

# The Birth of ATM in the USA

(as told by a Brit!)



Keith Venables FRAS

## Timeline

16-17<sup>th</sup>C Galileo et al  
17-18<sup>th</sup>C Newton  
18-19<sup>th</sup>C The Herschel's  
19<sup>th</sup>C Lord Rosse

# The origins of ATM



Galileo



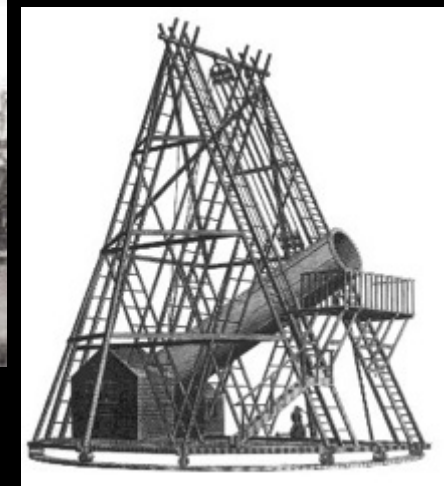
Newton



Herschel



Rosse



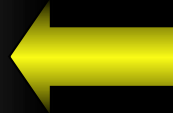
Herschel



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Late 19<sup>th</sup>C (Commercial)  
Clark, Cooke  
Brashear, Browning, Calver



# Commercially available late 19<sup>th</sup>C telescopes



Clark



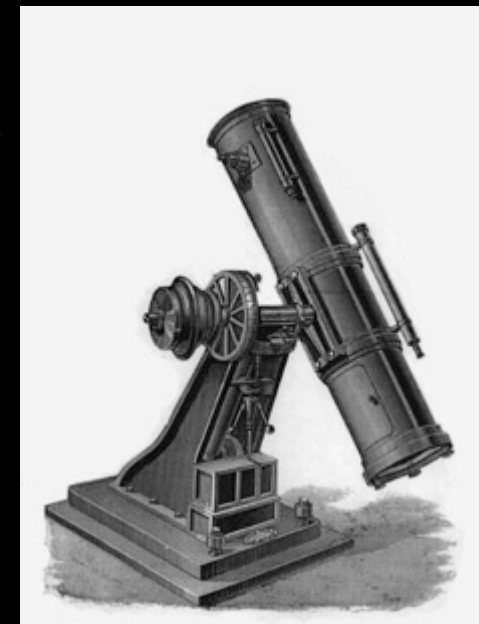
Cooke



Brashear



Browning

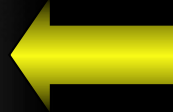


Calver

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# circa 1860 Silver on Glass invented

Earlier, mirrors were  
“Speculums” made from a  
polished Bronze & Arsenic  
alloy

Fragile, Soft, Dull, Heavy



Invented: Steinheil & Foucault

Silvering: Easy to do and  
easy to replace, cheap, but  
tarnishes

Glass mirror: easier to work

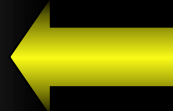
DIY instructions quickly  
published

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1865 'The English Mechanic  
& World of Science'



# The 'English Mechanic & World of Science'



Weekly

Half articles / half  
reader contributions

20% about astronomy

Of which half was ATM  
from 1900 - 1920!

Large number of US  
contributors

disc inside focus which the eyepiece test reveals, even when the shadow-test fails to show any defect, is the despair of nearly all who have tried to work a mirror. Even Mr. Wassell could not get rid of it, Mr. Calver can get rid of it, and so can I. I hope to give Mr. Walters and Mr. Davies an opportunity of examining results by and by, as offered above.

I am glad to see from Mr. Lowe's concluding words that Mr. Wassell discovered the merits of *big facets* in his later experience. I found it out for myself some time since, and recommended it in letter 79 ("E.M.," Feb. 24 last). I have also found a *slight groove* across the middle of each facet a great help in forming the curve, as it facilitates the expulsion of air. These grooves can be allowed to fill up naturally later on.

Mr. Ainslie's letter in the present number on shadow-testing is most excellent, and should make the process clear to the veriest tyro.

Wm. F. A. Ellison.

Monart Rectory, Enniscorthy, March 24.

[255.]—I AM much indebted to Mr. Davis (155) for his index to Mr. Wassell's letters on speculum grinding, as I have just purchased the back numbers of "Ours" with the intention of making a telescope. I have previously made several specula up to 9in. by hand, and have always used a glass tool, with which I can find no fault.

I am certainly inclined to agree with Mr. Ellison's method, as once you begin polishing I cannot see what effect the tool can have in the matter (provided it is made of some stable material), as the pitch is the most important part when polishing begins.

When using a Wassell machine, I presume it is necessary to rough-out by hand, and only do the fine-grinding on the machine; but I should like information on this point. Southern Cross.

[256.]—MR. ELLISON seems to be of opinion that the use of carborundum is the cause of the power which he claims to possess of making the figure of his mirror what he pleases. If he had formed this opinion after an equal experience with emery, one might be inclined to agree with him. But he has not used emery. I think, therefore, I am justified in holding the opinion that neither the one nor the other has any influence whatever on the ultimate figure of the mirror. If Mr. Ellison has succeeded in producing a perfectly regular paraboloid by hand work alone, it has been by sheer skill in the use of both grinder and polish.

March 1905



## Timeline

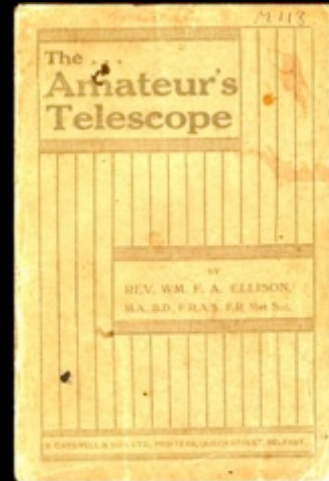
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1920 'The Amateur's Telescope'  
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## 1920 'The Amateur's Telescope' by Revd W F A Ellison



A reprinting of his 1918  
*English Mechanic*  
series of articles as a  
112 page book

Ellison was one of the  
more prolific  
contributors to the  
*English Mechanic* (circa  
500 entries)

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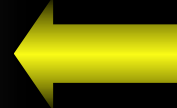
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WORKING DETAILS.

So far we have been trying to bring the figure of our mirror from sphere to parabola, or from oblate spheroid to parabola, via sphere. Now this is the way that the figure of a mirror, if left to itself during polishing, will travel nine times out of ten. We therefore call it working "downhill". But, supposing we have, to begin with, a more or less hyperbolic figure, or that we have, in bringing the figure downhill by any of the above methods, overdone the work, so very often happens, and obtained a hyperboloid, we will have to find means to make the curve retruce its steps. As this is considerably more difficult of need to be regarded impossible, hence the term "fired hyperboloid", we may call it "working uphill".

To begin with, we may lay down the principle that a hard polisher pulls the figure uphill, whereas a soft one lets it downhill. But we may as well say here of curves that although various types of pitch polishers are calculated to produce certain definite effects, the pitch tool is most delightfully inconsequential in its behaviour, and one never knows for certain what any given tool will do till it is tried. It is an *artemista* of unstable as any woman, and a speculum-maker may fancy that after some years of experience he has fashioned all that pitch can do when it will suddenly surprise him by some totally fresh whim.

However, the best thing to try, for a hyperboloid as well as for a turned edge, is a hard tool and short strokes, and three times out of four this will be successful. If, however, it is not, we must try graduating the facets in the opposite way to that shown in Fig. 13, cutting down the central ones and leaving

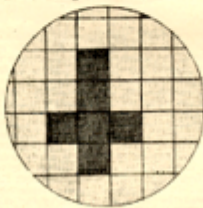


FIG. 13.—Tool for reducing a hyperbolic figure, the marginal ones full size. In extreme cases of a very deep or oblique hyperbola the whole centre of the tool may be removed bodily, leaving only a ring of pitch. This will probably result in an irregular oblate spheroid, whereas we make a fresh tool, and proceed to work downhill again.

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near the edge, and thus will obtain the desired result of a deepened curve near the centre, without increasing the stroke or imperiling the curve of the edge. The alteration will be made as shown in the figure (Fig. 13).



FIG. 12.—Tool graduated for parabolising. By an error of the draughtsman who copied the rough sketch, the lines are shown crossing at the centre. As before explained, the centre of tool should be oriented constantly with respect to the facets. If these are disposed asymmetrically about the centre, there is danger of rings forming on the mirror.

This is, perhaps, the easiest method of graduation. It might also be done by leaving the middle facet as it is, rounding off the corners of the three nearest to it, and cutting those next in order down to circles, and yet smaller circles. This will often produce the desired effect, but not always. It is well to use a broad chisel and light wooden mallet for trimming facets, and keep a large, soft brush handy for sweeping the tool free of chips. This should be kept in a dust-proof receptacle.

The above two methods of parabolising are standard methods of all the old masters of the mirror-rectifying art. Those that follow are the result of experiments of the present writer.

(2.) THE SMALL FOREBORN SYSTEM.

It has always been laid down as axiomatic that mirror and tool must be the same diameter; but, like many axioms of the old workers, this principle has no other foundation than their fear of attempting new methods. It is quite easy to both grind and polish on tools considerably smaller than the mirror. And what we have called the "Small Forebore System" is almost useful as a remedy for the great enemy, "turned edge." A polisher a little less in diameter than the mirror, of hard pitch, used with short, straight strokes, will often remove a turned

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And we must not forget the door in the tube, to give access to the cover of the mirror. In a built-up tube it is somewhat more convenient if we dispense with hinges and make the door simply to slip under a catch at the bottom and fasten with a turn-button at the top. In case of a telescope mounted as a fixture out of doors, to prevent entrance of rain, the bottom should be at the bottom and the top of the door made to dip under a projecting strip of the covering material, soldered on if zinc, or cemented if of rubberoid. This throws off the water, which runs down the outside.

CHAPTER XV.  
 THE FLAT COIL AND SUSPENSION.

The flat mount I now describe differs in some particulars from that made by Browning, and later by Calver. The first

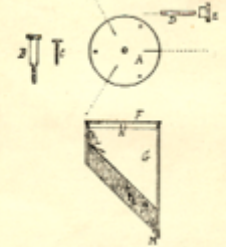
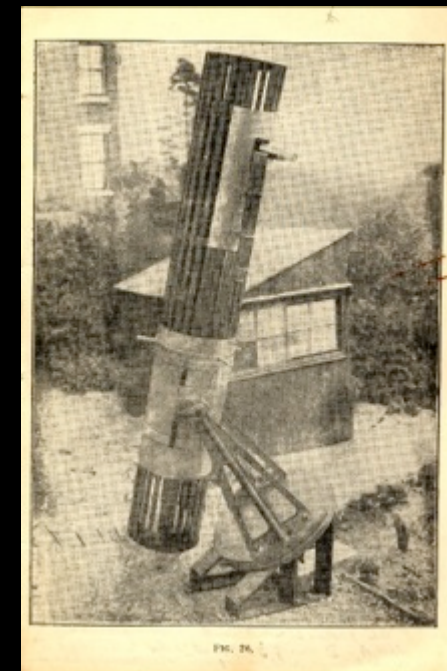


FIG. 21.—Details of Flat Coil and Suspension.—A, brass disc suspended in tube by clockspring supports (shown by dotted lines). B, large shouldered milled-head screw which passes freely through central hole, just screwed in disc A, till stopped by shoulder. C, one of three small milled-head screws tapped into hole passing through outside of main telescope tube, milled not in same. D, smaller disc, equal in size to A, converted into a milled-ed screw-cap screwing into brass tube G. H, hole in F tapped to take the screw B. K, glass plate. L, light brass spring and screw-clip. M, small piece of brass soldered in tube G at end toward glass in place.

*It has diff. out here*

*the holes should be made concentric to disc A. D on G is a screw cap which is attached to clock-spring, and fitting into hole passing through*





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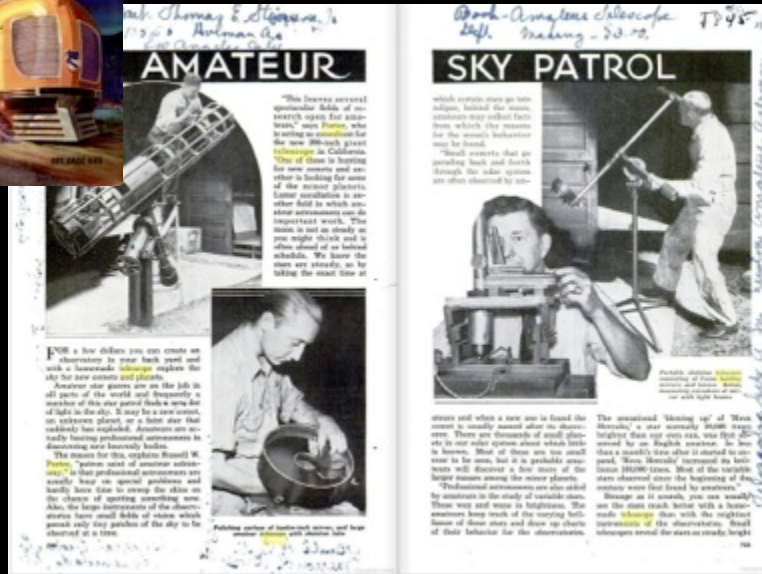
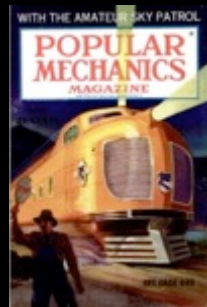
1920 'The Amateur's Telescope'  
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'Popular Mechanics'  
 'Popular Science'



# 'Popular Mechanics'

1902 -



## Key articles -

1907 brief instructions for building a telescope by **John Mellish**.

1936 Porter features in an article about ATM and his work on the Hale 200"

# 'Popular Science'

1872 -

## Key article -

In 1923 Porter features in an article about the Springfield telescope makers.





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# 'Popular Astronomy'

1893 - 1951



### Key articles -

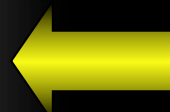
1910 short article about a telescope made by Leo Holcomb of Decatur, Illinois. "inspires Porter"

1916 Porter writes an article about his 16" Polar Reflector

1921 Porter writes the 'Poor Man's telescope'

1923 Porter writes about the Springfield telescope Makers

Albert Ingalls has just started as editor at Scientific American and "sees the 1921 and 1923 articles"



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'Popular Science'

'Popular Astronomy'

Society for Practical Astronomy

# The Society for Practical Astronomy

1909-1918



1915

1911 Frederick Leonard (aged 15!), placed an advert in *Popular Astronomy* for his new *Society for Practical Astronomy*, (SfPA)

The editor (Wilson) tried to cripple it. **"American amateur astronomers were encouraged to work on research on behalf of professionals"**. The AAS (formed 1899) was unsuccessfully trying to remodel itself, and Leonard was getting in the way!

Leonard wrote frequently to the *English Mechanic* and many other magazines. With Russell Porter he organised annual "International Conventions"

Leonard was blocked from joining the AAS for many years as being "unsuitable". He later became a professor at UCLA.

The Society wound up in 1918, but only after re-shaping the future of the AAS, AAVSO & AMS

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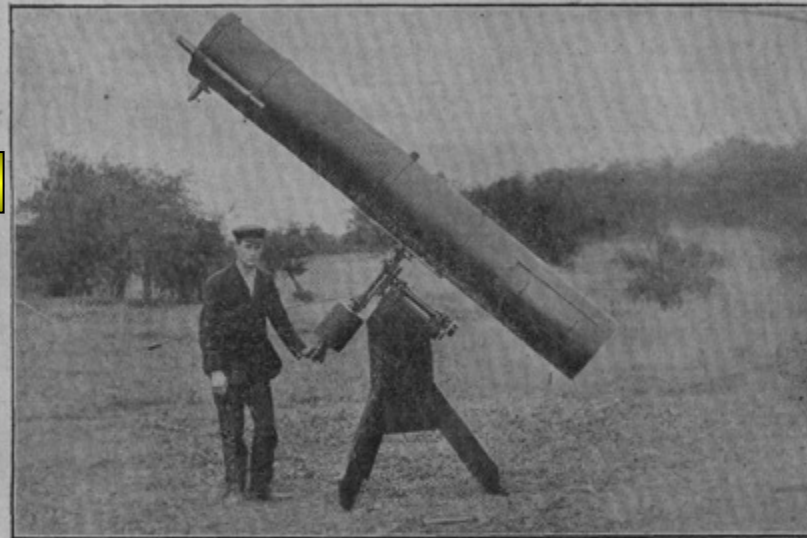
John Mellish, Secretary of SfPA at beginning  
Corresponded frequently & in detail with the  
*English Mechanic*

By 1911 had made 7½, 8½, 10, 12 & 16"  
reflectors & discovered a comet.

Went on to manufacture & sell telescopes



MY SIXTEEN-INCH REFLECTOR.  
[729.]—Enclosed is a photo of a 16in. reflector  
of 126in. focus. The stand is not used, but was  
just used to test the mounting on. The tele-  
scope is now mounted on a concrete pillar. The  
telescope, with the counterweights, axles, and



plates on which the polar axle is fastened,  
weigh nearly 400lb. The axles are 2in. steel.  
The tube can be rotated in cradle. There is a  
fine rack-and-pinion focusing-tube. The finder  
has a 2in. achromatic objective. The R.A. and  
Dec. circles are brass, and read to 15 minutes  
of arc. There are two slow motions. I am  
standing beside it, to show its size.  
My next letter will be about making the plane  
diagonal for reflectors. John E. Mellish.  
Cottage-grove, Wisconsin, U.S.A.

Letter to the *English Mechanic*,  
January 1912





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Society for Practical Astronomy

1920 R W Porter  
& the Springfield TM's



Porter returned to his home town of  
Springfield, Vermont & with James  
Hartness leads an evening class in mirror  
making to 15 men and 1 woman.

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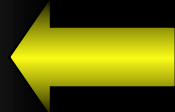
1920 R W Porter  
 & the Springfield TM's

1925-26 Scientific American  
 publishes first ATM articles  
 by Porter & Ingalls

# 'Scientific American' 1845 -



Ingalls, Nov 1925



Porter refers the reader to  
 Ellison's book for mirror  
 making



Porter, Feb 1926



Porter, Mar 1926

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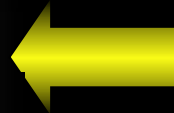
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1926 1<sup>st</sup> Stellafane Convention





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1926 "ATM" first published  
by SciAm, edited by Ingalls  
(last edition 1980) ←

1928 'The Back Yard Astronomer'  
section in *SciAm* appears

### Volume 1

•1926, *Amateur Telescope Making*, 1st ed.,  
Scientific American Publishing Co. 102 pp.

Subsequent editions 1928, 285pp.  
1933, 500pp  
1935, 4th ed., Munn & Co.  
1980, 24th printing. 510p.

Includes a reprint of the mirror making  
chapters of Revd W F A Ellison's book.

### Volume 2

•1937, *Amateur Telescope Making Advanced, a sequel to Amateur  
telescope making. Book Two*, 1st ed., Munn & Co. 650 pp.

Subsequent editions 1944, 1946, 1978,

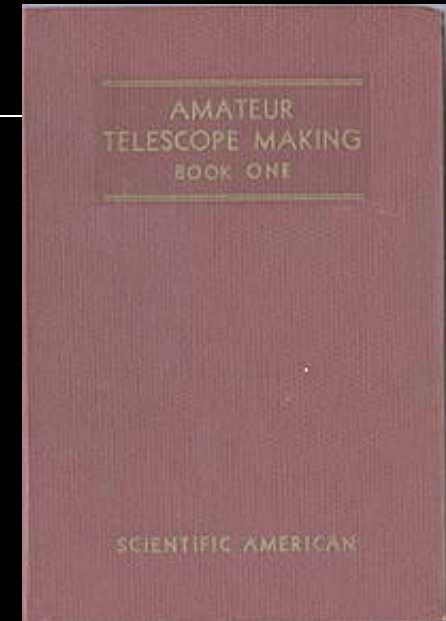
### Volume 3

•1953, *Amateur Telescope Making, Book Three: contributions to  
amateur precision optics by advanced amateurs and professionals*. 1st  
ed., Scientific American Publishing Company. 644p.

Subsequent editions 1956, 1961, 1979,

### Re-published by Willmann-Bell

The ATM books were republished, in a "re-organized" form, in 1996



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1926 "ATM" first published  
by SciAm, edited by Ingalls  
(last edition 1980)

30<sup>th</sup> May. 1932.

Dear Mr Ingalls

I send you herewith a copy of the new  
edition of "The Amateur's Telescope".

The general set up, price, & most of the  
matter, are the same as before. There  
are one or two extra illustrations, one  
you will recognise as your own <sup>highly</sup> suggestion  
to insert to assist in an expla-

acid is used, & consequently there is no  
explosive present in the residues, which  
can be kept with perfect safety, & when  
a sufficient quantity has accumulated  
be traded for a fresh quantity of silver nitrate.  
The only point in my process where cau-  
tion is indicated, is not to keep the solu-  
tion of ammonia-silver-nitrate.

With kind regards from self  
& Mrs Ellison.

Very sincerely yours  
W. F. A. Ellison

# THE ATM BIRTH CERTIFICATE

Date **1920 – *still alive and well aged 90!***

Place **Springfield, Vermont**

Parents **Russell W Porter, (1871-1949)**

Great astronomer, as a professional & an amateur  
Tireless Champion of ATM, dedicated and active

**Revd William F A Ellison (1864-1936)**

Expert mirror maker  
Prolific writer

Grandparents **The English Mechanic (1865-1926)** **And their**  
**Popular Mechanic (1902 -), Science (1872 -) &** **many**  
**Astronomy (1893 – 1951) Magazines** **contributors**

**Frederick Leonard (1896 – 1960) & the SfPA (1909 – 1918)**

**John Mellish (1886 – 1970)**

God Parents **Albert Graham Ingalls (1888 – 1958)**

**Scientific American (1845 -)**



**Date: December 2009**

**Place: A party in East London**

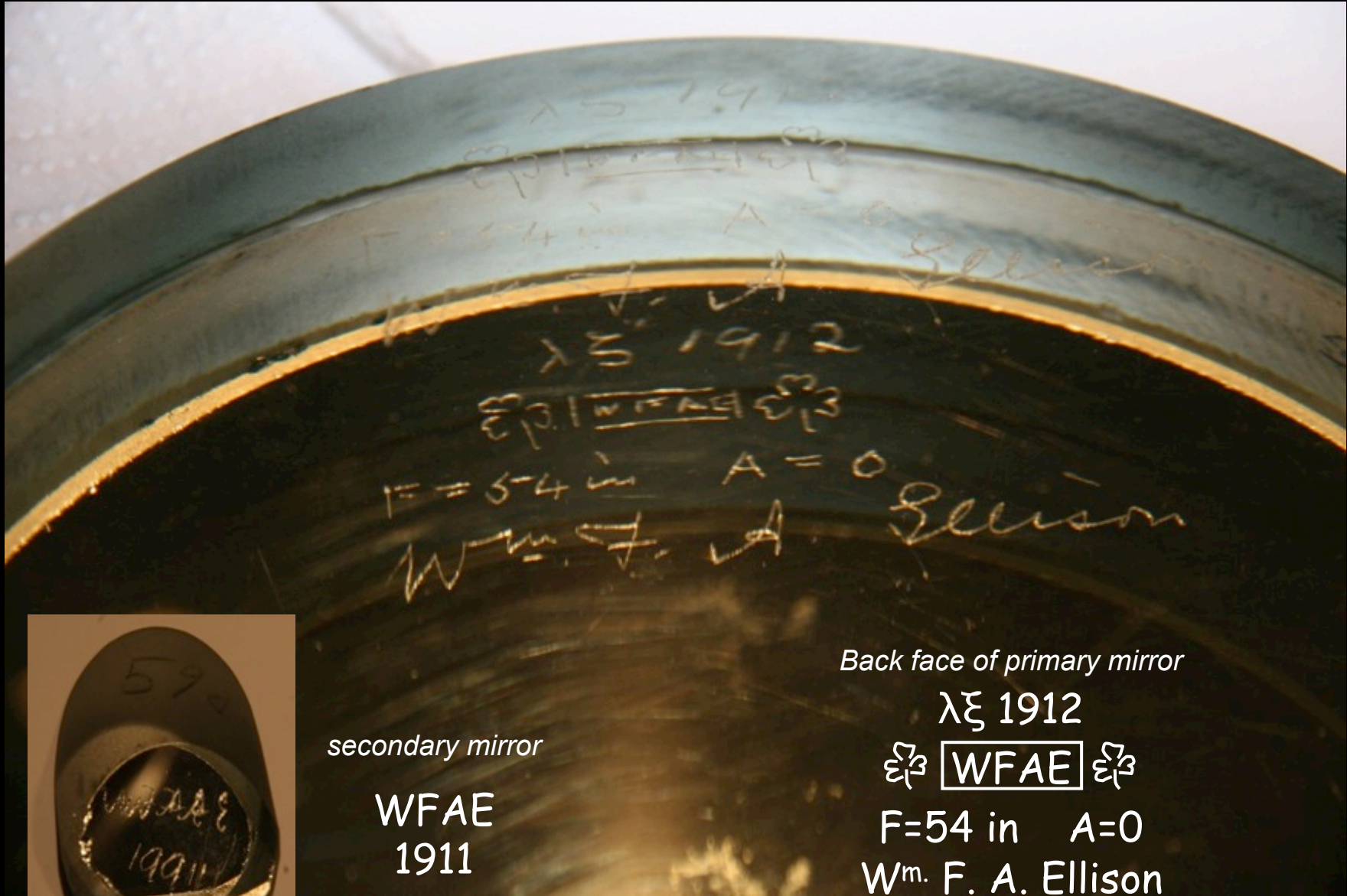
**Someone says:**

**“Would you like to have a look at an old telescope and see if it is any good”**

***Clearly old, amateur built, mechanically damaged & incomplete***

***But .....***





secondary mirror

WFAE  
1911

Back face of primary mirror

λξ 1912  
 ☸ WFAE ☸  
 F=54 in A=0  
 W<sup>m.</sup> F. A. Ellison



# Timeline

16-17<sup>th</sup>C Galileo et al  
 17-18<sup>th</sup>C Newton  
 18-19<sup>th</sup>C The Herschel's  
 19<sup>th</sup>C Lord Rosse

Late 19<sup>th</sup>C (Commercial)  
 Clark, Cooke  
 Brashear, **Browning**, Calver

1865 'The English Mechanic  
 & World of Science'

1920 'The Amateur's Telescope'  
 by Revd W F A Ellison

'Popular Mechanics'  
 'Popular Science'  
 'Popular Astronomy'

Society for Practical Astronomy

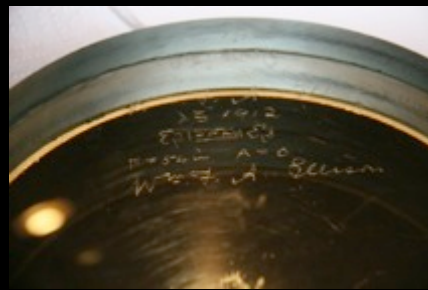
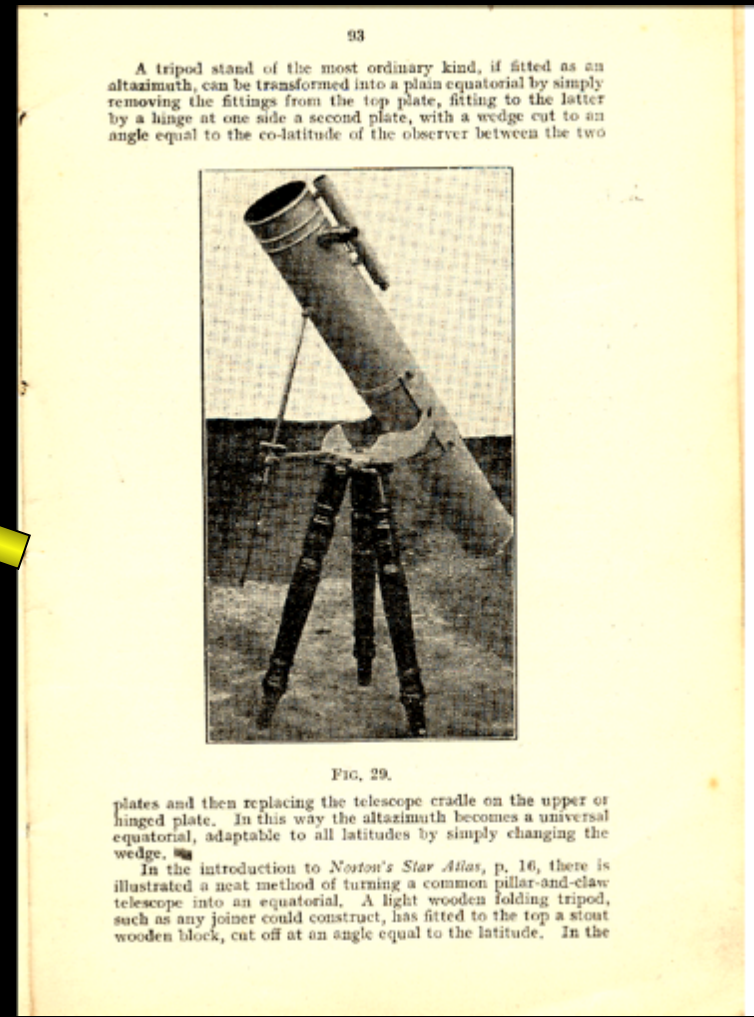
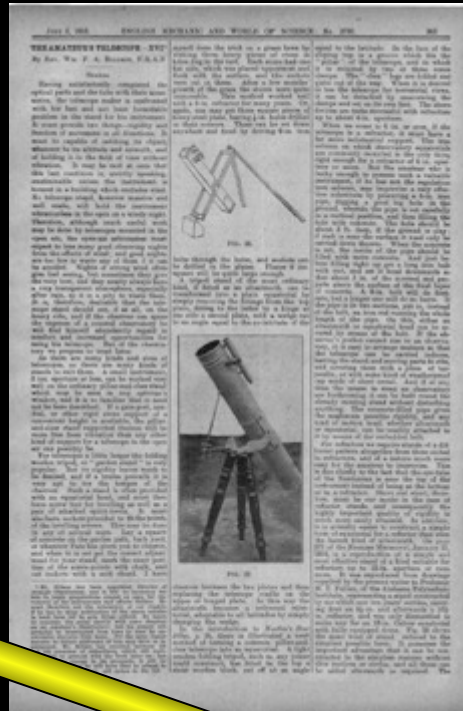
1920 R W Porter  
 & the Springfield TM's

1925-26 Scientific American  
 publishes first ATM articles  
 by Porter & Ingalls

1926 1<sup>st</sup> Stellafane Convention

1926 "ATM" first published  
 by SciAm, edited by Ingalls  
 (last edition 1980)

1928 'The Back Yard Astronomer'  
 section in SciAm appears





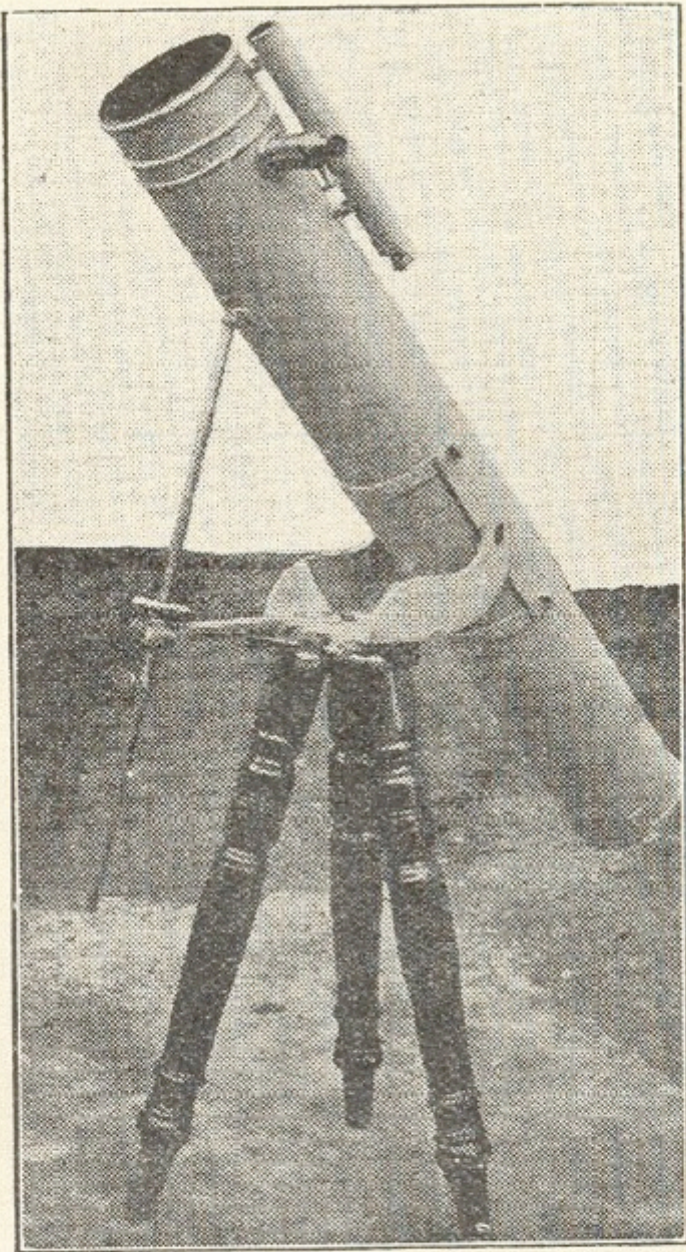


FIG. 20.





## Acknowledgements

- Gavin O' Shea (for giving me the Ellison telescope!)
- Mark Bailey & staff at the Armagh Observatory (Ellison was its 6<sup>th</sup> Director)
- William F A Ellison (Grandson) & Julian Ellison (Great grandson)
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- Brian Johnson for assistance with reconstruction
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- *Scientific American* for data & images
- Ted Saker & Pierre Faucher for acquiring the Scientific American originals
- Ric Hill, University of Arizona for finding the Ellison-Ingalls letter
- *Popular Mechanics* & *Popular Science* for images
- NASA Astrophysical Data System for magazine & article reprints