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To all to whom it may concern be it known that I Thomas Bolton of Calcutta holding the appointment of Mathematical Instrument maker to the Government of India am in possession of an invention for "Range Finding" and I the said Thomas Bolton do hereby declare the nature of the said Invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement thereof that is to say:-

General description

It is designed for the purpose of "Range Finding" by means of a system requiring a small telescope carrying two fine parallel wires inserted in the focus of the eye piece and used in combination with a scale attached to a staff also a prismatic shaped brass box in which are four silvered glass reflectors two in the upper part of the box set at an angle of 45 degrees furnishing a right angle by reflection and two in the lower part reflecting an angle of $88^{\circ} - 34' - 4''$ which forms one of the elements in a right angled triangle having the perpendicular and base in the proportion of one to forty.

Construction and appliance

The construction of the several parts constituting the apparatus will be understood by having reference to the annexed drawings.

A.A. (figure 1) is small telescope in the focus of the eye piece of which two fine parallel wires are inserted.

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C.C. (figure 2) is a prismatic shaped brass box furnished with four glass reflectors DD in the upper portion and inclined to each other at an angle of 45 degrees which serve to lay off a right angle by observing that the reflected image of an object coincides with another seen by direct vision and through the aperture below while those marked E.E. in the lower part of the box form an angle at the eye of $33^{\circ} - 34' - 4''$ included between two objects the one seen to coincide by reflection with the direct vision of the other as viewed through the same aperture which in this case lies above the reflectors and gives an element in a right angled triangle as stated before. It is also furnished with a small telescope F for observing very distant objects which may not be distinctly visible to the naked eye and is so arranged as not to interfere with the working of the instrument when not in use.

The complete apparatus consists of the following parts:-

- (1st) Telescope with two vertical sustainer wires.
- (2nd) Brass box with auxiliary telescope.
- (3rd) Four small telescope staves marked

A.B.C.D (figure 3)

- (4th) A painted scale attached to the staff A the numerals on which indicate distances comprising a range from 200 to 5000 yards.

The "modus operandi" in obtaining a range with the above apparatus is of the simplest nature

and

and is conducted without the aid of an assistant. However if one is available the operation may be facilitated with reference to placing of staff B and is as follows:-

Setting off the right angle

The observer places staff A perpendicular by the plummet attached at A' (vide diagram) from which the distance to "O" is required and a A' presents the open face of the brass box containing the reflectors towards the distant object "O". Holding the instrument at a slight angle he looks into the upper reflector D. (figure 2) in which the image of the distant object O. will be seen by reflection in the direction A' B. at right angles to A' O. noting at the same time any object or mark upon the ground seen by direct vision through the aperture below which coincides with the reflected image of O. The staff B should be set up perpendicular by the plummet attached some 10 or 20 yards distant from A in the observed line A' B. on returning to station A should the staff B not have been placed in the exact position where it will be seen by direct vision coinciding with the reflected image of O. at station A the staff A should be moved a little to the right or left till they coincide and form the right angle.

Placing the staff B.

Erecting the scale attached to staff A.

Before leaving the position A' the graduated arm attached to the staff A should be fixed up, care being taken that it is supported by the staff D in a horizontal position and points to the distant object O.

The observer then retires from station A' in the same straight line with A. B. as seen through a

aperture

Setting out the
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is to A. Q. as 1 is
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aperture and holding the instrument as before finds a position where the staffs A and B are seen by direct vision coinciding with the reflection of O. as seen in the lower reflector & there the staff C is set up.

Finding the
range.

The telescope carrying the sub-tense wires is next placed on staff C. the head of which is arranged as to insure sufficient stability for the purpose and turned to the graduated arm attached to staff A till the central one of the two wires in the field of the telescope intersects the end or zero of the scale which is coincident with the center of staff A the sub-tense on the scale between the wires is then noted and the corresponding numbers pointed on the scale (figure 3) denote at once the range of O. or the distance A. O. in yards or the distance A. O. may be placed the being multiplied by 40 gives the range.

N.B. For long ranges or in hazy weather the process is the same except that instead of looking at the staves directly the brass box with the mirrors is reversed and the distant object seen by direct vision is made to coincide with the reflected image of the staves &c &c respectively or by using the small auxiliary telescope attached.

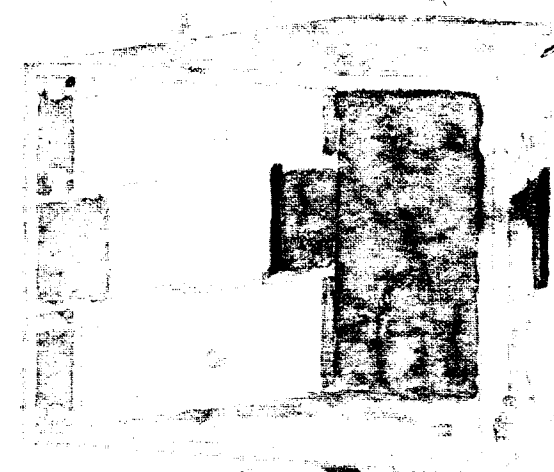
I claim no privilege for the separate principles involved in the construction of the instrument &c containing the four reflectors viz that of laying off a right angle and that of reflecting the elemental angle of $38^{\circ} 34' 4''$ but claim the combination of the two as arranged in a small instrument and its application to finding the distance or "range" by the construction of a right angled triangle having its sides about the right angle as one to forty as herein described.

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I claim no privilege for the two parallel substance
wires inserted in the focus of the eye piece in a telescope &
to claim the application of the same as a means of
finding the range in connection with the scale &
attached to staff A which gives a standard &
proportionate measure for the several distances.

I also claim the privilege of the system of "Range
Finding" as described herein by means of laying off a
right angle "O" A. B. at the position A and guided
by the line A. B. to form the right angle triangle O. C. A.
whose sides A. C. A. O. are in the proportion of one to
ten twenty or to forty as the case may require the
line A. B. being coincident with the reflection of the
object O.

Thomas Patton

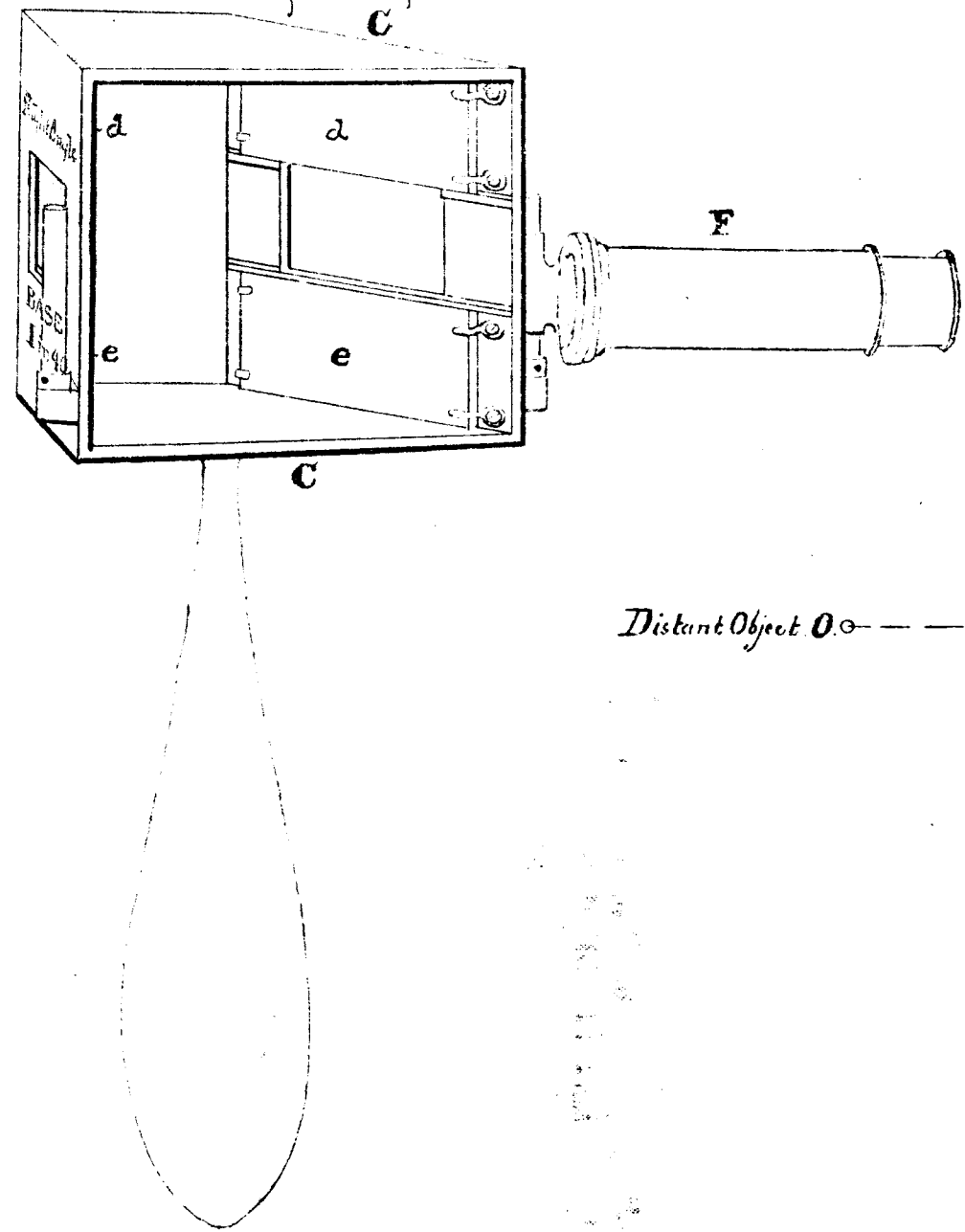


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Figure 2.

Prismatic Box and four Reflectors.



Instruments used in T Bolton's System of Range Finding.

Figure 3.

STAFFS.

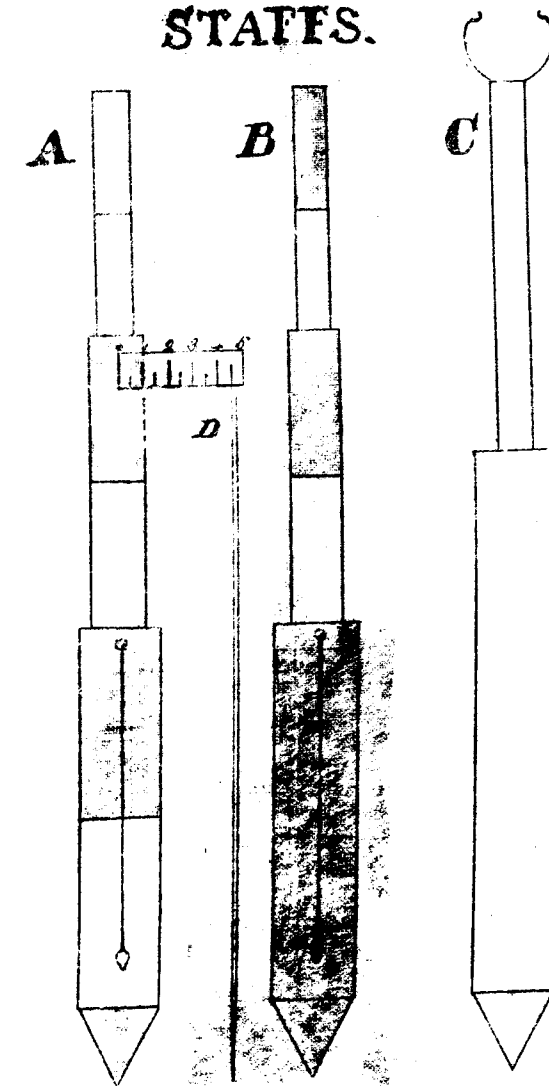


Figure I.
Telescope.

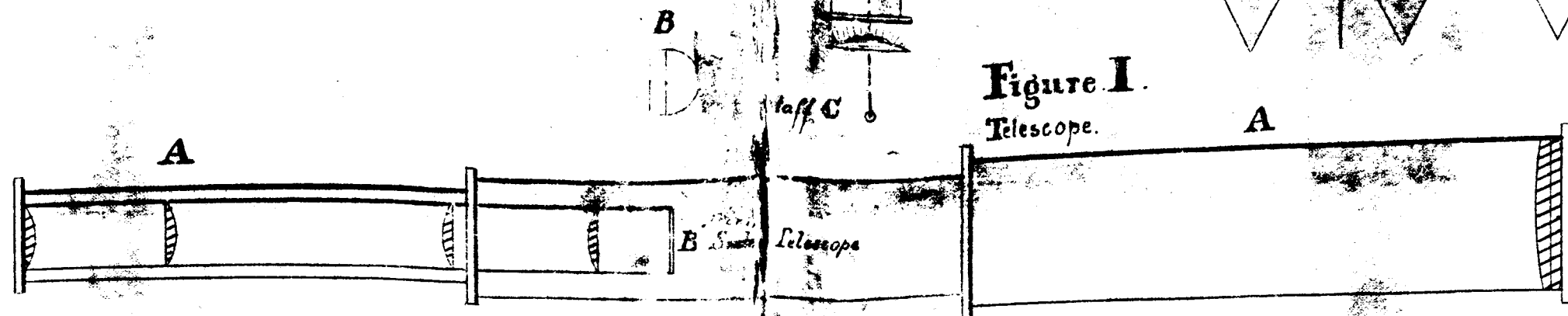


Figure 4.

Distant Object O.

Drawn by S.M. Ward.

$$\frac{1699}{7} \quad A$$

$$B. \quad \frac{1699}{\cancel{57}8}$$

Sanitary Journal, N. D. 1881.

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H. M. Lee Colonel

Secretary to the Govt. of India.

In Charge of the Department

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G. W. Lee Colonel

Secretary to the Govt. of India.
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 (PATENTS),
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