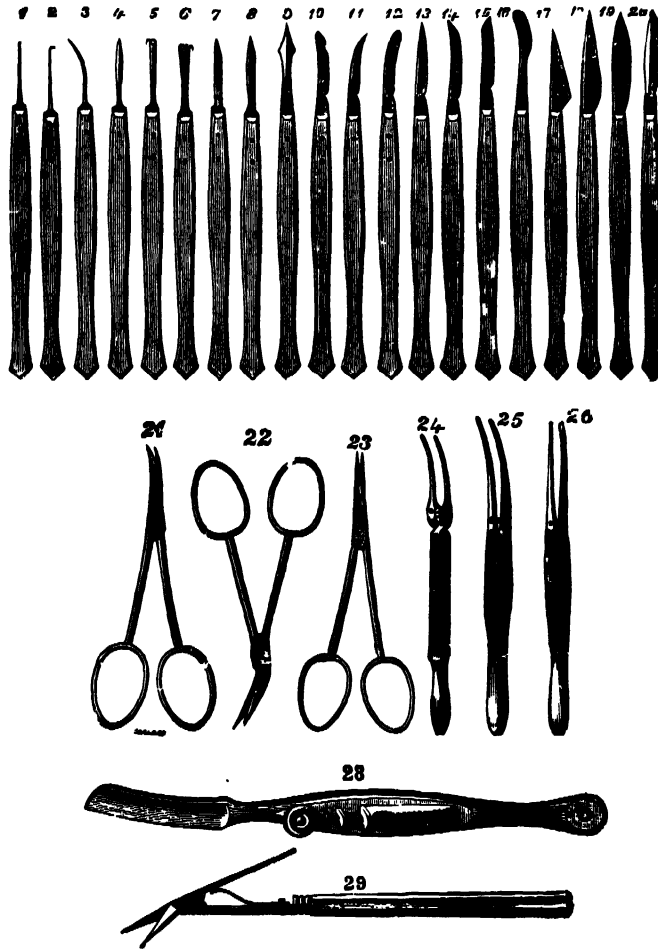


### BOXES FOR MICROSCOPIC OBJECTS.

Polished Pine, to hold one dozen Slides	...	...	...	...	...	...	...	...	<b>Rs. 2-8</b>
" " " two	"	...	...	...	...	...	...	...	<b>" 4</b>
" " " three	"	...	...	...	...	...	...	...	<b>" 4-8</b>
" " " six	"	...	...	...	...	...	...	...	<b>" 6</b>
" " " twelve	"	...	...	...	...	...	...	...	<b>" 9</b>

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

## Microscopic Dissection Instruments.



	Each.
Dissecting Knives and Needles, Ivory Handles, Fig. 1 to 20 ... ..	<b>Rs. 1-12</b>
Valantin's Section Knife, for cutting thin sections of soft substances, Fig. 28 ...	<b>12</b>
Scissors, curved blades, Fig 21 ... ..	<b>4-8</b>
Do. do. do. „ 22 ... ..	<b>4</b>
Do. straight „ 23 ... ..	<b>3</b>
Do. with spring, „ 29 ... ..	<b>9</b>
Steel Forceps, cross action, Fig. 24 ... ..	<b>3</b>
Do. do. curved „ 25 ... ..	<b>2-8</b>
Do. do. straight „ 26 ... ..	<b>2-8</b>
Stage do. ... ..	<b>3-8</b>
Hand do. ... medium points, <b>Rs. 1-8</b> ; fine points, <b>Rs. 2-8</b> ; large points, ...	<b>3-8</b>
Steel do. ... with platinum points, for work in acid ... ..	<b>8-8</b>
Flat pointed Forceps, for lifting thin cover glasses ... ..	<b>2-8</b>
Section lifters, aluminium ... ..	<b>1</b>
Do. do. copper ... ..	<b>0-8</b>

## Microscope Accessories.

									Code words for Telegrams
Angular Double Nose-piece .. .. .	Rs. 16-0	" VARNISH."							
Angular Triple.. .. .	" 28-0	" VAPOUR."							
Hand Microtome with Glass Top .. .. .	" 14-8	" VELLUM."							
" " " Brass Top .. .. .	" 7-0	" VAUNTER."							
Shadbolt's Spring Turntable .. .. .	" 12-0	" VENUS."							
Wedge Turntable self-centering .. .. .	" 16-0	" VERSION."							
Heating Table for Mounting Objects .. .. .	" 3-0	" VERDANT."							
Small Glass Lamp for Heating Table .. .. .	" 2-0	" VERDICT."							
Beale's Neutral Tint Lucida .. .. .	" 9-0	" VERGER."							
Fraser's Section Washer .. .. .	" 5-8	" VERMILION."							
Lever Compressorium with adjustments .. .. .	" 18-0	" VERNIER."							
Ordinary Live Boxes, 3 by 1, <b>Rs. 4</b> , Code word, "VESPER." 3½ by 1½, <b>Rs. 6</b> , Code word, "VESSEL." 3½ by 1½ .. .. .	" 8-0	" VICE."							
Spot Lens .. .. .	" 12-0	" VESTM ENT."							
Light Modifier with Blue and Grey Glasses .. .. .	" 7-0	" VETERAN."							
Abbe's Condenser with Iris Diaphragm .. .. .	" 32-0	" VIAL."							
Iris Diaphragm .. .. .	" 16-0	" VICTOR."							
Frog Plates, 4½ in. <b>Rs. 8</b> , Code word, "VICTORY." 4½ in. <b>Rs. 9</b> , Code word, "VICTIM." 5 in. .. .. .	" 10-0	" VIGNETTE."							
Dissecting Case, Leather Covered, containing one Knife, two Needles, one pair Scissors, straight blades, one pair Forceps, one Box Magnifier, small size, and one Glass Rod .. .. .	" 12-0	" VILLAGER."							
Dissecting Case, Leather Covered, containing one Two-edged Knife, one Preparation Knife, two Preparation Needles with straight and bent points, two Needles with Lance points, two pair Scissors straight and curved blades, one pair Forceps, one small Box Magnifier, and one Glass Rod .. .. .	" 20-0	" VITROL."							

## BEST STAND CONDENSERS.

Diameter of Glass	1½	2	2½	3 inches.
Price .. .. .	Rs. 16	20	28	35
Code words for Telegrams—"VANDYKE." "VORTEX." "VIRULENT." "VICEROY."				

## MICROMETERS.

Micrometer for Stage, ruled $\frac{1}{100}$ and $\frac{1}{1000}$ th of an inch .. .. .	Rs. 5-0	"VESTIBULE."
Ditto ditto $\frac{1}{10}$ .. $\frac{1}{100}$ of millimetre .. .. .	" 5-0	"VENTURE."
Ditto to drop in Eye-piece ruled $\frac{1}{100}$ th of an inch .. .. .	" 5-0	"VASCULAR."
Ditto ditto ruled in squares .. .. .	" 5-0	"VILLIAN."

## GLASS TROUGHS, &c.

Improved pattern Glass Troughs for Animalculæ, half round, 3 in. by 1 in. Rs. 1, Code word "WRAP." 3 in. by 1½ in. .. .. .	Rs. 1-8	"WONDER."
Improved pattern glass trough square, 3 in. by 1 in. Rs. 1, Code word, "WINCH." 3 in. by 1½ in. Rs. 1-8, Code word "WREN." 3 in. by 2 in. .. .. .	" 3	"WANDERER."
Improved pattern Glass Trough, with plates, wedge and spring, for Zoophytes .. .. .	" 4-8	"VENAL."
Plain Glass Dish for dissecting .. .. .	" 1-0	"WARD."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# Microscope Accessories.

## GLASS TROUGHS, etc. (Continued.)

Code word for Telegrams.

Glass Animalculæ Tanks, $3\frac{1}{2} \times \frac{3}{4} \times 3\frac{7}{8}$ deep ... ..	<b>Rs. 5-8</b>	"WARBLER."
" " " $4\frac{1}{2} \times \frac{1}{2} \times 4\frac{1}{8}$ deep ... ..	" <b>7-8</b>	"WAGON."
" " " $8 \times \frac{1}{2} \times 5\frac{1}{4}$ deep ... ..	" <b>10-8</b>	"WAGER."
Glass Stage Plates ... ..	" <b>1</b>	"WAINSCOT."
" " Large Size ... ..	" <b>1-8</b>	"WAITER."
Porcelain Dish, 9 in. $\times$ 7 in., extra deep, with cork loaded with lead for dissecting under water ... ..	" <b>5</b>	"WALRUS."

## BOTTERILL'S TROUGH.

This is composed of two plates of vulcanite, held together by three screws, between which are placed two slips of glass separated by an ordinary india-rubber ring. The glasses can be readily taken out and cleaned, and in the event of being broken, can at once be replaced ... ..

**Rs. 3-8** "WARDEN."

**BOTTERILL'S LIFE SLIDE** for watching the development of Confervæ, Infusoria, &c. ... ..

" **2-8** "WARRANT."

## COLLECTING MATERIALS.

Corked bottles for collecting insects, diatoms, &c., small, ...	<b>Rs. 1-8</b> per dozen; large ...	<b>Rs. 2-0</b>
Metal Pocket Cases, velvet lined, size $4\frac{1}{8}$ by $2\frac{7}{8}$ by $\frac{1}{2}$ in., containing 5 collecting bottles, corked ... ..	...	" <b>3-0</b>
Glass Dipping Tubes ... ..	...	" <b>0-4</b>
Ditto, three in leather case ... ..	...	" <b>1-8</b>
Camelhair brushes for lifting granular objects, diatoms, &c., each ... ..	...	" <b>0-6</b>
Set of six test Tubes, various sizes, in cardboard case ... ..	...	" <b>0-12</b>

## MICROSCOPE SLIDES.

Best Quality, Ground Edges ... ..	per dozen ...	<b>Rs. 1-0</b>
" with Cavities in Centre ... ..	do. ...	" <b>2-0</b>

## COVER GLASSES.

These are made in three thicknesses—No. 1, thinnest; No. 2, extra thin; and No. 3, ordinary thickness used.

Circles—No. 1, <b>Rs. 6</b> per oz.	No. 2, <b>Rs. 4</b> per oz.	No. 3, <b>Rs. 3</b> per oz.
Squares—No. 1, <b>Rs. 5</b> per oz.	No. 2, <b>Rs. 4</b> per oz.	No. 3, <b>Rs. 2</b> per oz.

*The above prices are for any size from 5-8 in. upwards.*

*Smaller sizes than 5-8 in. are charged at Rs. 1 per oz. extra.*

Ebonite Ring Cells, assorted sizes ... ..	per box 100 ...	<b>Rs. 2-0</b>
Pure Tin ditto. ditto. ... ..	" " ...	" <b>2-8</b>
Glass ditto. assorted sizes, $\frac{5}{8}$ , $\frac{3}{4}$ , and $\frac{7}{8}$ inches ... ..	per dozen ...	" <b>1-4</b>

## MICROSCOPE SPECIMENS.

Histological Objects ... ..	per dozen ...	<b>Rs. 20-0</b>
Physiological ... ..	do. ...	" <b>30-0</b>

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# PRICES AND MAGNIFICATIONS OF ZEISS, REICHERT & LEITZ'S APOCHROMATIC OBJECTIVES & COMPENSATING EYE-PIECES. Specially made for India.

Focal Length.		Numerical Aperture	Magnification of Objectives without Eye-pieces.	Magnification of Objectives with Compensating Eye-pieces.						Price.	Code Word for Telegrams.
inches.	mm.			2	4	6	8	12	18		
By Reichert.	16	0.30	15.5	31	62	94	125	187	281	65	Halberd
	8*	0.50	22.5	45	90	135	180	270	405	30	Halcyon.
	4*	0.95	63	125	250	372	500	750	1125	130	Halibut.
	4**	0.90	45	90	180	270	360	540	—	85	Hammer.
	3**	0.95	63	125	252	378	504	756	—	75	Hanker.
By Zeiss.	16	0.30	15.5	31	62	94	125	187	281	80	Harness.
	8	0.65	31	62	125	187	250	375	562	95	Harpoon.
	4	0.95	63	125	250	372	500	750	1125	130	Hamlet.
	3	0.95	63	167	333	498	667	1000	1500	150	Hassock.
	3	0.95	63	167	333	498	667	1000	1500	150	Hassock.
By Reichert.	2**	1.30	125	250	500	750	1000	1500	2250	240	Hatchet.
	2**	1.40	125	250	500	750	1000	1500	2250	320	Haunch.
	2**	1.30	83	167	333	498	667	1000	1500	275	Hazel.
	2**	1.40	83	167	333	498	667	1000	1500	360	Healer.
	2**	1.30	125	250	500	750	1000	1500	2250	275	Hearth.
By Zeiss.	2**	1.40	125	250	500	750	1000	1500	2250	360	Heather.
	2**	1.50	167	333	667	1000	1334	2000	3000	330	Hector.

\* Semi-Apochromatic. † With Coverglass correction. \*\* These Objectives have been reconstructed with hard glass. Extra cost of Coverglass correction for 6 mm., 4 mm. and 3 mm. Objectives ... Rs. 20.

## COMPENSATING EYE-PIECES for 160 mm. 6 ins. tube length.

Price ...	No. 2 Rs. 15	No. 4 Rs. 15	No. 6 Rs. 15	No. 8 Rs. 28	No. 12 Rs. 22	No. 18 Rs. 18
Code Word for Telegrams	Helical.	Hellmist.	Hemlock.	Herbalist.	Herbane.	Hawthorn.

## PRICES OF ACHROMATIC OBJECTIVES. (Dry Objectives.)

By Reichert.	No. 1a	Equivalent Focal Distance in Millimetres.	40.0	Equivalent Focal Distance in Inches.	1.58	Numerical Aperture.	Double Double	Rs. 16	Herdsman.
	" 2a	" 30.0	30.0	" 1.18	" 1.18	" 1.18	" 1.18	Rs. 16	Heritage.
	" 3a	" 15.5	15.5	" 0.62	" 0.62	" 0.62	" 0.62	Rs. 16	Hermetic.
	" 4a	" 9.2	9.2	" 0.36	" 0.36	" 0.36	" 0.36	Rs. 22	Heron.
	" 5a	" 5.4	5.4	" 0.21	" 0.21	" 0.21	" 0.21	Rs. 26	Hesperian.
By Zeiss.	No. 20	Equivalent Focal Distance in Millimetres.	45	Equivalent Focal Distance in Inches.	1.77	Numerical Aperture.	Double Double	Rs. 28	Hibernal.
	" 21	" 39	39	" 1.54	" 1.54	" 1.54	" 1.54	Rs. 34	Hinge.
	" 22	" 37	37	" 1.46	" 1.46	" 1.46	" 1.46	Rs. 30	Hireling.
	" 23	" 28	28	" 1.10	" 1.10	" 1.10	" 1.10	Rs. 14	History.
	" 24	" 26.29	26.29	" 1.03	" 1.03	" 1.03	" 1.03	Rs. 14	Hobnail.
	" 25	" 15	15	" 0.59	" 0.59	" 0.59	" 0.59	Rs. 14	Holly.
	" 26	" 17	17	" 0.67	" 0.67	" 0.67	" 0.67	Rs. 38	Homerie.
	" 27	" 12	12	" 0.47	" 0.47	" 0.47	" 0.47	Rs. 25	Honillist.
	" 28	" 7	7	" 0.28	" 0.28	" 0.28	" 0.28	Rs. 23	Honey.
	" 29	" 4.2	4.2	" 0.17	" 0.17	" 0.17	" 0.17	Rs. 30	Hooper.
By Leitz.	No. 3	Equivalent Focal Distance in Millimetres.	30	Equivalent Focal Distance in Inches.	1.18	Numerical Aperture.	Double Double	Rs. 30	Horde.
	" 4	" 18	18	" 0.71	" 0.71	" 0.71	" 0.71	Rs. 38	Hornet.
	" 5	" 13	13	" 0.51	" 0.51	" 0.51	" 0.51	Rs. 40	Horseman.
	" 6	" 4.4	4.4	" 0.17	" 0.17	" 0.17	" 0.17	Rs. 80	Hoster.
	" 7	" 3.2	3.2	" 0.13	" 0.13	" 0.13	" 0.13	Rs. 65	Hostage.

\*DD, E, F., can be fitted with correction collar at an additional charge of Rs. 15.

## New Homogeneous Immersion Objectives (Semi-Apochromatic Objectives).

Numbers of the Objectives.	Equivalent Focal Distance in Millimetres.	Equivalent Focal Distance in Inches.	Numerical Aperture.	Prices.	Code Word for Telegrams.
By Reichert. 18b	1.8	1.8	from 1.20 to 1.30	Rs. 90	Hydrogen.
By Reichert. 19b	1.2	1.2	from 1.20 to 1.30	Rs. 135	Hydrostat
By Zeiss.	1.8	1.8	1.30	Rs. 155	Howdah.
By Leitz.	2.5	2.5	1.30	Rs. 65	Hyson.
	2.1	2.1	1.30	Rs. 90	Hysteria.

A Bottle of CEDAR OIL is included in price of Immersion Objectives.

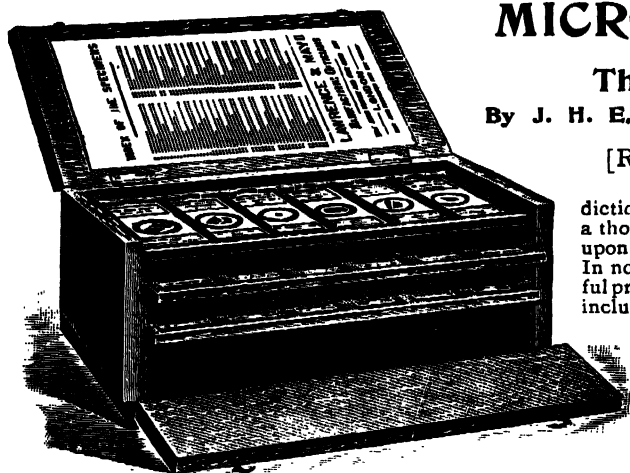
## HUYGENIAN EYE-PIECES FOR USE WITH ACHROMATIC OBJECTIVES.

Eye-piece Number.	1.	11.	11.	11.	11.	Price.
Focal length in Millimetres	50	40	30	25	20	Rs. 7
" " Inches	2	1.6	1.2	1	0.8	Rs. 7
Magnification of the Eye-piece	3	4	5	7	9	Rs. 7
Code Word for Telegrams	Image.	Implex.	Import.	Inane.	Incline.	

The most useful Eye-piece for all objectives is No. 3.

It is, however, better to have a lower as well as a higher one. In this case, Nos. 2 and 4 are the most suitable.

The Compensating Eye-pieces Nos. 4 to 12 can only be used with the higher power Achromatic Objectives. No. 4, 1/2 inch upwards.



# MICROSCOPE OBJECTS.

## The Study of Physiology.

By J. H. E. BROCK, M.D., B.S. (London), F.R.C.S.

[Reprinted from *Science and Art*.]

"It may safely be asserted, without fear of contradiction, that, for an adequate grasp of a scientific subject, a thorough acquaintance with the practical groundwork upon which such science has been reared is essential. In no science is it more important to insist upon a careful practical training than in those known as the biological, including under this head physiology, botany, and zoology. It will readily be granted that physiology, dealing as it does with the complex problems of life, and of the normal processes which take place in the healthy living body, requires at least that the student shall be familiar, not only with the general anatomy of the body, but also that he shall be conversant with the details of the minute structure of every part of the organism. Although the claim of physiology to be ranked amongst the exact sciences has only been recognised within

the last fifty years, yet such has been the marvellous rapidity with which our knowledge has grown, that not only have we determined the rôle of nearly every organ of the body, but we have even mapped out the brain itself into areas, with functions peculiar to each. Enormous as has been the labour expended in accumulating these facts, physiologists have already perceived that far more intricate problems still await solution. We can no longer be content with broad statements, as, for example, that the stomach secretes an acid juice containing pepsin, which converts proteids into peptones; or that the liver secretes bile, which has such-and-such properties; or that certain nerves conduct sensory, and others motor impressions; but we are impatient to know what are the vital changes and chemical processes occurring in the individual cells composing those structures which lead to the results described. In a word, the physiology of the future must be the physiology of the various cells of the animal body. Enough has been said above to demonstrate the vast importance of histological study, an importance which histologists themselves, clearly perceiving, have, by the introduction of improved practical methods, endeavoured to keep pace with the growing needs of physiologists. Indeed, so numerous have been the changes which have overtaken the preservation, cutting, staining, and mounting of microscopical preparations, that details in cell structure can now be demonstrated which but a dozen years ago would have been deemed incredible."

Every medical student is taught how to mount his own specimens for the microscope. A limited amount of time is, however, available for this work, and few students or even professors are ever able to carry out the process of double and triple staining, injecting, etc. This work is only undertaken by a few specialists, and we have been fortunate enough to arrange with the leading one to produce a set of slides to illustrate systematically the structure of the human body. They are the same as are used for the illustrations of his lectures on microscopy at the leading London hospitals.

These slides will prove quite a revelation to many medical men. The process of double staining and injecting brings out the details very beautifully. Apart from their medical interest, they will always be examined with pleasure.

A medical man will always find them of great use for reference, and a student with this collection and a good microscope should have no difficulty in passing any examination in histology.

The following list of slides show the extent of the structures shewn:—

1. Blood of a Mammal, Non-Nucleated. Human.
2. Blood of an Amphibia, Nucleated Frog.
3. Epithelium Squamous, from Human Mouth.
4. Epithelium Columnar, from Stomach of a Frog.
5. Epithelium Ciliated, from Pharynx of a Frog.
6. Epithelium Transitional, from Bladder of a Sheep.
7. Epithelium Endothelium, Mesentery of a Frog.
8. White Fibrous Tissue, Teased out: Tendon, Human.
9. Yellow Elastic Tissue, Teased out Lig-Nuchæ of Ox.
10. Adipose Tissue, Human.
11. Tendon, Human. Trans. and Long. sect.
12. Cartilage Hyaline Costal, Human. Trans. sect.
13. Cartilage Yellow Elastic, Ear of a Cow. Trans. sect.
14. Cartilage White Fibro, Tail of a Cow. Trans. sect.
15. Bone, Human Femur. Trans. sect. Decalcified.
16. Bone, Human Femur. Trans. sect. Hard.
17. Bone, Intra Membranous Ossification, Kitten.
18. Bone, Intra Cartilaginous Ossification, Kitten.
19. Marrow, Red, from Femur of Guinea Pig.
20. Muscle, Non-Striated, Bladder of Frog.
21. Muscle, Striated, Human, Teased out.
22. Muscle, Heart. Trans. and Long. sect. Human.
23. Nerve, Medullated, Sciatic, of a Frog.
24. Nerve, Non-Medullated, from Spleen of an Ox.
25. Nerve, Compound Trunk. Trans. sect. Human.
26. Nerve, Spinal Ganglion of a Dog. Long. sect.
27. Nerve, Pacinian, Body of a Cat.
28. Skin from Human Hand. Vert. sect.
29. Scalp, Human. Vert. and Hor. sect.
30. Tooth in situ in Jaw of a Cat. Long. sect.
31. Tooth Developing in Jaw of a Kitten. Long. sect.
32. Tongue, Filiform, Fungiform, and Circumvallate Papillæ.
33. Tongue, Papilla Foliate of Rabbit. Vert. sect.
34. Oesophagus of a Dog. Trans. sect.
35. Stomach, Mucous Membrane. Vert. sect. Cardiac and Pyloric Ends.
36. Duodenum of a Cat. Trans. sect.
37. Small Intestine of a Cat Stained. Ditto, Injected T.S.
38. Small Intestine, Peyer's Patch. Trans. sect.
39. Large Intestine of a Dog. Trans. sect.
40. Salivary Glands, Mucous, Serous and Mixed.
41. Pancreas of a Dog. Trans. sect.
42. Liver, Dog, Stained, Cat, Injected. Vert. sect.
43. Aorta of a Sheep. Trans. sect.
44. Artery and Vein, Medium sized, Human. Trans. sect.
45. Lymphatic Gland of a Cat. Trans. sect.
46. Thymus Gland of a Calf. Trans. sect.
47. Tonsil of a Dog. Trans. sect.
48. Trachea, Human. Long. sect.
49. Lung and Bronchus of Sheep, Stained. Ditto Cat, Injected.
50. Kidney, Dog Stained. Ditto Injected. Vert. sects.
51. Uterus, Human. Trans. sect.
52. Penis of an Infant. Trans. sect.
53. Testicle and Epididymis of a Dog. Trans. sect.
54. Vas deferens, Human. Trans. sect.
55. Prostate Gland of a Dog. Trans. sect.
56. Ovary of a Kitten. Trans. sect.
57. Uterus of a Cat, Human Fallopian Tube. Trans. sect.
58. Placenta, Human. Trans. sect.
59. Mammary Gland of a Cat, active. Ditto Human passive.
60. Spleen of a Dog. Trans. sect.
61. Supra-renal Gland, Human. Trans. sect.
62. Thyroid Gland of a Dog. Trans. sect.
63. Cerebrum of a Sheep. Vert. sect.
64. Cerebellum of a Sheep. Vert. sect.
65. Medulla Oblongata of a Sheep. Trans. sect.
66. Spinal Cord of a Dog, Stained and Injected. Trans. sect.
67. Eyelid of a Monkey. Vert. sect.
68. Cornea, Sclerotic, etc., of a Sheep. Vert. sect.
69. Crystalline Lens of a Sheep. Teased out Fibres.
70. Retina and Choroid of a Sheep. Vert. sect.
71. Optic Nerve of a Sheep. Trans. and Long. sects.
72. Olfactory Region of a Dog. Vert. sect.

Price of the complete collection of 72 Slides, in a Pine Cabinet, Rs. 75. Code Word for Telegrams—"BASTION."

# The "Tropical Sanderson" Hand Camera.

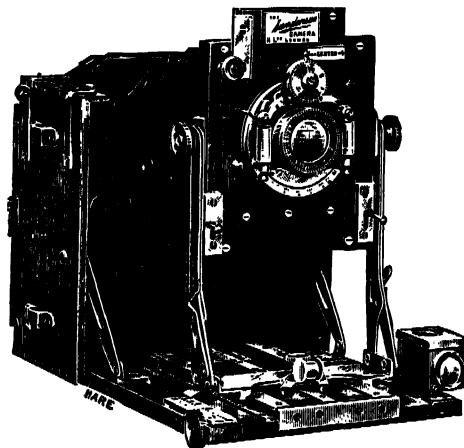
$\frac{1}{4}$ -PLATE AND 5 by 4.

**A Perfect Model Camera** for military men and those requiring an instrument capable of doing any class of work.

The "Tropical Sanderson" is constructed of **selected teak**, a wood renowned for its great damp and heat resisting qualities. The woodwork is polished instead of being leather covered, leather covering, no matter how carefully carried out, being liable to rot and peel when exposed to a damp atmosphere.

**The Cameras are Brass Bound in all vital parts**, and the bellows are specially attached with brass plates to the body of the Camera.

No Camera destined for tropical use can be absolutely reliable unless all the joints, combings, and edges are tongued with brass. Wood alone, even teak, is bound to warp, and in an instrument of precision, like the "Sanderson," there must be no warping and no weak places. The "Tropical Sanderson" is essentially the Traveller's Camera, for nothing is sacrificed to appearance, and every practical point has been considered.



**The Sanderson Hand Camera** is the most perfect model for military men and those requiring an instrument capable of doing any class of work, whether of an ordinary nature or of a difficult nature, requiring a great range of movement.

The Camera has the usual Reversing Back and Focussing Screen with hood. It is provided with an engraved Focussing Scale and Patent Infinity Catch. An independent Rising and Falling Front is also fitted.

**PRICE** of the "Tropical Sanderson" Hand Camera,  $\frac{1}{4}$ -plate, with "Beck" Double Aplanat Lens, F/7.7 "Unicum" Shutter, Brilliant View Finder, Level and 3 Teak Double Plate Holders, complete in Solid Leather Case ... .. **Rs. 150.**

Code Word for Telegrams—"EXPOSITOR."

"Tropical Sanderson" Camera, complete as above, for plates 5 by 4, **Rs. 180.**

Code Word for Telegrams—"EXTEMPORE."

Extra Plate Holders for  $\frac{1}{4}$ -plate Camera, **Rs. 4-8.**

" " 5 by 4 " **Rs. 5-8.**

**Special Lenses and Shutters can be fitted to above Cameras. Prices on application.**

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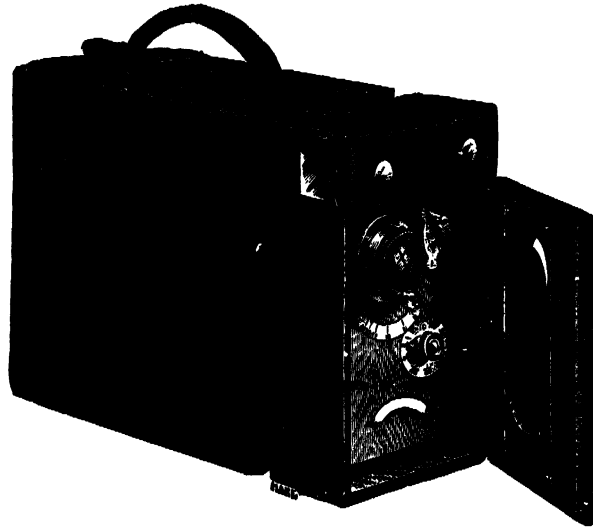
**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# The "Chameleon" Magazine Hand Camera

(London Made).

Specially constructed for India, of selected Teak, highly polished; all joints being clamped with a view to resisting the greatest extremes of damp and heat.

**Takes**  
**12 Plates**  
 **$4\frac{1}{4} \times 3\frac{1}{4}$**



**Beck**  
**Rapid**  
**Symmetrical**  
**Lens.**

## SPECIFICATION.

**CAMERA.** Thoroughly well made, of specially selected Teak, highly polished. All joints are clamped, and the Camera is specially made with a view to resisting the greatest extremes of damp and heat. Opening Front Door, with Lacquered Brass Fittings, Divided Back Door for removing exposed plates.

**LENS.** "Beck" Rapid Symmetrical F/8, of excellent quality and covering power.

**SHUTTER.** Accurately adjustable for speeds from one second to  $\frac{1}{100}$  second, and gives also prolonged Time Exposures.

**STOPS.** Iris Diaphragms.

**FOCUSSING.** By Rack and Pinion, with Engraved Scale.

**FINDERS.** Two Real Brilliant, showing the image the correct way up.

**CHANGING ARRANGEMENT.** Simple and reliable with Automatic Indicator for either 12 Plates or 24 Films in Sheaths.

**ISOCHROMATIC SCREEN.** Sliding, adjustable from the front.

**BUSHES AND TRIPOD SCREW** are provided.

Price of the "CHAMELEON" MAGAZINE HAND CAMERA, complete with Solid Leather Case, **Rs. 85.**

Code Word for Telegrams—"KNAPSACK."

Film Sheaths (per set of 18) **Rs. 5.**

Code Word for Telegrams for one set of Film Sheaths—"KILDERKIN."

Code Word for Telegrams for the CHAMELEON CAMERA, complete, with one set of Film Sheaths—"KEEPSAKE."

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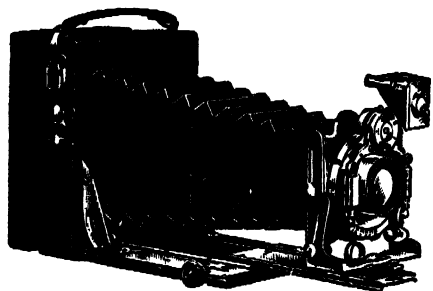
**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**



# THE "COMET" POCKET CAMERA,

FOR PLATES  $4\frac{1}{2} \times 3\frac{1}{2}$  in.

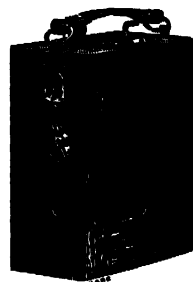
## SPECIFICATION.



OPEN.

**CAMERA.** Selected Polished Teak with Solid Nickel Fittings, Red Leather Bellows, Engraved Focussing Scale, Focussing Screen, and Aluminium Front.

**EXTENSION.** Double Extension by means of Rack and Pinion.



CLOSED.

**SWING BACK.** Double Swing Back, which allows of both top, bottom and side swing, is governed centrally by a single locking nut on either side of the Camera, and allows of an absolutely universal central swing.

**PATENT COMBINED RISING AND SWING FRONT.** This insures that, no matter how much the Lens is raised in order to photograph high objects, the Plate or Film is always fully illuminated. A Cross Front is also fitted. The Finder swings to exactly the same angle as the Lens, and thus always shows the amount of rise obtained on the Plate.

**SHUTTER.** Bausch and Lomb "Unicum," with adjustable Speeds.

**VIEW FINDER.** Real Brilliant, Reversing.

**LEVEL.** Attached to View Finder.

**INFINITY CATCH.** Patent. Fixes the Camera Front automatically at Infinity.

**SLIDES.** Teak Double Dark Slides of light and compact form, with Aluminium draw-out Shutters.

**BUSHES.** Fitted for upright and oblong pictures.

PRICE of the "Comet" Pocket Camera, complete, in solid leather case, with Busch Rapid Symmetrical Lens, F8., "Unicum" Shutter, and Three Teak Double Slides for Plates  $4\frac{1}{2} \times 3\frac{1}{2}$ , **Rs. 95.**

Code word for Telegrams—"EXPONENT."

Extra Double Slides    ...    ...    ...    ...    Each **Rs. 5.**

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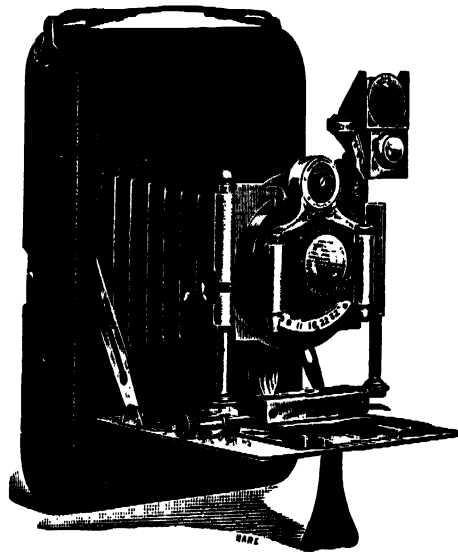
**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The "ENSIGN" Model "V."

## - - Camera. - -

*IMPROVED MODEL.*

FOR PLATES OR DAYLIGHT LOADING ROLL FILMS  $4\frac{1}{2} \times 3\frac{1}{4}$ .



THE "Model V Ensign" has been greatly improved. It is fitted with **Rack and Pinion Adjustment** of improved design for fine focussing, improved form of Spool Carrier, Level to View Finder, etc.

The Camera is strongly constructed of seasoned mahogany, with leather bellows, aluminium baseboard, covered in seal grain leather; Rising and Falling Front; Removable Back Panel, which is quite flush with Camera back, and is simply withdrawn when using Dark Slides.

Bausch & Lomb "Unicum" or "Automat" Shutter, Pneumatic and Trigger Release.

Reversible, Real Brilliant Finder.

Focussing Scale shows objects in focus up to within 5 feet.

Patent Infinity Catch.

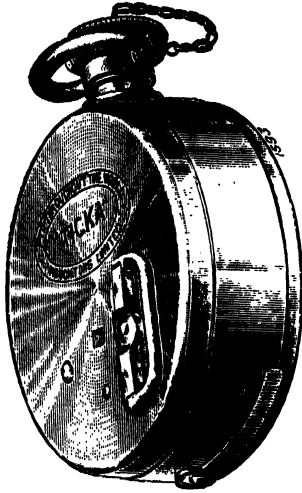
	For Pictures $4\frac{1}{2} \times 3\frac{1}{4}$	Code Word for telegrams.
"Ensign" Camera as above, with "Busch" Rapid Symmetrical Lens, $f/8$	<b>Rs. 60.</b>	"EDIFICE."
Glass Focussing Screen, with 3 Single Metal Slides for Glass Plates in		
Envelope Case, per set .. .. .	<b>Rs. 7.</b>	"ELEGIST."
Extra Single Slides, each .. .. .	<b>Rs. 1.</b>	"ELOGIUM."
Solid Leather Case, with Shoulder Strap to carry Camera .. .. .	<b>Rs. 6.</b>	"EMBASSY."

Each Camera is supplied in Box with Book of Instructions.

---

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

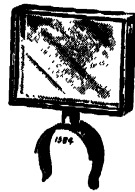
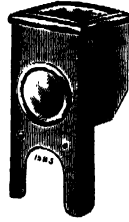
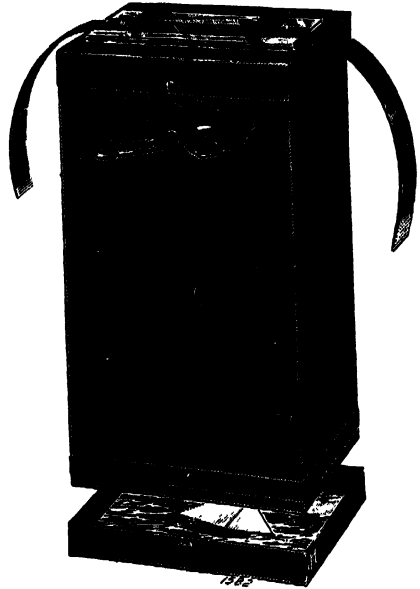
# THE "TICKA"



The "TICKA" (actual size).

A Watch Pocket Camera that  
can be Loaded and Unloaded  
in Daylight.

Each Spool takes  
25 Photographs.

"TICKA" View  
Finder, Model A.  
Direct View."TICKA" View  
Finder, Model B.  
Brilliant Pattern.

The "TICKA" Printing Box.



From Original Negatives.

You need not possess any knowledge of photography to manipulate the "Ticka." The spools are loaded in daylight, and are slipped into the camera as easily as putting a pellet into an air gun.

After the 25 exposures are made, you can open your camera in daylight, take out the exposed spool and put in another.



Enlargement from Original Negative.

- |   | Each.    | Code Word<br>for Telegrams. |
|---|----------|-----------------------------|
| "Ticka" Watch Pocket Camera. (Complete)   | Rs. 9    | "EGLANTINE."                |
| "Ticka" Film Spool (25 exposures)   | Rs. 0-12 | "ELEMENTAL."                |
| "Ticka" View Finder (to fit on the stem of<br>"Ticka" just over the lens)   |          |                             |
| Model A. To view from behind  | Rs. 1-8  | "EMBRYON."                  |
| Model B. To view from above   | Rs. 2    | "EMENDATOR."                |
| Developing and Printing Outfit. Complete<br>with Book of Instructions. (For De-<br>veloping Spools and making Contact<br>Prints, actual size) | Rs. 3-8  | "ELUCIDATOR."               |
| "Ticka" Printing Box. Complete with<br>Book of Instructions. (For making en-<br>larged Prints, $3\frac{1}{2} \times 2\frac{1}{2}$ )           | Rs. 4-8  | "EPICURE."                  |
| Printing Box Outfit. Complete with Book<br>of Instructions. (For Developing and<br>Finishing Enlarged Prints)                                 | Rs. 2-8  | "EPIGRAM."                  |
| "Ticka" Printing Paper. (For Contact<br>Prints)   | Rs. 0-8  | "ERUDITION."                |
| "Ticka" Bromide Paper. (For Enlarged<br>Prints)   | Rs. 0-8  | "EXCEPTOR."                 |

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# PHOTOGRAPHIC ACCESSORIES.

## TRIPOD STANDS.



Fig. 1.  
The "FEATHER-WEIGHT."

**Fig. 1. "The Feather-weight" Tripod Stand.** Light and portable. Three-fold, specially made for use with Hand Cameras. Weighs 19 ozs., and measures 19 by 1½ by 1½ in. Height extended, 48 in. Well-made and rigid, with cloth covered top, fitted with Patent Self Locking Joint, much facilitating the opening and closing of the Stand.

PRICE, **Rs. 8.**  
Code word for Telegrams—"FRONTLET."

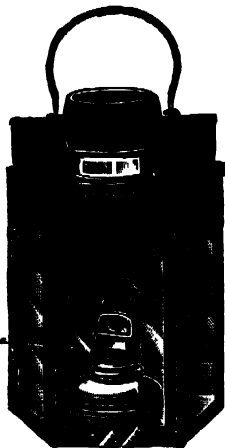


Fig 2.

**Fig. 2. The "Auto-matic" Metal Telescopic Tripod Stand.** Specially made for Cameras. Very strong and compact. Height when fully extended, 57½ ins.; when closed, 16½ ins.

PRICE, including leather case, **Rs. 12.**

Code word for Telegrams—"FUSTIAN."



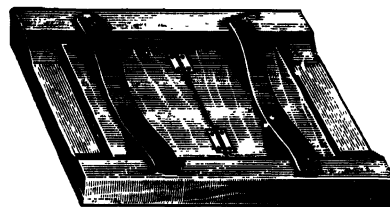
### "RELIANCE" DARK ROOM LAMP.

Japanned, two Ruby and one Orange Obscured Glasses, Paraffin Burner, Outside Winder.

**Rs. 4.**

Code word for Telegrams—"FOUNDERY."

### TEAK PRINTING FRAMES.



½-Plate **0-8-0** Code word for Telegrams—"GASIELIER."  
5 x 4 **0-12-0** " " " " "GARMENT."

### EXPOSURE METER. "WYNNE'S INFALLIBLE."

**THE "STANDARD" METER.**—This Exposure Meter is in the form of an ordinary watch, and is supplied in Nickel Silver Case with improved yellow glass exposure shutter. The Meter is set with one movement only.

Price, **Rs. 5-8.**

Code word for Telegrams—"KALMUCK"

### "ENSIGN" DEVELOPING CARTRIDGES. In hermetically sealed Glass Tubes.

			Per Box, ½-doz. Cartridges.	Code word for Telegrams.
Metol-Quinol ...	(Each Cartridge makes 10 oz. Solution)	...	<b>Rs. 1</b>	"FACET."
Pyro-Soda ...	" " 8 oz. "	...	<b>Rs. 1</b>	"FLUTE."
Hydroquinone ...	" " 8 oz. "	...	<b>Rs. 1</b>	"FISH."

### SPECIAL SET OF DEVELOPING, TONING AND FIXING CHEMICALS.

1 Cartridge Metol-Quinol Developer	}	... PER SET, <b>Rs. 1.</b>	Code word for Telegrams—"FORAGER."
1 " Toning and Fixing			
1 Packet Acid Hypo Fixing			

### PORCELAIN DISHES.

Inside Measure.				Shallow Each.			Deep Each.
4½ by 3½	...	...	...	<b>0-8</b>	...	...	<b>0-9</b>
5 " 4	...	...	...	<b>0-9</b>	...	...	<b>0-12</b>

## READING

## GLASSES.

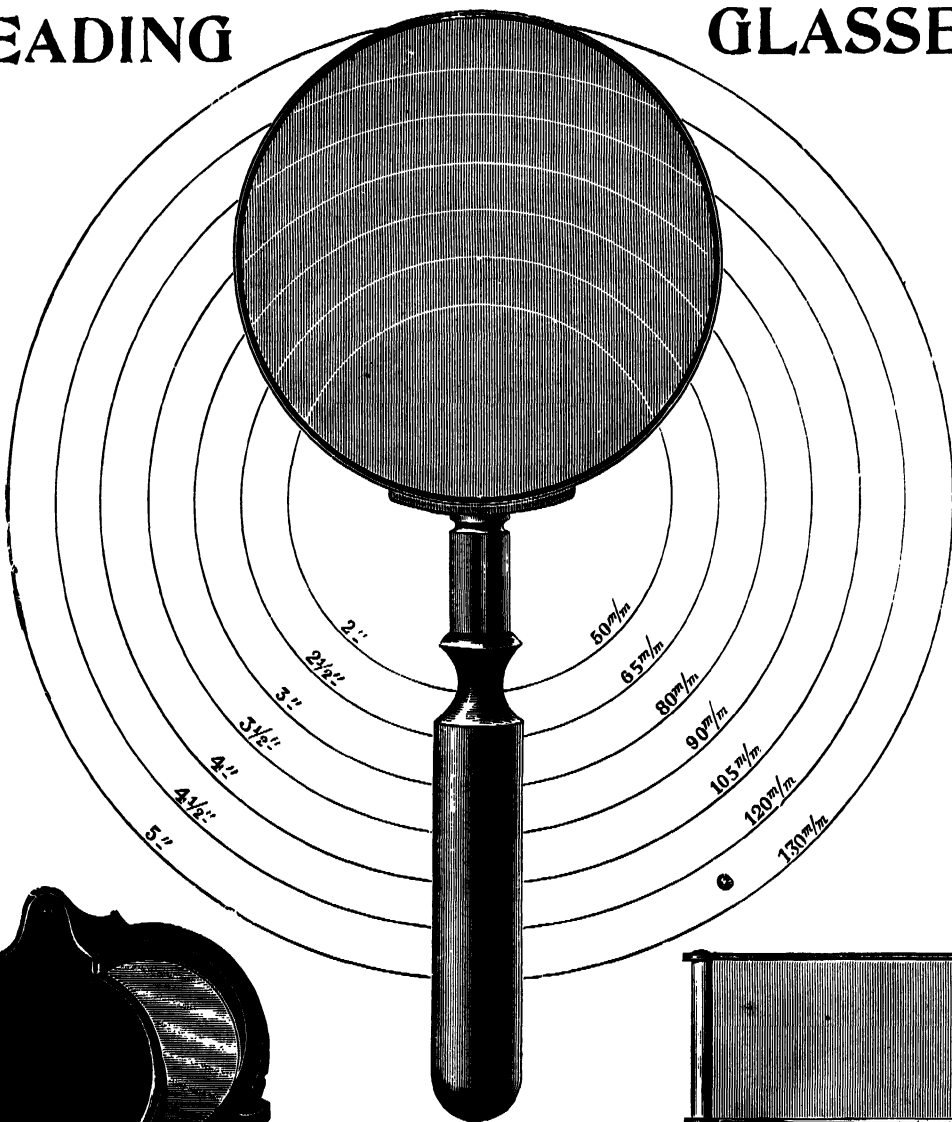


FIG. 1.

## DESCRIPTION.

FIG. 1.—Round Magnifying Lens, in metal rim with polished wood handle—Diameter of Lens— $1\frac{1}{2}$  inches ...

Do.	do.	2	do.	...	Rs. 3
Do.	do.	2 1/2	do.	...	Rs. 4
Do.	do.	3	do.	...	Rs. 5
Do.	do.	3 1/2	do.	...	Rs. 6
Do.	do.	4	do.	...	Rs. 7
Do.	do.	4 1/2	do.	...	Rs. 8
Do.	do.	5	do.	...	Rs. 10

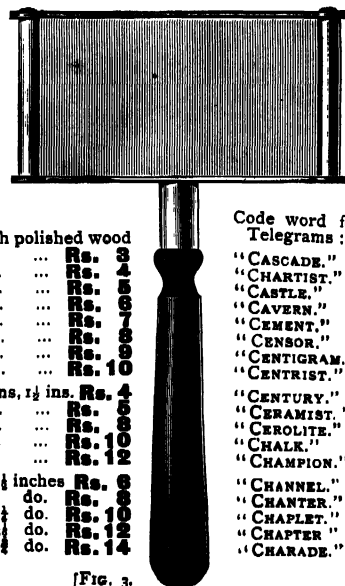
FIG. 2.

FIG. 2.—Pocket Reader, best quality Biconvex Lens folding in vulcanite frame, diameter of lens,  $1\frac{1}{2}$  ins. Rs. 4

Do.	do.	do.	diameter of lens, $1\frac{1}{2}$ inches	...	Rs. 4
Do.	do.	do.	do.	2 1/2	Rs. 5
Do.	do.	do.	do.	3	Rs. 6
Do.	do.	do.	do.	3 1/2	Rs. 10
Do.	do.	do.	do.	4	Rs. 12

FIG. 3.—Oblong Magnifying Lens, mounted in metal rim with polished wood handle, length  $2\frac{1}{2}$  inches Rs. 6

Do.	do.	do.	do.	do.	do.	3	do.	Rs. 6
Do.	do.	do.	do.	do.	do.	3 1/2	do.	Rs. 8
Do.	do.	do.	do.	do.	do.	4	do.	Rs. 10
Do.	do.	do.	do.	do.	do.	4 1/2	do.	Rs. 12
Do.	do.	do.	do.	do.	do.	5	do.	Rs. 14



[FIG. 3.]

Code word for Telegrams:

"CASCADE."  
"CHARTIST."  
"CASTLE."  
"CAVERN."  
"CEMENT."  
"CENSOR."  
"CENTIGRAM."  
"CENTRIST."  
"CENTURY."  
"CERAMIST."  
"CEROLITE."  
"CHALK."  
"CHAMPION."  
"CHANNEL."  
"CHANTER."  
"CHAPLET."  
"CHAPTER."  
"CHARADE."

# BOTANICAL LENSES.

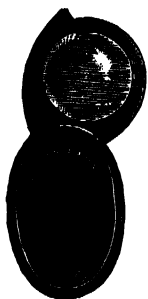


FIG. 1.

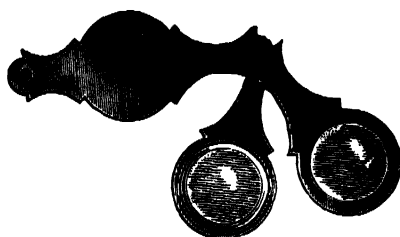


FIG. 2.

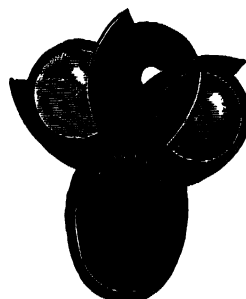


FIG. 4.

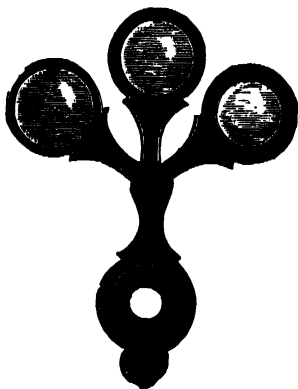


FIG. 3.

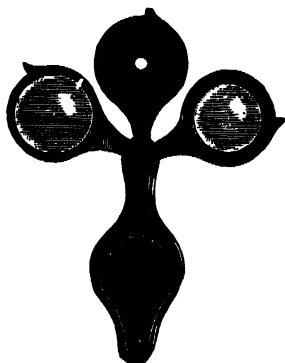


FIG. 7.

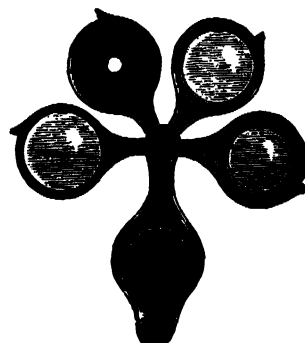


FIG. 6.

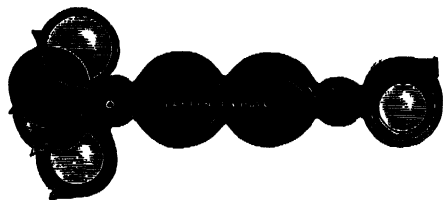


FIG. 5.



FIG. 8.

FIG. No.

DESCRIPTION.

1. 1 Biconvex Lens,  $\frac{3}{4}$ -inch diameter, in horn frame ... ..  
Do.  $1\frac{1}{4}$ -inch diameter, with high magnification, a useful lens for  
medical practitioners ... ..
2. 2 Achromatic Convex Lenses, each 15 millimetres diameter, in  
horn frame ... ..
3. 3 Biconvex Lenses, different powers, in horn frame ... ..
4. 2 Biconvex Lenses and Diaphragm, in horn frame ... ..
5. 1 Coddington Lens and 3 Convex Lenses with Diaphragm,  
folding in vulcanite frame ... ..
6. 3 Magnifying Lenses and Diaphragm, folding in strong frame...
7. 2 Plano Convex Lenses and Diaphragm, folding in horn frame
8. 1 Plano Convex Lens, 13 millimetres diameter, in horn frame...

FIG. 8.

PRICE.

Code word for  
Telegrams.**Rs. 2**

"CARBINE."

" 8

"CARBON."

" 9

"CARDAMON."

" 4

"CARLIST."

" 5

"CARPET."

" 10

"CELTIC."

" 5

"CARTOON."

" 4

"CARTRIDGE."

" 2

"CARNIVAL."

**LAWRENCE & MAYO, Manufacturing Opticians,**  
**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# Coddington and Cylinder Magnifiers.

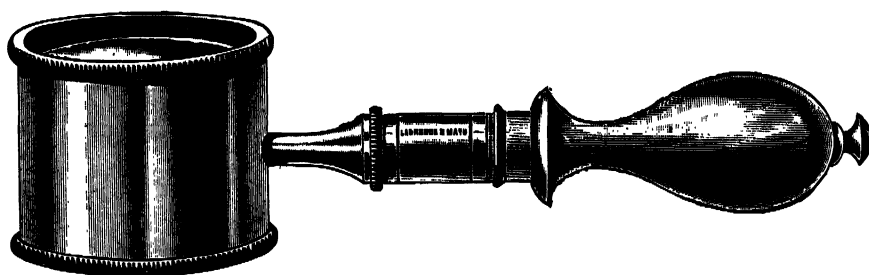


FIG. 9.



FIG. 11.



FIG. 13.



FIG. 15.

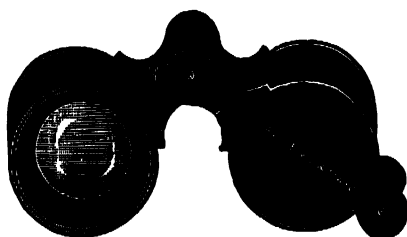


FIG. 10.

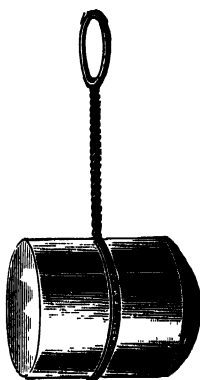


FIG. 12.

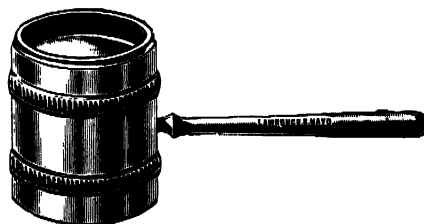


FIG. 14.

Fig. No.

DESCRIPTION.

PRICE.

Code word for  
Telegrams.

- |     |   |              |             |
|-----|---|--------------|-------------|
| 9.  | 2 Biconvex Lenses, diameter 1 in, with Diaphragm in metal frame   | <b>Rs. 6</b> | "CAVALIER." |
| 10. | Extra Powerful Coddington Lens, $\frac{3}{4}$ -inch diameter, with Diaphragm worked in the Lens, folding in tortoiseshell frame   | <b>18</b>    | "COSMETIC." |
| 11. | Extra Powerful Coddington Lens, $\frac{1}{2}$ -inch diameter, with Diaphragm worked in the Lens, folding in nickel case   | <b>6</b>     | "CABLE."    |
| 12. | Cylinder Magnifier, diameter $\frac{1}{2}$ -inch, one end convex, other end plane, with metal wire handle   | <b>3</b>     | "CACTUS."   |
| 13. | Cylinder Magnifier, diameter $\frac{3}{8}$ -inch, with brass mount and handle   | <b>4</b>     | "CAGE."     |
| 14. | Extra Powerful Coddington Lens, diameter $\frac{3}{8}$ -inch, fitted into strong case with handle   | <b>8</b>     | "CALENDER." |
| 15. | Extra Powerful Aplanatic Magnifier, folding in horn case. This lens, as its name implies, gives a perfectly flat field of great brilliancy and exquisite definition, entirely free from spherical or chromatic aberration | <b>10</b>    | "CALIBER."  |

**LAWRENCE & MAYO, Manufacturing Opticians,**

27 & 29, CHANCERY LANE LONDON. Also POORVA CALCUTTA MADRAS and RANGOON.

## VARIOUS MAGNIFIERS.

FLOROSCOPE.

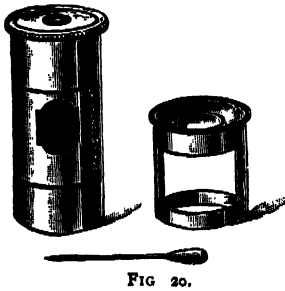


FIG. 20.

HOP MAGNIFIER.

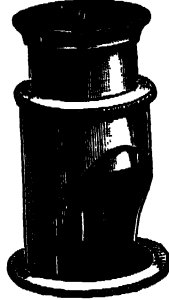


FIG. 19.

SEED MICROSCOPE.

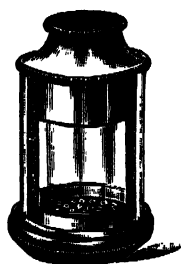


FIG. 18.

TRIPOD MAGNIFIER.

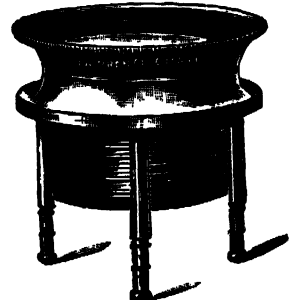


FIG. 17.

LINEN PROVER.

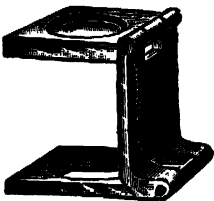


FIG. 22.

LENS.



LENS HOLDER.

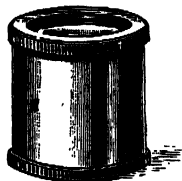
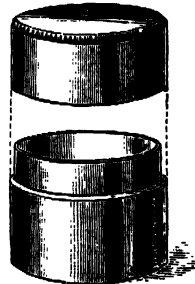


FIG. 16.

PROTECTING CASE.



INSECTOSCOPE.



FIG. 21.

Fig No.

DESCRIPTION.

Price.

Code Word for Telegrams.

16. Extra Powerful Cylinder Lens, with Diaphragm worked in the Lens, with nickel holder and nickel protecting case ... ..  
 17. Tripod Magnifier, in metal, with double convex Lens, very powerful... ..  
 18. Seed Microscope, with screw to focus lenses, fitting into metal protecting case ... ..  
 19. Hop Magnifier, with two powerful plano convex lenses and metal tubes for adjusting focus ... ..  
 20. Floroscope mounted in metal, with 1 Insect Holder and 1 extra mounted lens for preparing objects ... ..  
 21. Insectoscope, extra powerful lens ... ..  
 22. Linen Prover, brass mounted Achromatic lens, folding  $\frac{1}{2} \times \frac{1}{2}$  in.  
 Do. do.  $\frac{1}{2} \times \frac{1}{2}$  in.  
 Do. do.  $1 \times 1$  in.  
 22a Lawrence & Mayo's Combination Triple Gauge Linen Tester,  $\frac{1}{2} \times \frac{1}{2}$ ,  $\frac{1}{2} \times \frac{1}{2}$ ,  $1 \times 1$  in, brass mounted with best quality Achromatic lens ... ..

- Rs. 22 "Cabin."  
 " 8 "Calliope."  
 " 4 "Colorific."  
 " 6 "Cambrian."  
 " 3-8 "Camel."  
 " 3-8 "Camelion."  
 " 3-8 "Campaign."  
 " 5 "Camphor."  
 " 12 "Candle."  
 " 16 "Cannon."

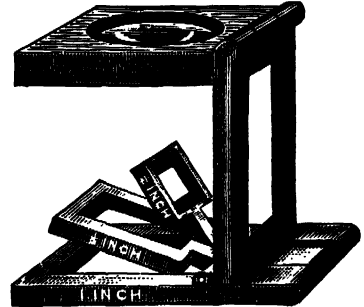


FIG. 22A.

## CHARM MAGNIFIERS.

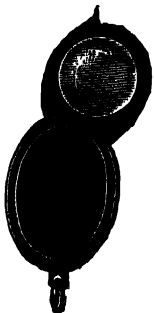


FIG. 25.



FIG. 24.



FIG. 23.



FIG. 27.



FIG. 26.

Fig. No.

DESCRIPTION.

Price.

Code Word for Telegrams.

23. 1 Coddington Lens,  $\frac{1}{2}$ -inch diameter, in nickel frame with protecting lids which when folded back form the handle  
 24. 1 Biconvex Lens,  $\frac{1}{2}$ -inch diameter, in nickel frame with ring  
 25. 1 Powerful Biconvex Lens, folding in horn frame ... ..  
 26. 1 Biconvex Lens,  $\frac{1}{2}$ -inch diameter, in nickel frame with ring  
 27. 1 Biconvex Lens, folding in tortoiseshell frame ... ..

- Rs. 8 "CANOE."  
 " 2 "CAPRICORN."  
 " 2-8 "CAPSULE."  
 " 2-8 "CARAVAN."  
 " 3 "CAPTOR."

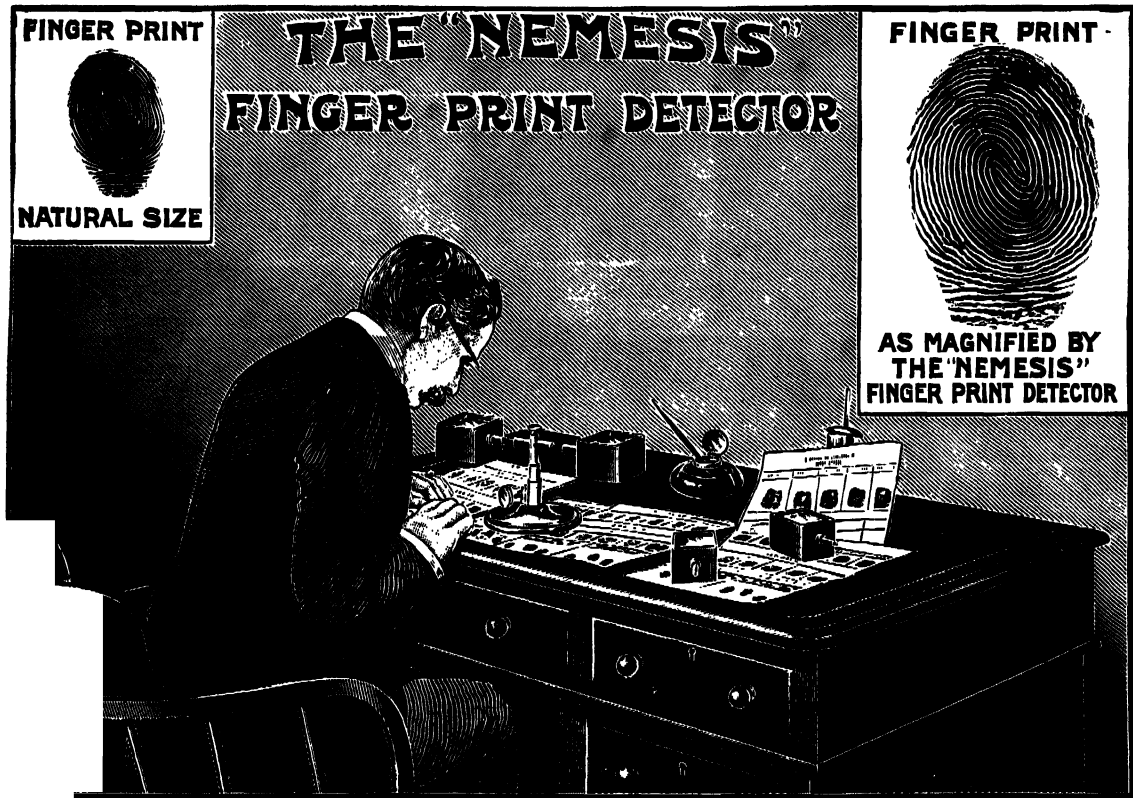
LAWRENCE &amp; MAYO, Manufacturing Opticians,

67 &amp; 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.



# The "Nemesis" Finger Print and Forgery Detector.

As supplied to Monsieur Alphonse Bertillon, Chief of the "Service de L'Identité Judiciaire" of France, and originator of the system of identification of criminals by means of Finger Impressions or Prints.



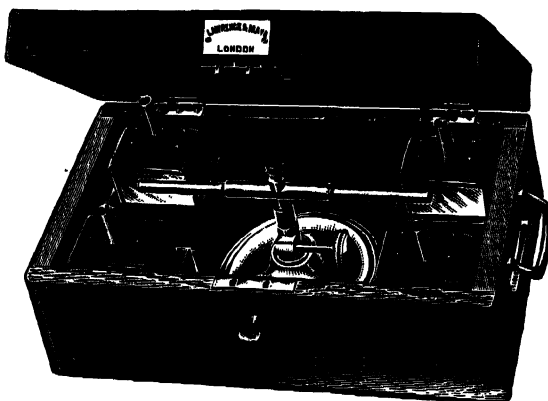
The long-felt want experienced by Judges, Magistrates, Police Officials, and others for a reliable instrument to aid in the examination and detection of finger prints and forgeries, and in response to numerous requests for the same from Police Officials in England, France and India, we have devoted considerable time and labour in experimenting with lenses and mounts to produce an instrument that could be relied on for exposing the most minute details in the comparison of finger print impressions and the detection of forgeries and erasures.

The "Nemesis" Finger Print and Forgery Detector is the outcome of our exhaustive experiments and trials, and from the fact that Monsieur Bertillon, Chief of the "Service de L'Identité Judiciaire" of France, to whom we submitted the first finished model, writes, after a lengthy examination and practical use of the instrument, "it is a model to which it seems impossible to add anything or modify anything," are sufficient reasons for our confidence in bringing the particulars of the apparatus to the notice of all concerned or engaged in the classification or identification of the records of criminals.

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

The "Nemesis" Finger Print and Forgery Detector consists of four mounts or lens-holders, each containing 2 plano convex lenses of the finest quality, and optically worked and specially mounted to produce in combination the highest possible magnification with the least possible

spherical or chromatic aberration, consequently giving a perfectly flat field of great brilliancy and superb definition. The special construction of the stand which is very firm and substantial, permits of any two of the four lenses being available for use at the same time, the arm or holder to which they are attached working on a pivot, so that either of the two lenses can be easily brought into the required position. The focus is obtained in the usual way by turning the thumb screw attached to the rack and pinion. To render the apparatus thoroughly complete we have considered it necessary to supply four lenses of varying focal lengths, thus enabling anyone with either normal or defective vision obtaining the best results, and will prove of great service in Bureaus where many officials require to use the apparatus, and also in cases where documents have to be submitted to juries or assessors.



This illustration shows the "Nemesis" Finger Print Detector Complete in Case.

Copy of Unsolicited Testimonial for the "Nemesis" Finger Print and Forgery Detector received from Monsieur Bertillon, Chief of the Bureau "Service de L'Identité Judiciaire" of France:

PREFECTURE DE POLICE

DIRECTION GÉNÉRALE  
DES RECHERCHES

SERVICE  
DE  
L'IDENTITÉ JUDICIAIRE

Anthropologie, Photographie, Renseignements

N°

Avis essentiel.

Les réponses doivent toujours porter en marge toutes les indications qui figurent en dessous et être adressées au Préfet de Police (Identité Judiciaire).

RÉPUBLIQUE FRANÇAISE

LIBERTÉ — ÉGALITÉ — FRATERNITÉ

Paris, le 24 mai

1906

Messieurs,

Je viens de procéder à l'essai pratique des loupes à pied spécialement construites par vous pour l'examen des empreintes digitales, comptage de leurs millons etc.

L'achromatisme de la combinaison optique que vous avez employée me semble très suffisante. J'en dirai autant de son pouvoir agrandisseur.

Mes agents et moi donnons la préférence à la longueur focale 80 m/m les longueurs plus courtes tendant à produire une certaine fatigue de la vue.

Quant au porte-loupe, c'est un modèle auquel il semble impossible de rien ajouter, de rien modifier, tellement il est simple et pratique. Tel qu'il est, cet appareil est appelé, je n'en doute pas, à rendre de grands services dans tous les bureaux d'identification.

Veuillez agréer,

Messieurs l'assurance de mes sentiments les plus distingués

*Alphonse Bertillon*

Price of the "Nemesis" Finger Print and Forgery Detector complete in Case, Rs. 65.

Code word for Telegrams—"NEMESIS."

# Dr. Berger's Binocular Loupe.

For Medical Practitioners, Artists, Engravers, etc.

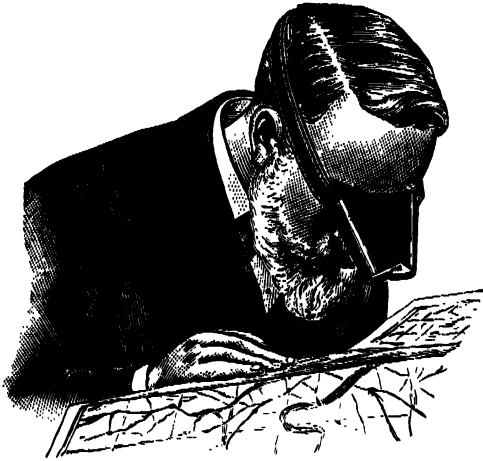


Fig. 1.

## THE SPINTHARISCOPE.

*Demonstrating Radium Energy.—Fig 2.*

This instrument has been devised by Sir William Crookes, F.R.S., to demonstrate the wonderful physical properties of Radium. A small quantity of Radium is placed on a pointer in front of a fluorescent screen, and on close observation with a high power lens a number of constantly moving points of light can be seen. These scintillations, as they are called, are due to the bombardment of Electrons of Radium against the Zinc blende screen, they continue for an unlimited time.

The Spinthariscopes is made as follows:—

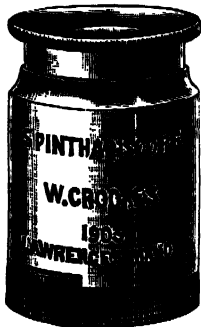


Fig. 2.

As a pocket instrument (as illustrated), microscopically arranged about  $\frac{1}{2}$  inch long, containing the fluorescent screen over which is pivoted a movable pointer on which the radium is fixed.

A powerful lens with screw adjustment completes the instrument, which fits into a neat leather case.

In order to see these fine scintillations the observer should have been in a darkened room for at least five minutes (especially on a bright day) so that the eye should be sufficiently sensitive. The fluorescent screen should be properly focussed by adjustment of the lens.

By moving the small milled screw near the base of the instrument, the pointer on which the Radium is placed is raised or

lowered about 5 m/m. At its lowest point it is about 1 m/m from the screen and the area of scintillations is smaller.

Observations are best made *after sunset and in a darkened room.*

Light should not be allowed to pass through the lens on to the Zinc blende screen, owing to the power of Zinc blende to absorb ordinary light, which is liable to spoil the effect of the scintillations temporarily.

Price, complete with case, **Rs. 16.**

Code word for Telegrams—"RADIUM."

FIG. 1.—This Loupe consists of two spherio-prisms with bases together mounted in a light frame and set at such an angle that magnified binocular vision with stereoscopic effect is obtained at very close range.

This Magnifier will be found of great service in all cases where continuous use of a magnifying glass of high power is necessary, and is of great advantage over the ordinary single lens, which soon causes fatigue to the eye.

An elastic head band is provided for keeping the Loupe in position whilst in use.

PRICE, **Rs. 17.**

Code word for Telegrams—"LOUPE."

## THE DICHRAISCOPE,

For Testing Rubies.

FIG. 3.—By the aid of this instrument anyone can easily detect a genuine ruby from an imitation one. By simply holding the stone to be examined in front of the square opening of the instrument and observing the same against a good light, a genuine ruby would show but one square instead of two as seen through the instrument alone with a false or imitation ruby the double square would still be seen.

Price, **Rs. 12.**

Code word for Telegrams—"DICHRAISCOPE."

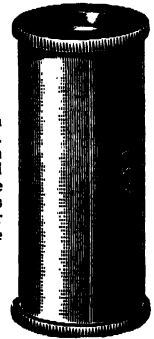
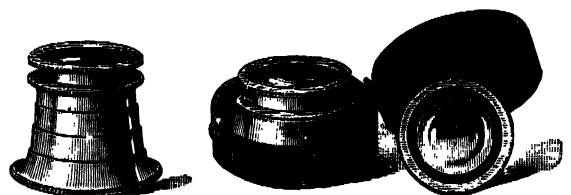


Fig. 3.

## COLLAPSIBLE WATCHMAKERS' LENS.



Half-size.

Instrument collapsed in case, showing extra Lens.

For Medical Practitioners, Botanists, Geologists, &c. Made of Aluminium, and fitted with two powerful Bi-convex lenses.

Price, including Pocket Case, **Rs. 7-8.**

Code word for Telegrams—"WATCH."

Extract from "BRITISH MEDICAL JOURNAL," of May 6th, 1897:—

"WATCHMAKERS' LENS.—Dr. J. Home Ross, of Bishop's Stortford, has designed a very convenient Watchmakers' Lens for carrying in the pocket. Such an appliance is often of use to Medical Practitioners, especially in examining cases of skin diseases. This pattern, which has been made by Messrs. Lawrence and Mayo, 67 and 69, Chancery Lane, London, is very light and portable. It is made of aluminium, and is collapsible into its case, after the manner of some metal drinking cups. Two lenses are supplied, and the whole occupies very little space in the pocket or bag."

**LAWRENCE & MAYO, Manufacturing Opticians,**

**67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.**

# Magneto-Electric Machines and Medical Galvanic Batteries.

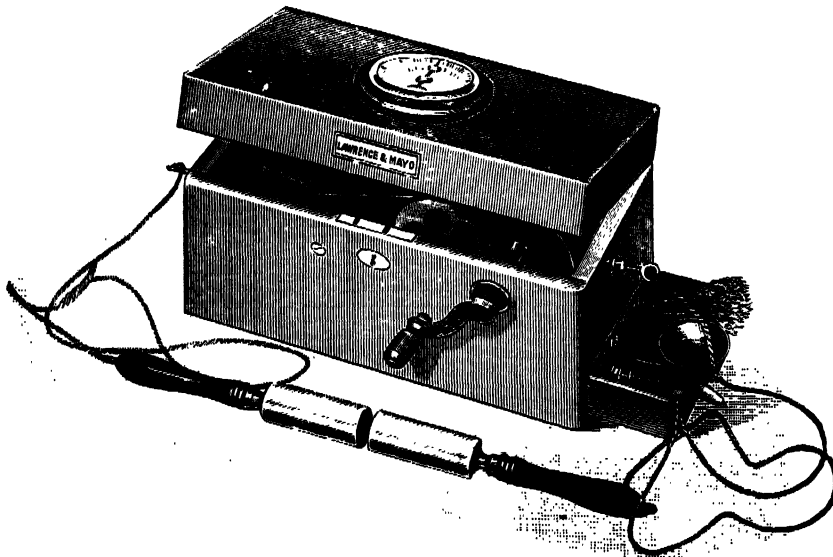


FIG. 1.—MAGNETO-ELECTRIC MACHINE, with Indicator for registering and regulating the power. This machine will be found indispensable for Invalids, as by its means the power can be adjusted with the greatest accuracy, from the strength that a child can bear with comfort up to the maximum limit of the Machine. It is simple in construction, and will not easily get out of order. It is worked by the screw at the end of the box, which is connected with the Armature of the Magnet, and also with the Dial, thus *regulating & indicating* the power at the same time. After using return index hand to 0.

Price, complete with drawer containing appliances for the Tooth, Ear, &c., **Rs. 45.**

Code word for Telegrams, "MACHINE."

FIG. 1.

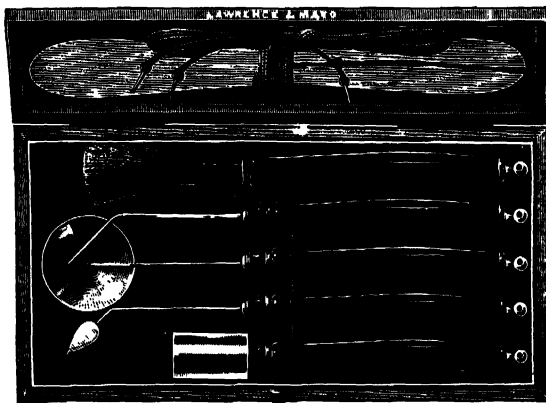


FIG. 4.

FIG. 2.—Medical Pocket Magneto-Electric Machine.

PRICE, **Rs. 18.**

Code word for Telegrams—"MALT."

FIG. 3.—Primary and Secondary REGULATION Bichromate Battery, Bottle of Chemicals, Nickelled handles in portable polished Walnut Case.

PRICE, **Rs. 30.**

Code word for Telegrams—"MINT."

FIG. 4.—Case of Appliances, containing Rephores, Tooth, Ear, Disc, Brush, Sponge Holder, and Foot Plates.

PRICE, **Rs. 15.**

Code word for Telegrams—"MINERAL."

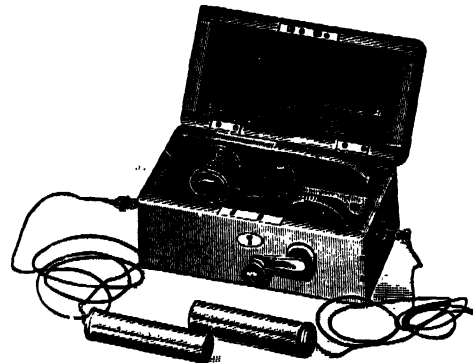


FIG. 2.

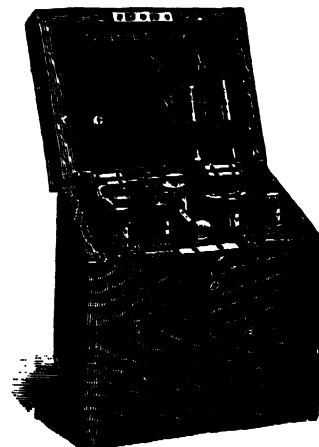


FIG. 3.

# MAGNETS.

Best quality Horse shoe shape Magnets.

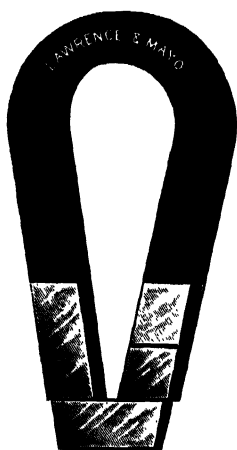


FIG 1.

FIG 1.

	Inches 2	3	4	5
	Rs. 0-8-0	Rs. 1-0-0	Rs. 1-8	Rs. 2-0
Code word for Telegrams }	"FABRIC."	"FANATIC."	"FACTOR."	"FINCH."
	Inches 6	9	12	14
	Rs. 2-8	Rs. 5-0	Rs. 7-8	Rs. 10
Code word for Telegrams }	"FIDDLE."	"FUMID."	"FAMINE."	"FASHION."

Magnets with grooved ends for Thermometers.

FIG 2.

	Inches 1½	2	2½	3
	Rs. 0-8-0	0-12-0	1-0-0	1-4-0
Code word for Telegrams }	"FASTENER."	"FATHOM."	"FAWN."	"FEDERAL."

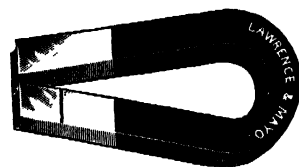


FIG 2.

Straight bar Magnets for adjusting Ships' Compasses.



FIG 3.

FIG. 3.—Best quality straight bar Magnets, fitted in copper tubes (Mandrel drawn), perfectly water-tight.

	Inches 6	9	12	15
	PRICE, Rs. 2	Rs. 3	Rs. 4	Rs. 5
Code word for Telegrams }	"FELLOW."	"FELON."	"FENCER."	"FUNNEL."
	Inches 18	24	30	
	PRICE, Rs. 6	Rs. 9	Rs. 12	
Code word for Telegrams }	"FIBRE."	"FISHER."	"FLAME."	

FIG 4.

Giant or Compound Horse shoe Magnets.

Composed of Six Magnets, rivetted together, the whole forming magnets of extra power (made to order only).

	Length 6 in.	9 in.	12 in.	15 in.
	Rs. 30	Rs. 50	Rs. 90	Rs. 110
Code word for Telegrams }	"FLANNEL."	"FLASK."	"FLICKER."	"FLEXIBLE."

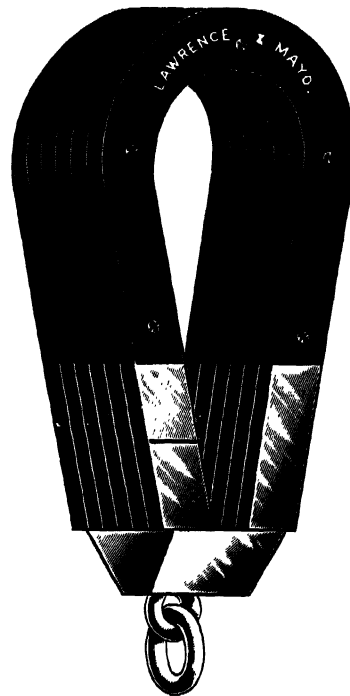


FIG 4.

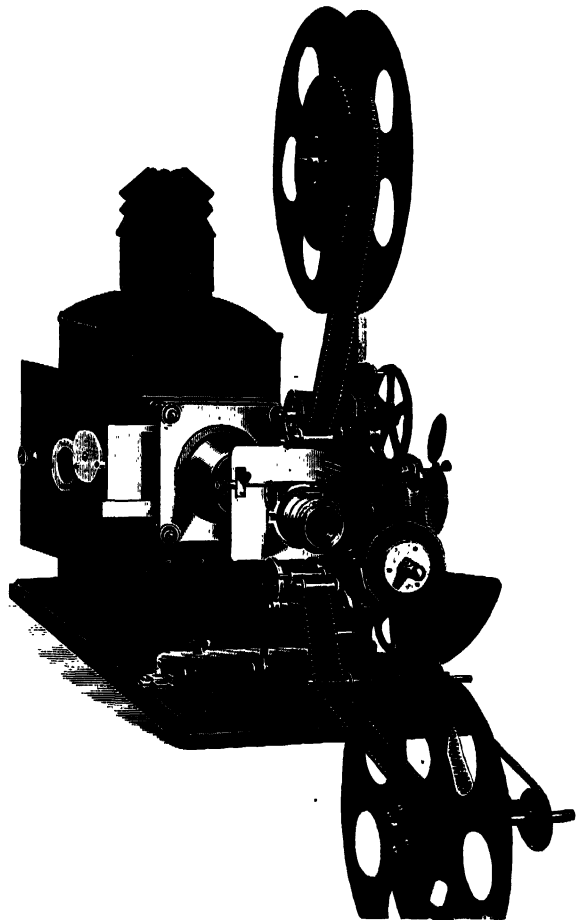
**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# The Universal Latest Model (1906) Bioscope

Or Combined Bioscope and Optical Lantern Outfit.

The Best Projector for Films of any make.

The Universal Bioscope and Slide Projector (for Lime-Light or Electric-Light) including the Bioscope Mechanism complete, with top arm for taking a 12 inch diameter spool, and re-winder arm for taking a similar spool for Films after having passed through the Projector. Large and well ventilated Russian iron lantern with all brass stage front, into which is fitted a 4 inch bi-convex and meniscus condensor. The whole mounted on solid oak base board. Slide Carrier, High-Power Jet and Adjustable Tray, Saturator and Oxygen Generator, One 3 inch and One 4 inch Focus, Bioscope Lens, One 8 inch and One 10 inch Focus Lantern Objective, Film Mender Tools, Spare Driving Band, etc. The whole packed complete in strong travelling case.



PRICE, complete as above, **Rs. 975.**

Code Word for Telegrams, "BIOSCOPE."

---

**LAWRENCE & MAYO, Manufacturing Opticians,**  
67 & 69, CHANCERY LANE, LONDON; also BOMBAY, CALCUTTA, MADRAS and RANGOON.

# CONTENTS OF CATALOGUE.

- Abney Levels, 70  
Acre Comb Scales, 123  
Addiscombe Case of Drawing Instruments, 146  
Admiralty pattern Sextants, 55  
" " Field's Rolling Rule, 127  
Aim Corrector, Jeffery's, 88  
Air Meters, 190  
Alert Binocular Field Glass, 11  
Alidade, for Plane Table, 80  
Altitude and Prismatic Compass Combined, 68  
Anemometers, 190, 191  
Aneroid Barometers, 170, 171, 172, 173, 174, 175, 176, 177, 178, 180, 181, 183, 184  
Angular Double Nose Piece, 218  
" Triple Nose Piece, 218  
Animalcule Tanks, 219  
Aplanatic Magnifiers, 230  
Achromatic Objectives, 220  
Appliances for Electric and Galvanic Batteries, 235  
Architects' Cabinet Scaucers, 165  
" and Engineers' Case of Drawing Instruments, 146  
" Pocket Knife, 140  
" Scales, 123  
" Stencil Plates, 138  
" Waterproof Drawing Inks, 164  
Armstrong's Scales, 123  
Army Signalling Flags, 75  
" " Lamp, 74  
" " Poles, 75  
" " Whistles, 90, 91  
Arrows, Land Chain, 119  
Artificial Horizons, 55  
Artists' China Ware, 165  
" Pencils, 167  
Ascot Ladies' Field Glass, 21  
Astronomical Telescopes, 33, 34, 35, 36, 37, 38  
Azimuth Folding Sights, 52  
Backlight Protector, 86  
Bacteriological Microscope, 212  
Barographs, Self-recording, 183, 184  
Barometers, Aneroid, 170, 171, 172, 173, 174, 175, 176, 177, 178, 180, 181, 183, 184  
" mercurial, 182  
Bate's Standard Saccharometer, 199  
Bath Thermometers, 196  
Bath for Washing Prints, 158  
Batteries, Bichromate, 235  
" Galvanic, 235  
" Magneto Electric, 235  
Batters and Slopes, 131  
Battery Military Watch, 95  
" Renewals for Military Telephones, 72, 73  
Beale's Neutral Tint Lucida, 218  
Beam Compasses, 154  
Belfry Military Watch and Chronograph, 94  
Berger's Binocular Loupe, 234  
Bevel protractor, 114  
" Universal, 114  
Binnacles and Compasses for Boats and Yachts, 52, 53  
Binocular Body Microscope, 214  
" Field Glasses, 7, 8, 10, 11, 19, 20, 21  
" Telescopes, 4, 5, 6  
" " Prismatic, 18  
Bioscope, Universal, 237  
Biram's Anemometer, 190  
Birdseye Binocular Telescope, 5  
Bisecting Divider, 150  
Bluish Transparent Parchment, 157  
Boat Compasses, 51, 52  
Boning Rods, 122  
Books, Field, 159  
" Levelling, 159  
" Measuring, 159  
" Sectional, 159  
" Surveying, 159  
Bordering Pen, 147  
Borer, Tree and Timber, 116  
Botanical Lenses, 229  
Botterill's Life Slide, 219  
" Trough, 219  
Boucher's System, Calculating Circle, 129  
Bows, Pen and Pencil, 149  
Boxes for Microscopic Objects
- Boxwood protractors, 123  
" Rule for Sketchboard, 76  
" Scales, 123  
Bracket for Barograph or Thermograph, 185  
Brass Levels, 108  
Brick Gauges, 140  
Brimometers or Salt Hydrometers, 199  
Britannia Sextant, 55  
Brooks' Corner Curve, 135  
" Flexible Curves, 134  
" Mathematical Curves, 135  
Browne and Sharpe's Rule Depth Gauge, 111  
Brushes for Painting in Water-colours, 163  
Bryan's Luminous Compass, 42  
Bubbles, Ground and Divided for Dumpy Levels, Theodolites, etc., 108  
Builders' Level, 101  
Bullseye Target Telescope, 26  
Bulwark Binocular Telescope, 6  
Burbridge's Scale Elevator, 86  
Cabinets for Microscopic Objects, 218  
Cabinet Scaucers, 165  
Cables for Rifle Range Telephones, 73  
Calculating Circle, 129  
" Rules, 128  
Caliper Gauges, 111  
" Rules, 112  
Cameras, 222, 223, 224, 225, 226  
Camera Lucida, 80  
Captain Field's Parallel Rules, 127  
" George's Artificial Horizon, 55  
Cards, Luminous, 50  
Carriage Pattern Aneroid Barometer, 178  
Cartoon Cartridge Papers, 157  
Cartridges, Ensign Developing, 227  
Cartridge Papers, 157  
Cases of Drawing Instruments, 141, 142, 143, 144, 145, 146  
Castanets, 75  
Caustic Soda, Thermometer for Testing, 196  
Celluloid Protractors, 136  
" Set Squares, 131  
Centrolineads, 137  
Chain Scales Boxwood, 123  
" Ivory, 123  
Chameleon Magazine Hand Camera, 223  
Charm Compasses, 47  
Chart Magnifiers, 231  
Chart Pencils, 167  
" Rules, 127  
Chemicals, Developing, Toning, and Fixing, 227  
Cherub Pocket Hand Camera, 192  
" Prismatic Binocular Field Glass, 17  
" Ship Log, 56  
Chesterman's Jointed Rules, 125  
" Land Chains, 119  
" " Arrows, 119  
" Steel Band Measuring Chains, 120  
" Steel Caliper Gauges, 111  
" Steel Depth Gauge, 123  
" " Feeler (or Thickness Gauge), 111  
" " Measures, 121  
" Straight Edges, 119  
" Tapes for Measuring Diameters and Circumferences, 121  
" Wind up Measures, 120  
Chimeys for Microscope Lamp, 218  
China Tinting Cup, 165  
Chondrometer or Corn Balance, 199  
Chronographs, 94, 96, 97  
Chronometers, Marine, 92  
Chronometer Pattern Aneroid Barometer, 177  
Circular Protractors, 136  
" Slant Cup and Basin, 165  
Clinical Thermometers, 198  
Clinograph (Harrison's Patent), 132  
Clinometer Rules, 69  
" Service Pattern Mirror, 69  
Club Tripod Stand, 32  
Collidington Lenses, 229, 230, 231  
Code Signals, 64  
Cold Storage Thermometers, 190  
Collapsible Watchmaker's Lens, 234  
College Drawing Boards, 140  
" Microscope, 209  
" Spectroscope, 207  
Colonel Goulier's Pocket Collimator Level, 102  
Colour Boxes, 160, 161  
Coloured Crayons, Service Set, 160  
Combination Compass Set, 152  
" Set, Starrett's, 115  
Comet Pocket Camera, 224  
" Watch or Motor Speed Recorder, 97  
Compasses, Beam, 154  
" Boats and Yachts, 51, 52, 53  
" Bryan's Luminous, 42  
" Charm, 47  
" Colonial, 46  
" Half Sets, 151  
" Magnetic, 39, 40, 41, 42, 44, 45, 46, 47, 48, 49, 65, 80  
" Napier, 153  
" Pillar, 153  
" Plane Table, 80  
" Pocket, 153  
" Proportional, 153  
" Rotating, 155  
" Triangular, 150  
Compass Pencils, 166  
Compensating Eye Pieces, 220  
Computing Scales, 123  
Condensers, Stand, 218  
Continuous Tracing Paper, 157  
Cooper's Hill Case of Drawing Instruments, 146  
Copper Stencil plates for Architects, 138  
" " Engineers, 139  
Course Correcting Instruments, 60  
Cover Glasses, 219  
Cross Staff Head, 105  
" Staves, 105  
Current Meters, 109  
Curves, Brook's corner, 135  
" Flexible, 134  
" Mathematical, 135  
" Pearwood, 133  
" Railway, 133  
" Ship, 133  
Curve Radiator, 133  
Curved Scissors, 217  
Cylinder Magnifiers, 230, 231  
Dairy Thermometers, 196  
" Dallinger's Bacteriological Microscope, 212  
Damp Detectors, 177  
Davy and Co.'s Marine Lamps, 62  
Dead Shot Prismatic Binocular and Monocular Field Glasses, 12  
Deck Watch, 93  
De La Rue's Fountain Pens, 168  
Densimeter or Petrol Tester, 199  
Depth Gauge for Engineers, 111  
Designers' Pencils, 166  
" Waterproof Drawing Ink, 164  
Detail Papers, 157  
Developing, Toning, and Fixing Chemicals, 227  
Diagonal Eyepiece for Transit Theodolite, 104  
Dihedralscope, 234  
Dissecting Cases, 218  
" Knives and Needles, 217  
" Microscope, 215  
Distress Signal Lamp, 62  
Divided Slant Tile, 165  
Dividers, 148, 149, 150  
" Napier, 153  
Dogstar Compass, 46  
Dotted Pen for Beam Compasses, 154  
Dowse's Vellum Tracing Cloth, 158  
Draughtsman's India Rubber, 167  
" Pencils, 167  
Drawing Boards, 140  
" Inks, 164  
" Instruments, Cases of 141, 142, 143, 144, 145, 146  
" and Measuring Instruments, Book on, 137  
" Papers, 157  
" Pens, 147, 148  
" Pins, 140  
Dummy Telegraph Key, 75  
Dumpy Level, 101  
Ebonite Ring Cells, 219  
Ebony Bar Parallel Rules, 126  
" Rolling Parallel Rules, 126  
Recentrolinead, 137  
Eidographs, 137  
Elphinstone-Keith Spacing Rolling Parallel Rule, 126  
Emporium Case of Drawing Instruments, 145  
Engineer and Architects' case of Drawing Instruments, 146  
Engineers' Pocket Knife, 140  
" Rule, Garrett's, 124  
" Scales, 123  
" Slide Rule, Routledge's, 124  
" Steel Depth Gauge, 111  
" Rules, 125  
" Stencil Plates, 139  
Ensign Camera, 225  
" Developing Cartridges, 227  
Equatorial Sun Dial, 203  
" Telescopes, 36, 37  
Excelsior Yacht Log, 57  
Explorers' Watch, 93  
Exposure Meter, Wynne's infallible, 227  
Eye-Piece Micrometer, 218  
Faber's Calculating Rules, 128  
" Pencils, 166  
Featherweight Tripod Stand, 227  
Feeler or Thickness Gauge, Steel, 111  
Field Books, 159  
Field's Parallel Rules, 127  
Finger Print and Forgery Detector, 233  
Fixing Chemicals, 227  
Flags, Army Signalling, 75  
Flash Light Hellograph, 71  
Flexible Cable for Military Telephones, 73  
" Curves, Brook's, 134  
Florescope, 231  
Foghorns, 63  
Folding Plane Table, 78  
Forceps, 217  
Foresight Protector, 86  
Fountain Pens, 168, 169  
Four Legged Nautical Divider, 150  
Fraser's Section Washer, 218  
French Pearwood Curves, 133  
Frog Plates, 218  
Galvanic Batteries, 235  
Garrett's Engineers' Rule, 124  
Garrison Case Case of Drawing Instruments, 146  
Gauge Glasses for Rain Gauges, 189  
Gauges, Brick, 140  
" Micrometer, 110  
" New Universal Surface, 115  
" Thickness, 111  
" Whitworth Screw Pitch, 112  
" Wyke's Universal Screw-cutting, and Twist Drill, 113  
George's Artificial Horizon, 55  
Geometrical Sets for Colleges and Schools, 141  
Ghat or Road Tracers, 106  
Giant or Compound Magnets, 236  
Gimbal Compass, 46  
Glaisher's Rain Gauge, 189  
Glass Animalcule Tanks, 219  
" Dissecting Dish, 218  
" Hydrometers, 199  
" Paper Weights, 140  
" Ring Cells, 219  
" Saccharometers, 199  
" Salinometers, 190  
" Stage Plates, 219  
" Troughs, 218, 219  
" Tubes for Thomson's Sound-ing Machine, 59

# CONTENTS OF CATALOGUE—continued.

- Globe, Prismatic Binocular Telescope, 18  
Gold Compasses, 47  
Goulier's Pocket Collimator Level and Inclinator, 102  
Government Pattern Plane Table, 77  
Gravatt's or Dumpy Level, 101  
Groper Military Compass, 40  
Ground and Divided Bubbles for Theodolites, Dumpy Levels, etc., 108  
Gun Metal Rolling Parallel Rules, 126  
Gun Signal Sun Dial, 204  
Gunter's Scales, 123  
Ha-Hy Course Corrector, 60  
Half Set Compasses, 151  
Hammer and Hatchet, Pioneer, 117  
" Pioneer, for Tree and Timber, 116  
Hand Camera, 222, 223  
" Counter, Harding's, 118  
" Microtomes, 218  
Harding's Machine and Pocket Counters, 118  
Harley Dissecting Microscope, 215  
Harpoon Sounding Machine, 59  
Harrison's Clinograph, 132  
Heating Table for Mounting Objects, 218  
Hedley Dials, 103  
Heliograph, 71  
Hexagon Cake Water Colours, 164  
" Nut Angles, 131  
Histological Microscope, 214  
Hop Magnifiers, 231  
Horizontals, Artificial, 55  
Horn Centres, 140  
Horsehoe Shape Magnets, 236  
Howard's Rain Gauges, 189  
Huygenian Eyepieces, 220  
Hydrometers, 199  
Hygrometers, Mason's, 196  
Hypsometric Apparatus, 179  
Improved Abney Level, 70  
" Miners' Dials, 103  
India Engineering College (Cooper's Hill), Case of Drawing Instruments, 146  
India Rubber, 167  
Indian Ink, Best Nankin, 164  
" " and Colour Tiles, 165  
" " Waterproof, Bottles of, 164  
Indigo Thermometers, 196  
Insectoscopes, 231  
Instructors' Flag, 75  
Insulated Thermometer, 196  
Iolanthe Opera Glass, 21  
Iris Diaphragms, 218  
" Orthoptic Shooting Spectacle, 89  
Iron Ground Box for Military Telephones, 72  
Levels, 108  
Ivory Levels, 124  
Jeffery's Aim Corrector, 88  
" Combination Sight Elevator and Wind Gauge, 87  
" Foresight Protector, 86  
" Improved Pattern Ventometer, 88  
" New Scoring Book, 88  
" " Sighting Wind Gauge, Back-sight, 88  
" 200 Yards Scale Elevator, 86  
Jointed Pocket Rules, 124, 125  
" Kay " Yacht Log, 58  
Koh-i-noor Chart Pencils, 167  
Labbez Mirror Telemeter, 83  
Lamp Plummet, 106  
" Target for Miners' Dial, 106  
Lamps, Dark Room, 227  
" Military Signalling, 74  
" Ships Marine Signalling, 62  
Land Chain Arrows, Chesterman's, 119  
" Chains, Chesterman's, 119  
Lantern Binocular Telescopes, 4  
Lawrence-Belcher Laboratory Microscope, 210  
Leads for Pencils, 166, 167  
Lean's Dial, 103  
Legh's Luminous Compass, 41  
Leitz Compensating Eyepieces, and Immersion Objective, 220  
Lettering Set Squares, 131  
Levelling Books, 159  
" Staves, Sopwith's, 122  
Levels, Abney, 70  
" Builders', 101  
" Locke's, 70  
" for Plane Tables, 80  
" Gravatt, or Dumpy, 101  
" Reversible, 99  
" Solid Engineers' and Surveyors', 98  
" Tubes for, 108  
" "Y", 100  
Lever Compressorium with Adjustments, 218  
Light Slide, Botterill's, 219  
Light Horse Military Sketch Board, 76  
" Modifier, with Blue and Gray Glasses, 218  
Linen Provers, 231  
Live Boxes, 218  
Livingstone Set, 178  
Logarithms for Beginners, Book on, 128  
Log Glasses, 59  
" Lines, 59  
Logs, Ship, 55, 56, 57, 58  
London Polaris, Course Corrector, 60  
Look-Out Telescopes, 29  
Loupe, Berger's Binocular, 234  
Luminous Cards for Column Leaders, 50  
" Compasses, 39, 40, 41, 42, 44, 45  
" Oil Paint, 50  
" Slates, 50  
Lynx Binocular Field Glasses, 7  
Lyric Lorgnette Opera Glass, 22  
Machine and Pocket Counters, Harding's, 118  
Magazine Case of Drawing Instruments, 144  
" Hand Camera, 223  
Magneto-Electric Machines, 235  
Magnets, 236  
Magnifying Lenses, 228, 229, 230, 231  
Mahogany Set Squares, 131  
" Straight Edges, 119  
" T Squares, 130  
Major Bryan's Luminous Compass, 42  
" Wilkinson's Attachment Compass, 48  
Mapmeters, 156  
Marine Artificial Horizons, 55  
" Binoculars, 19  
" Chronometers, 92  
" Foghorns, 63  
" Lamps, 62  
" Sextants, 55  
" Telescopes, 29, 31  
Markhoor Telescope, 30  
Marking Hammer, Pioneer, 117  
Marquols Scales, Sandhurst pattern, 123  
" Woolwich pattern, 123  
Mason's Hygrometers, 196  
Mathematical Curves, Brook's, 135  
" Instruments, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156  
Maximum and Minimum Thermometers, 195  
Thermometers, 195  
Measuring Books, 159  
Mechanical Foghorns, 63  
Medical Galvanic Batteries, 235  
" Pocket Spectroscope, 206  
Megaphones, 63  
Mekometer Range Finder, 81  
Mercurial Horizon, 55  
Message Book, Signalling, 75  
Meteorological Instruments, Observer set of, 192  
Micrometer Gauges, 110  
" Micrometers for Eyepieces, 218  
" Stage, 218  
Microscope accessories, 218  
" Apochromatic Objectives, 220  
" Cabinets, 216  
" Cover Glasses, 219  
Microscope Dissection Instruments, 217  
" Eyepieces, 220  
" Immersion Objectives, 220  
" Lamps, 216  
" Objects, 219, 221  
" Slides, 219  
" Specimens, 219, 221  
Microscopes, 208, 209, 210, 211, 212, 213, 214, 215  
Military Barometers, 180  
" Clinometers, 69  
" Compasses, 39, 40, 41, 42, 44, 45, 46, 47, 48, 49, 80  
" Compasses, Prismatic, 39, 41  
" and Engineering Aneroid Barometer, 177  
" Field Glasses, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16  
" Flags, 75  
" Lamps, 74  
" Plane Tables, 77, 78, 79  
" Range Finders, 14, 81, 82, 83, 84, 85  
" Scales, 123  
" Signalling Message Books, 75  
" Sketch Boards, 76  
" Surveying Aneroid Barometers, 177  
" Telephones, 72, 73  
" Telescopes, 23, 24, 25, 26, 28, 29  
" Watches and Chronographs, 94, 95  
" Whistles, 90, 91  
Miners' Dials, 103  
Minimum Thermometers, 196  
Mining and Surveying Aneroid Barometers, 176  
Mirror Clinometer, 69  
Moist Water Colours in Boxes, 161  
Monsoon Rain Gauge, 186  
Morse Code Marine Signalling Lamp, 62  
" Code Military Signalling Lamp, 74  
Motor Speed Recorder, 97  
Mountain Aneroid Barometer, 177  
Mountaineers' Companion, 178  
Nankin Indian Ink, 164  
Napier Compass, 153  
" Divider, 153  
Nautical or Chart Parallel Rules, 127  
" Dividers, 150  
" Works, 64  
Naval Architecture, School of, Case of Drawing Instruments, 146  
" Barometers, 180  
" Binoculars, 19  
" Books, 64  
" Chart Parallel Rules, 127  
" Chronometers, 92  
" Dividers, 150  
" Foghorns, 63  
" Lamps, 62  
" Logs, 56, 57  
" Megaphones, 63  
" Mercurial Horizons, 55  
" Salinometers, 199  
" Sextants, 55  
" Signal Cards, 64  
" Telescopes, 31  
" Whistles, 91  
Navisphere, The, 61  
Needles, Dissecting, 217  
Negative Sensitised Paper, White Lines on Dark Blue Ground, 158  
Nemesis Finger Print and Forgery Detector, 232, 233  
New Universal Surface Gauge, 116  
Nose Piece, Angular, Double, 218  
" " triple, 218  
Nut Angles, Hexagon, 131  
Observatory Recording Barograph, 183  
Observer Chronograph Watch, 97  
" Set of Meteorological Instruments, 192  
Offset Rods, 122  
Offsets for Chain Scales, 123  
Oil Immersion Objectives, 220  
" Paint, Luminous, 50  
" Sketching Case, 162  
One Handed Nautical Divider, 150  
Onoto Self-Filling Fountain Pens, 168, 169  
Opera Glasses, 21, 22  
Opsometers, 156  
Optical Lantern Outfit, 237  
" Squares, 106  
Orthoptic Shooting Spectacle, 89  
Paceometers, 129  
Paint Boxes, 160, 161  
" Brushes, 163  
Paper Weights, Glass, 140  
Papers, Bluish Transparent  
" Parchment, 157  
" Continuous Cartoon Cartridge, 157  
" Continuous Cartridge, 157  
" Tracing, 157  
" Drawing, 157  
" Negative Sensitised, White Lines on Dark Blue Ground, 158  
" Positive Sensitised, Black Lines on White Ground, 158  
" Sectional, 157  
" Whatman's Handmade, 157  
" Solid Sketch Blocks, 157  
Parallel Rules, 127  
" Rolling, 126  
Pearwood Curves, 133  
Pebble Compass, 47  
Pedestal Rain Gauge, 189  
Piedmont Barometers, 182  
Pedometers, 129  
Pencils, Artists', 167  
" Chart, 167  
" Compass, 166  
" Designers', 166  
" Draughtsman's, 167  
" Sketching, 166  
Penning Batters or Splines, 133  
Pentagraphs, 137  
Perspective Instruments, 137  
Petrol Tester or Densimeter, 199  
Photographic Accessories, 227  
Photographic Printing Apparatus, 155  
Pickets, 122  
Pillar Compass, 153  
Pin Lifters, 140  
Pioneer Hammer, 117  
" Hatchet and Hammer, 117  
" Wood or Tree Borer, 116  
Plane Table Compasses, 80  
" Outfit, 79  
" Rules, 80  
" Tables, 77, 78, 79  
Planimeters, 137  
Plug Connection for Military Telephones, 72  
Plummets, 106  
Pluviograph, Rain Gauge, 188  
Pocket Anemometers, 190  
" Aneroid Barometer, 177  
" Cameras, 226  
" Clinometer, 69  
" Compass and Sun Dial, 49  
" Counters, Harding's, 118  
" Knives for Architects, 140  
" " Engineers, 140  
" " and Pin Lifters, 140  
" Levels, 108  
" Micrometer Gauges, 110  
" Microscope, 215  
" Rules, 124, 125  
" Sextant, 54  
" Sounders or Castanets, 75  
" Spectroscope, 206  
" Thermometers, 195, 196  
Pointer, Station, 136  
Pole Star Military Compass, 44  
Polar Light, for Cross Staves, 122  
" Ranging, 122  
Porcelain Dish for Dissecting, 219  
" Dishes for Developing, 227  
" Shades for Microscope Lamps, 216  
" Thermometers, 196  
Portable Current Meter, 199  
" Stands for Telescopes, 32  
" Telephones, 72, 73  
Pricker, 147  
Printing Frames, 158, 227



# CONTENTS OF CATALOGUE—continued.

- Prism, Mounted on Stand, 206  
Prismatic Binocular Field Glasses  
12, 14, 16, 17  
" Binocular Field Glass  
and Range Finder, 14  
" Binocular Telescope, 18  
" Compass, Leigh's, 41  
" Compasses, 39, 41, 66,  
67, 68  
" Telescopes, 24  
Proportional Compass, 153  
Protractors, Boxwood, 123  
" Circular, 123  
" Ivory, 123  
" Semi-circular, 136  
Public Schools, Cases of Drawing  
Instruments for, 146  
" School Drawing Board,  
140  
Rabone's Steel Wind-up Measuring  
Tapes, 120  
Railway Curves, 133  
Rain Gauges, 186, 187, 188, 189  
" " Recording, 186,  
187, 188  
Range Finders, 14, 51, 82, 83, 84,  
85  
Ranging Poles, 122  
Reading Glasses, 228  
Red Line Protractors, 123  
Referee Prismatic Binocular Field  
Glass, 16  
Regulation Army Signalling  
Flags, 75  
Reichert Apochromatic Objec-  
tives and Compensating Eye-  
pieces, 220  
Reliance Dark Room Lamp, 227  
Reversible Levels, 99  
Rifle Range Telephones, 73  
" Sight Colour Box, 160  
Ring Cells, Ebony, 219  
" " Glass, 219  
" " Tin, 219  
Road or Double Pen, 147  
" Perambulator or Viameter,  
107  
" Tracers, 106  
Robinson's Anemometer, 191  
" " with wind vane,  
191  
Rocket Naval Telescope, 31  
Rods, Offset, 122  
Rolling Parallel Rules, 126  
Roof Pitches, 131  
Rotameters, 156  
Rotating Compass, 155  
Routledge's Engineers' Slide  
Rule, 124  
Royal India Engineering College  
(Cooper's Hill) Case of  
Drawing Instruments, 156  
" Military Academy Case of  
Drawing Instruments, 146  
" School of Naval Architec-  
ture Case of Drawing  
Instruments, 146  
Rule Depth Gauge, Browne and  
Sharpe's, 111  
" for Sketch Board, 76  
Rules Calculating, 128  
" Calliper, 112  
" Clinometer, 69  
" Parallel, 127  
" Pocket, 124, 125  
" Sighted for Plane Tables,  
80  
Sable Hair Brushes for Painting  
in Water Colours, 163  
Sacharometers, 199  
Sagar's Vellum Tracing Cloth,  
158  
Salinometers, 199  
Salt Hydrometers, 199  
Sanderson Tropical Hand Camera,  
222  
Sandhurst College Case of Draw-  
ing Instruments, 146  
" " Pattern Marquois  
Scales, 123  
" Sketching Case, 76  
Scales, Boxwood, 123  
" Ivory, 123  
" Sandhurst Marquois, 123  
" Woolwich Marquois, 123  
School of Naval Architecture  
Case of Drawing Instruments,  
146  
Scissors, Curved, 217  
" Straight, 217  
Scoring Book, 88  
Scout's Companion, 8  
Screw Cutting Gauge, 113  
Sea Dog Binocular, 19  
Searchlight Prismatic Telescope, 24  
Section Lifters, 217  
Sectional Books, 159  
" Paper, 157  
Sectograph, 132  
Sector, Ivory, 123  
Seed Microscope, 231  
Self Filling Fountain Pens, 168,  
169  
" Recording Barometer, 183,  
184  
" " Rain Gauges, 187  
" Thermometers, 185  
Semaphore Flags, 75  
" Pocket Chart, 75  
" Watch, 95  
Semi-circular Protractors, 136  
" Circumferencers, 105  
Sensitised Linen, Black Lines on  
White Ground, 158  
" Paper, Negative, White  
Lines on Dark Blue  
Ground, 158  
" Paper, Positive, Black  
Lines on White  
Ground, 158  
Serpentine Rain Gauge, 187  
Service Pattern Binocular Field  
Glass, 10  
" " Mirror Clin-  
ometer, 69  
" " Paint Box, 160  
" " Prismatic Com-  
pass Mark V, 39  
" " Protractors, 123  
" " Range Finder, 81  
" " Set of Coloured  
Crayons, 160  
Set Squares, 131  
Sextants, Marine, 55  
" Pocket, 54  
Shadbolt's Spring Turn-table, 218  
Shades for Microscope Lamp, 216  
Ship Curves, 133  
" Log Connector, 56  
Ship's Hold Thermometer, 196  
" Lampe, 62  
" Log, 56, 57  
" Magnets, 236  
Shooting Spectacles, Iris Orthop-  
tic, 89  
Sight Elevator and Wind Gauge,  
87  
Sighted Rules for Plane Tables, 80  
Signal Cards, 64  
Signalling Lamps, Marine, 62  
" " Military, 74  
" " Message Book, 75  
Sign Post Military Telescope, 23  
Silver Compasses, 47  
Simplex Range Finder, 85  
Six's Maximum and Minimum  
Thermometers, 195  
Sketch Board, Light Horse Mili-  
tary, 76  
Sketching Cases, 162  
" Pencils, 166  
" Protractors, Military,  
123  
" Umbrella, 76  
Slant Tile, 165  
" Well Tile, 165  
Slates, Luminous, 50  
Slide Calliper Rules, 112  
Slides, Microscope, 219  
Slopes and Batteries, 131  
Snapshot Pocket Binocular, 20  
Solar Radiation Thermometers,  
194  
Sopwith's Levelling Staves, 122  
Souchier's Telemeter, or Pocket  
Range Finder, 84  
Sounding Boards, 75  
" Machine, 59  
" Sextant, 55  
Spacing Rolling Parallel Rule,  
Elphinstone-Keith's, 126  
Spanton's Scio-graphic Set Square,  
132  
Spectroscopes, 206, 207  
Spiritharoscope, 234  
Spirit Levels, 108  
Splines, 133  
Split Seconds Chronograph, 96  
Spot Lens, 218  
Spring Bows, 155  
Spring Measures, Linen Tape, 121  
" " for Measuring  
Diameters and  
Circumferences,  
121  
Spring Steel Tape, 121  
Stage Forceps, 217  
" Micrometer, 218  
Stand Condenser, 218  
Standard Aneroid Barometer, 174  
" Mercurial Barometer,  
182  
" Thermometers, 195  
Stands for Telescopes, 32  
Starlight Compass, 45  
Starrett's Combination Set, 115  
" Universal Bevel Pro-  
tractor, 114  
Station Pointer, 136  
Staves, Sopwith's Levelling, 122  
Steel Band Measuring Chains,  
120  
" Calliper Gauges, 110  
" Rules, 112  
" Depth Gauge for Engin-  
eers, 111  
" Rules, Chesterman's, 125  
" T Squares, 130  
Stencil Plates for Architects, 138  
" " Engineers, 139  
Stephenson's Screen for Ther-  
mometers, 194  
Stereoscopic Camera, Cherub  
Pocket, 192  
Straight Edges, Mahogany, 119  
Steel, 119  
Students' Astronomical and Ter-  
restrial Telescope, 35  
" Chemical Spectroscope,  
207  
" Microscope, 208  
Sun Dials, 49, 200, 201, 202, 203,  
204  
" Shine Recorders, 205  
Surface Gauge, 115  
Surveying and Astronomical In-  
struments, Books  
on, 67  
" and Mining Aneroid  
Barometers, 176,  
177  
" Range Finder, Wel-  
don's, 82  
Surveyor's Books, 159  
" Levels, 98, 99, 100,  
101  
" Rods, 122  
Syke's Standard Hydrometer, 991  
T Squares, 130  
Tapes, Steel, for Measuring Dia-  
meters and Circumferences, 121  
Target Telescopes, 26, 28  
Telemeters (Range Finders), 81  
82, 83, 84, 85  
Telephones, Portable, 72, 73  
Telescopes, 8, 23, 24, 26, 28, 29,  
30, 31, 33  
" Terrestrial and Astronomical  
Telescopes, 33, 34,  
35, 36, 37, 38  
" Radiation Ther-  
mometers, 194  
Theodolites, Transit, 104  
" " Y" 104  
Thermograph, 185  
Thermometers, 194, 195, 196,  
197, 198  
" Clinical, 198  
" Screens for, 194  
" for Tea Planters,  
197  
Thickness Gauge, Steel, 111  
Tie Watch Pocket Camera, 226  
Tin Ring Cells, 219  
Toning Chemicals, 227  
Topographers' Plane Table, 78  
Tracer, 147  
Tracing Papers, 157  
Transparent Parchment, 157  
" Protractors, 136  
" Set Squares, 131  
Travellers' Thermometers, 195  
Tree Borer, 116  
" " and Height Measurer,  
118  
" Hammer, 117  
Triangular Divider, 150  
" Scales, 125  
Tripod Magnifier, 231  
" Stands for Cameras, 227  
" " Compasses, 67  
" " Signalling Lamps,  
74  
" Telescopes, 32  
Trocheometers, 107  
Trojan Pendant Military Aneroid  
Barometer, 161  
Tropical Rain Gauges, 189  
Tropical Sanderson Hand Camera,  
222  
" Umbrella for Sketching,  
76  
Trough, Botterill's, 219  
Compasses, 80  
Tubes, Glass, for Thomson's  
Sounding Machine, 59  
Turntables, Shadbolt's, 218  
" Wedge, 218  
Twaddles' Hydrometer, 199  
Twist-Drill Gauge, Wykes', 113  
Umbrella for Sketching and Field  
Work, 76  
Universal Bevel, 114  
" Bevel Protractor, 114  
" Bioscope, 237  
" Scales, 123  
" Sun Dials, 202  
" Sunshine Recorder,  
205  
" Tripod Stand for Tele-  
scopes, 32  
Valantin's Section Knife, 217  
Ventometers, Jeffery's, 88  
Viameter or Road Perambulator,  
107  
Vulcanite Set Squares, 131  
Walker's Current Meter, 109  
" Harpoon Sounding Ma-  
chine, 59  
" Ship Logs, 56, 57  
Watch Form Compass, 47  
" Pocket Camera, 226  
Watchmakers' Lens, 234  
Watches, 93, 94, 95, 96, 97  
Water Colour Boxes, 164  
" Brushes, 163  
" Colours, Hexagon Cakes of  
164  
" Level, 102  
Waterproof Drawing Inks, 164  
Weldon Range Finder, 82  
Well Tile, 165  
Whatman's Drawing Paper,  
157  
Whatman's Solid Sketch Blocks,  
137  
Wheel Pen, 147  
Whistles, 90, 91  
White Ensign Naval Pendant  
Barometer, 180  
Whitworth's Screw Pitch Gauge,  
112  
Wilkinson's Attachment Com-  
passes, 48  
Wilson Electric Self-Recording  
Rain Gauge, 188  
Wind Gauge, Backsight, 88  
Wind-up Measures, Chesterman's,  
120  
" Measuring Tapes, Ra-  
bone's, 120  
Wind Vanes, 191  
Winsor & Newton's Brushes for  
Painting in  
Water Col-  
ours, 168  
" Colour Boxes,  
160, 161  
" Hexagon  
cake, Water  
Colours, 164  
" Indian Ink,  
164  
" Waterproof  
Drawing  
Inks, 164  
Wood or Tree Borer, 116  
Woolaston's Hypsometric Ap-  
paratus, 179  
Woolwich Pattern Marquois  
Scales, 123  
Wristlet Compass, 49  
Wristlets for Watches, 94  
Wyke's Universal Screw Cutting  
and Twist Drill Gauge, 113  
Wynne's Infatigable Exposure  
Meter, 237  
" Levels, 100,  
" Theodolites, 104  
Yacht Compasses, 61  
" Logs, 57, 58  
Zeiss Objectives and Compensating  
Eyepieces, 220  
Zinc Baths for Washing Prints,  
158



















