Appendix 1. A brief history of Prouds Electric Clocks and Scientific Instruments

Prouds Ltd was begun by William James Proud as a retail jeweller in 1904.

Around 1912, Prouds Electric Clocks and Scientific Instruments started operations with a workshop at 336 Kent Street, Sydney. The manager was the newly-arrived English engineer and horologist Thomas John Murday. They probably took over the business of the Synchronome Electrical Company of NSW.

A photograph that probably shows a Prouds workshop

A number of specialist timing instruments quickly appeared on the market, including a recording microbarometer and a boxing match timer (Athletograph) but the main business was electric tower clocks and electric clock systems where a master clock sent impulses to numerous dials around a building .

The first such installation was at the Sun newspaper, maybe in 1912.

A major system was installed soon after in several buildings at Circular Quay, on the ferry wharves and in the nearby Sydney Harbour Trust building. It had a connection to Sydney Observatory to provide correct time.

Prouds went on to install hundreds of systems and tower clocks, mostly in NSW, but across Australia from Kingaroy in Queensland to Avoca in Tasmania, to Perth, and even to Madras in India. A few are still operating. The installation in Parliament House in Canberra had over

100 dials. The workshop moved several times, from 336 Kent St to 49 Clarence St about 1915, to 422 Kent St by 1923 and finally to 160 Day St in the late 1930s.

Eventually, as wristwatches became ubiquitous, and impulse dials were superseded by mains powered synchronous motor clocks, about 1940 the business passed into the hands of Alan Crook (ACElec) on the construction side, and Scientific Clocks, run by Cecil Gross and Lawrence Taprell on the maintenance side.

The retail jewellery business continued under control of the Proud family until 1999 when it was acquired by overseas interests.

Appendix 2. Observatory Letters

Incoming Mail

I was able to examine three items:

NRS-22112-1-4-[13]……1905

NRS-22112-1-5-[20] 1912

NRS-22112-1-5-[21]……1917-1924

All the letters are loose in folders. I photographed a number relating to other interesting topics but found NOTHING from Prouds. Unfortunately, there are no items from 1913-1916 in the catalogue.

Outgoing Mail

I examined five bound books of spirit copies:

NRS-22111-1-6-[18]……1912

NRS-22111-1-6-[19]……1913-1914

NRS-22111-1-6-[20]……1914-1915

NRS-22111-1-7-[21]……1916-1917

NRS-22111-1-7-[22]……1917-1918

I found the following letters relevant to this project:

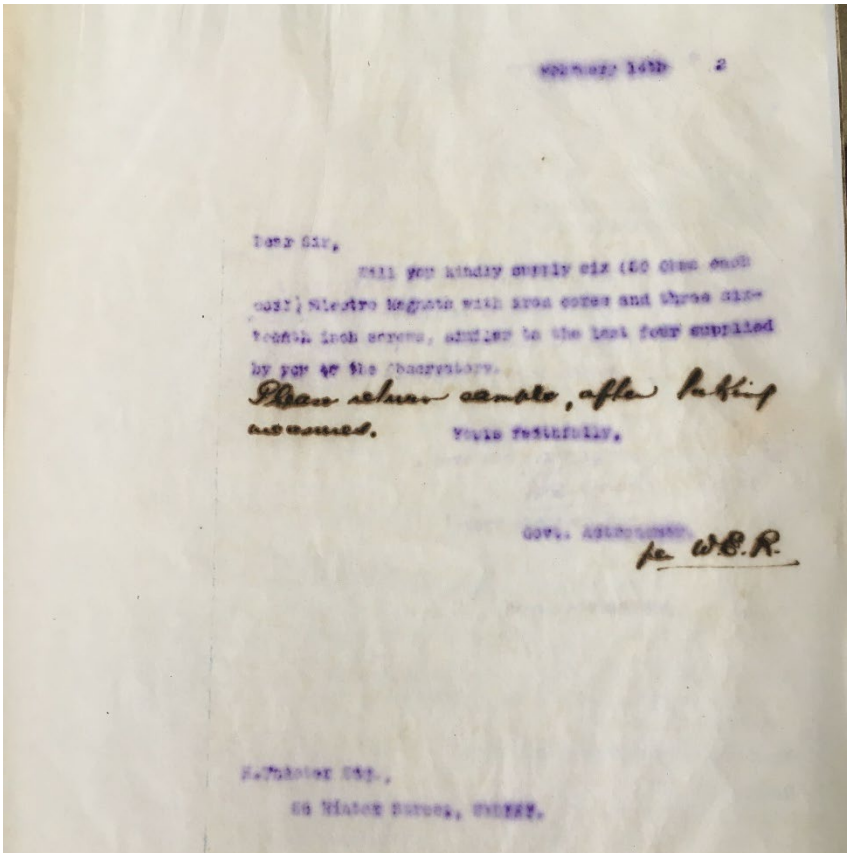
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
14-??-12	?	965	18-638	Per Raymond	Magnets for synchronisation?
04-04-12	Sydney Ferries	927		W.E. Raymond	Telephone time – Raymond synchronisation
25-09-12	Perth Obs (Dodwell)	963		Govt. Astronomer Per W.E.R.	Return of papers on Synchronisation of clocks
26-09-12	Baracchi	956	18-380	W.E. Cooke	Magnetically controlled clock
28-??-12	Public Instruction		18-392	W.E. Cooke	Summary of time services
19-11-12	Dodwell	959	18-489	W.E. Cooke	Synchronising clocks by electromagnetic impulses
02-12-12	Perth		18-512	Raymond	Invar pendulums received
04-12-12	Dodwell		18-522		Harvard plates
23-12-12	Robertson		18-555	Cooke	Order Underhill electromagnet book
01-03-?	Grubb		343	W.E. Cooke	Magnetic attachment for clock on order
?	Kirkby		18-588	Cooke	Order four more relays
14-02-12?	?		18-638	Raymond	Order six more relays
?	Agriculture		18-721	Cooke	Sundial
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
?-02-13	Public Instruction		18-624	W.E. Cooke	Advocates telephone time service
18-04-13	Andrews		18-731 -735	W.E.Cook e	Wireless longitude determination details
22-04-13	Harbour Trust		18-738	Raymond	Tide services

?	?		18-749	Raymond	Time and latitude and longitude
09-10-14	T.J. Murday	946	19-109	Govt. Astronomer	Rejection of clock
27-11-14	Sydney Uni	933/4		W.E. Cooke, Prof	Uni clocks-ticks available now for correction
01-03-15	Agent General	930		Govt. Astronomer	Mean Time clock
01-03-15	Sir Howard (Grubb)	931		W.E. Cooke	Magnet for Mean Time clock
25-08-15	Elec Eng, GPO	926		Govt. Astronomer	Harbour Trust clock connection
26-08-15	Prouds	925	19-609	Govt. Astronomer	Copy to Prouds
16-10-17	Prouds	920		W.E. Cooke	Accepts quote for mechanism
08-04-18	Prouds	921		Govt. Astronomer	Order for one seconds impulse clock
10-04-18	Prouds	924		W.E. Cooke per?	Order for Invar rods
11-12-18	Prouds	923		W.E. Cooke per?	Order for Vernier clock

Note that Murday disembarked in Sydney 22/7/1911. Cooke was appointed Govt. Astronomer in 1912.

Images of the letters follow, together with transcripts and comments.

They show that the Observatory was dealing with Prouds, including having them make bespoke items and items specified by personal conversations. Also, there are mentions of connections to the ferry terminal but that seems to have been held at arm's length. Perhaps G.P.O archives might turn up something. There is no evidence of cooperation with Prouds on synchronisation issues.



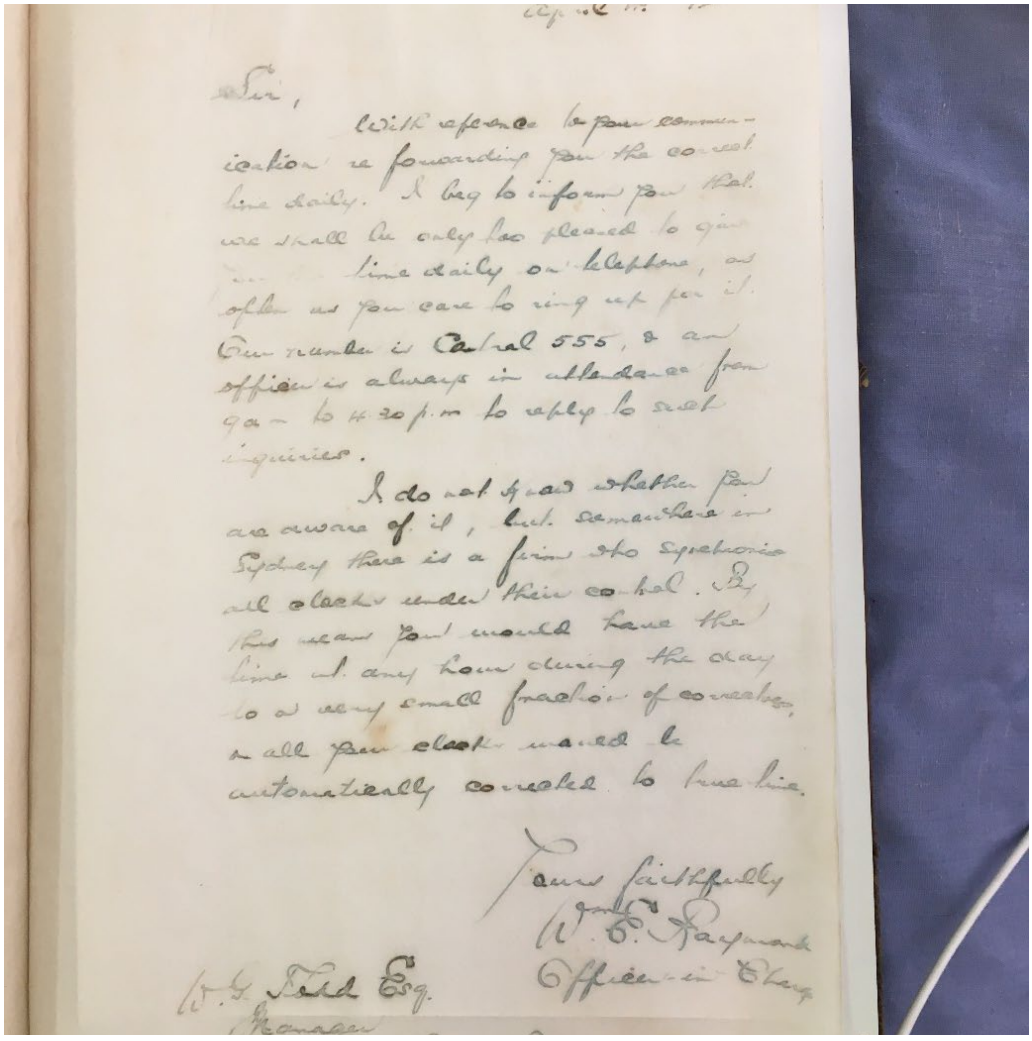
IMG 965

18-638

H. ? ster Esq.,
56 Hinter? Sstreet, SYDNEY
Dear Sir,
Will you kindly supply six (50 ohm each coil) Electro Magnets with iron cores and three six-teenth inch screws, similar to the last four supplied by you to the Observatory.
Please return sample, after Making
Measured Yours faithfully

Govt. Astronomer
Per WER

These look to be magnets meant for experiments in pendulum control. The request is per Raymond so perhaps near the end of the year, after the arrival of Cooke.



Sir,

With reference to your communication re forwarding you the correct time daily. I beg to inform you that we shall be only too pleased to give you the time daily on telephone, as often as you care to ring up for it. Our number is Central 555, & our officer is always in attendance from 9 a.m. to 4.30 p.m. to reply to such inquiries.

I do not know whether you are aware of it, but somewhere in Sydney there is a firm who synchronise all clocks under their control. By this means you would have the time at any hour during the day to a very small fraction of a second, & all your clocks would be automatically corrected to true time.

Yours faithfully
W. G. Raymond
Officer in Charge

W. G. Todd Esq.
Manager

IMG 927

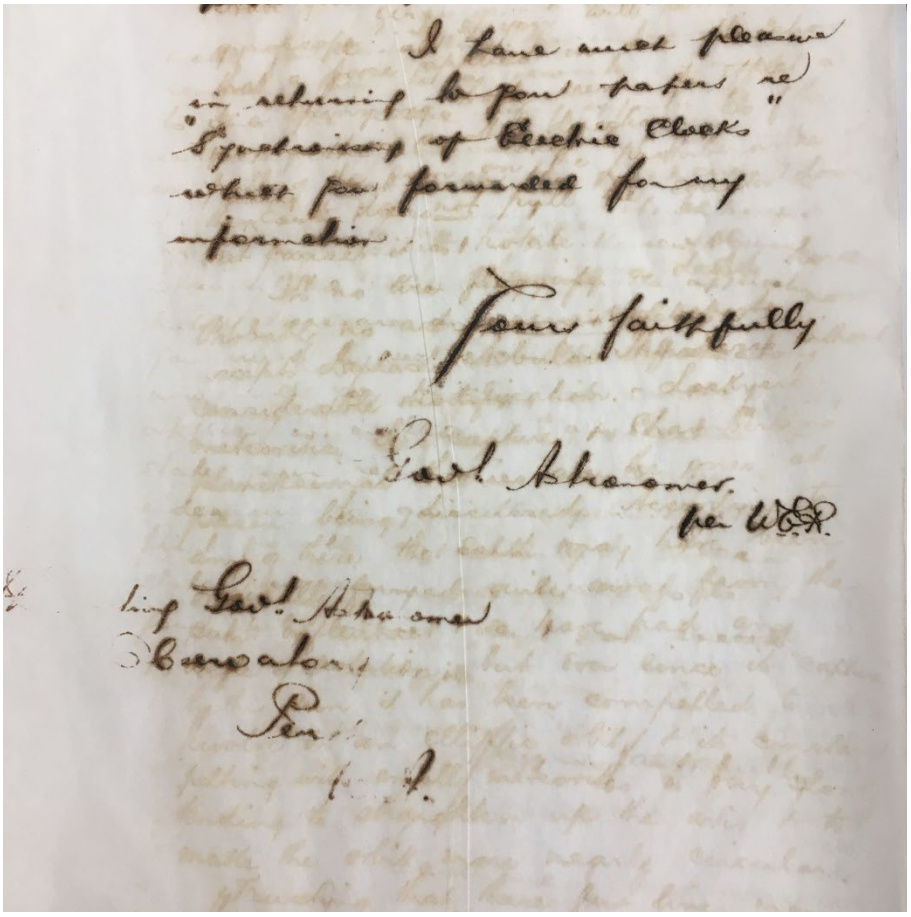
April 4 12

W.G. Todd Esq.
Manager
Sydney Ferries Ltd
Circular Quay
Sydney
Sir,
With reference to your commun-
Ication re forwarding you the correct
time daily, I beg to inform you that
we shall be only too pleased to give
you the time daily on telephone, as
often as you care to ring up for it.
Our number is Central 555, & our
officer is always in attendance from
9 am to 4.30 pm to reply to such
inquiries.

I do not know whether you
are aware of it, but somewhere in
Sydney there is a firm who synchronise

all clocks under their control. By
this means you would have the
time at any hour during the day
to a very small fraction of correctness
& all your clocks would be
automatically corrected to true time.
Yours faithfully
W.E. Raymond
Officer in Charge

This letter probably refers to Prouds but it might be the Grau Wagner installation at Central Railway Station. Sydney Ferries was a separate operation from the Sydney Harbour Trust that was responsible for the wharves but it is slightly strange that Todd seemed to be unaware of Prouds.



IMG 963

25 Sept [191] 2

Acting Govt. Astronomer
Observatory
Perth
W.A.

Dear Sir,

I have much pleasure
In returning to you papers re
"Synchronising of Electric Clocks"
Which you forwarded for my
Information.

Yours faithfully

Govt Astronomer
Per W.E.R.

This would presumably be Harold Burnam Curlewis , who was Acting Government Astronomer from 1912 when Cooke moved to Sydney, until 1920. It shows that synchronisation of clocks was an area of interest, maybe even before Cooke arrived.

18- 380

Sept26 2 [handwritten img 956]
My dear Baracchi,
I am interested in your
magnetically controlled clock & should
be much obliged if you can give me
any information about it. I suppose
you have no printed description?
Otherwise can you answer the following:

1. *To what extent is the control operative?*
   E.g. suppose the secondary clock has
   A gaining or losing rate of say 10s per
   Day on the parent will the latter be
   Able to keep it in beat?
2. *Do I understand that the pendulum weight*
   Of the controlled clock clock consists of a
   Heavy electromagnet through which a
   Current passes momentarily once a
   Second & that this approaches alternately
   The N & S poles of two fixed permanent magnets?
3. *If so, can you give me any measure-*
   ments (approximate) as to
   (a)weight or dimensions of electromagnet
   (b)resistance of do.
   (c) gauge of wire
   (d) current & emf used
   (e)duration of momentary current
   (f) nearness of approach of E. mag.to permanent mag.
4. *Do you consider the system reliable?*

Yours faithfully,
Kind regards, WEC

This letter suggests that Baracchi, Govt. Astronomer in Melbourne, was conducting experiments in pendulum synchronisation. Cooke does not reveal any experiments of his own.

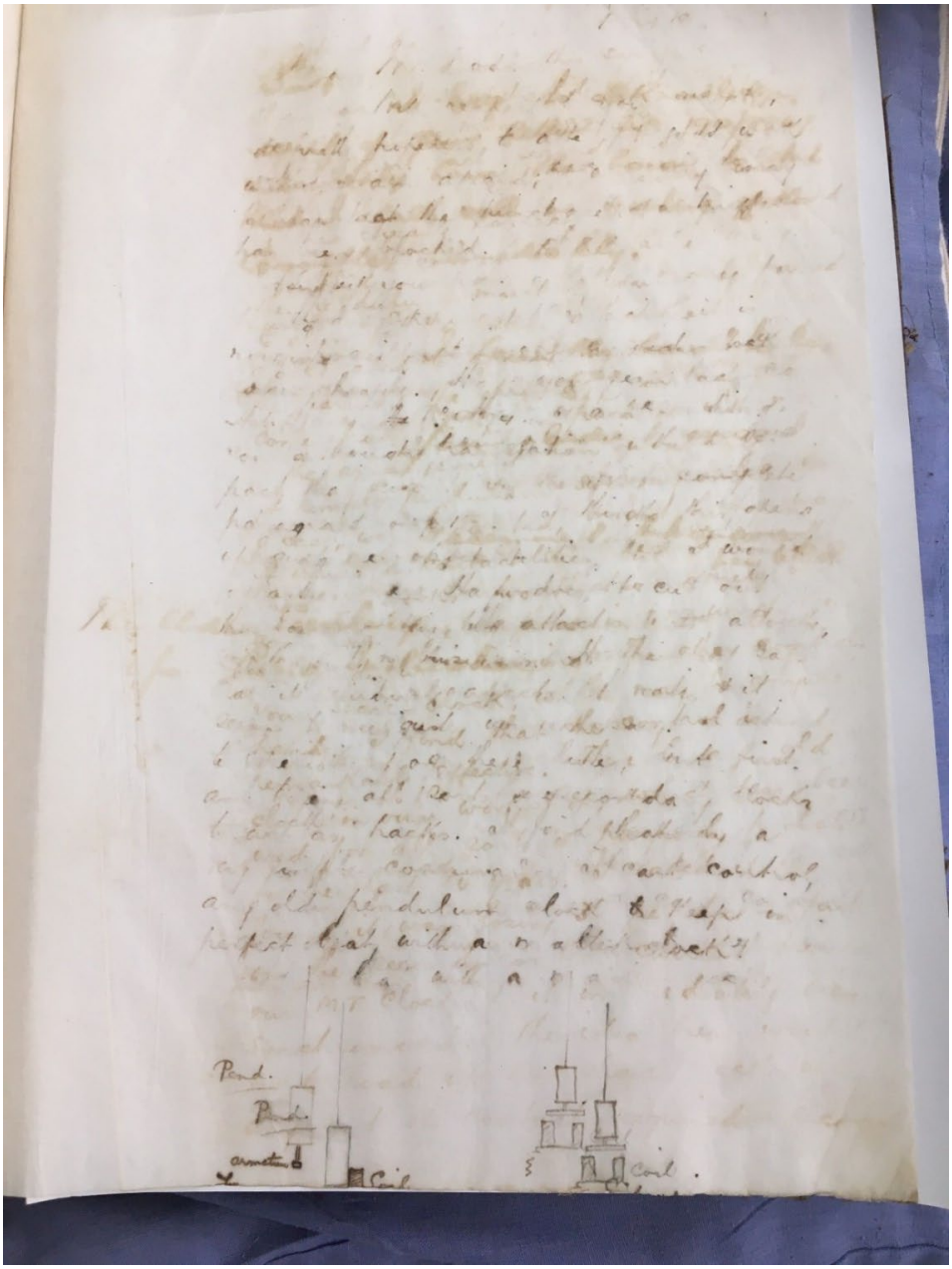
18-392 28- ??- 1912

The Under Secretary for Public Instruction
Dear Mr King,
Sir,

In reply to P.O. 12/5197 I have the honor to state that the only services rendered by this department to the Commonwealth are in connection with time distribution, as follows
? transmit, daily, clock signals to the G.P.O., also on a special line to Messrs Hardy and Allerding, between 0^{hr} 45 & 0^{hr} 50^{m} pm

For this we receive no payment, but the Post & Telegraph Dept charges a fee for the above servce to Messrs Hardy & Allerding and also makes use of our signals to distribute time at 1pm to a number of paying subscribers.

I have the honor to be Sir
Your obedient servant
WE Cooke
Govt Astronomer



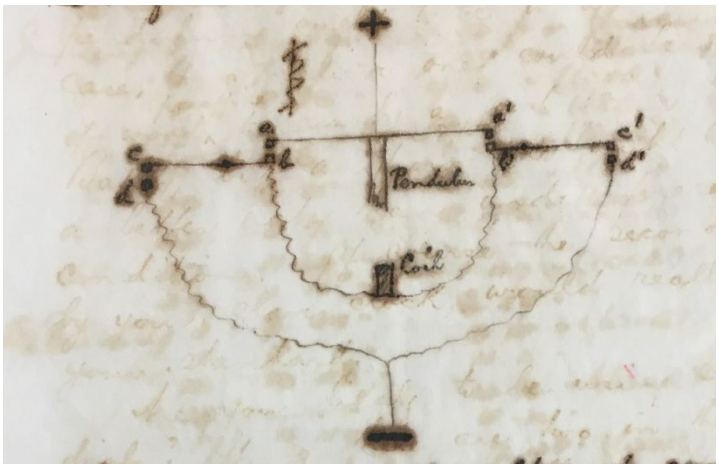
IMG 958, page **18-489**

18-489 – I have been able to decipher only a few lines on this page but can determine the date and addressee from the Letterbook index to be 19/11/1912 to Mr Dodwell. Near the bottom, I can read *'I find that by a very simple contrivance can control any old pendulum clock be kept in perfect ??? within ???? clock!'* The subsequent pages of the letter are clear.
The letter is important as it shows that Cooke was well aware of how to synchronise pendulum clocks swing for swing as Prouds claimed in their advertising to be able to do. Note that the observatory master clock provides 1s pulses.

18-490 (scan not shown for brevity)
I extend the pendulum & fix a soft iron armature, as shown. This swings over an elec. mag. at the extremity of its swing on one side, & a momentary current is sent into the e.m. each second from the master clock. Every other second would be theoretically correct, but every second is easier & comes to the same thing.
The weight of the pendulum must of course be raised to allow for the extra attachment, & the clock rated to approx.. agreement with the parent. The primary contact can come from b_1b_2 in parallel with r_1r_2 (?????)
The Arrangement would then be:
A simple pendulum swinging freely in a case, well mounted, & out of the way.
It issues a contact every second, the current from which splits and works two electromagnets in common. One of these is r_1r_2, which keeps the pendulum swinging. The other controls your slave-clock which may be anywhere handy. I find that the control is remarkably effective. There is an old clock in the workshop, which has been used for all sorts of purposes, probably for the last 50 years. I rated it & found it was losing 36^s per day – put on the seconds-contact current from our M.T. clock & it immediately was synchronised. The idea then would be to load up the slave clock with any sort of contacts required, seconds
18-491
Minutes, 10" (for seismograph), hourly etc, put on extra driving weight if required, and let the pendulum below control it. Strictly speaking the free pendulum ought to be in an air-tight case, & I believe one could be made of wood (?) & glass by a good man, like Baker, but anyhow one ought to get a better rate than under present conditions. Of course the seconds issued by your slave clock would really be your standard.
Are you likely to be using secondary dials? If so there are two in the market

a long way ahead of the competitors.
The Wagner & the Magneta, each costing
about £3 to £3/10/- per clock. A distin-
guishing feature of these is that they
require their impulses to be in alternate
directions, but I can show you how to
get that from your slave clock. This
is a great advantage, because the clock
cannot respond to a chattering relay,
or accidental shorts on the line etc.
Suppose a positive current has gone
along the line you can send 100 other
positive currents & nothing will happen.
It cannot respond until a negative
comes along. This cuts out a lot of
trouble, but of course doesn't guarantee
against actual failure of contact.

18-492
The controlled pendulum does that,
By the way, to a considerable extent.
If you want to use it, here is the general
Sort of scheme – adapted here to seconds,



The pendulum makes alternate contacts
ab and a'b' : bc is a lever, pivoted as
shown, so that c normally rests on d,
but when a makes contact to depress b, the
contact cd is immediately broken. You
can easily follow the current & you will

find it goes in alternate directions through
the coil.
The Magneta and Wagner clocks are for
impulse once a minute, but will of
course record seconds only if you want
it with the above arrangement. For ordinary
clock use you can adapt <u>two</u> wheels on
your minute arbor of the slave clock to
transmit impulses every alternate minute.
I find 100 ohm (50 in each coil) elec. mag^{s}.
wound with N^{o} 28 wire a useful size using
a 4 volt current from a portable Fors 75 amp.
hour accumulator.
Kind regards Yours sincerely

WEC

The work behind this letter must have been done at about the same time that Murday arrived in Sydney but no influence is revealed. Cooke expresses his opinions on impulse dial systems and has a clear preference for the continental alternate polarity pulse systems rather than the English single polarity pulse systems (which is what Prouds took up)

18-512

December 2nd. 1912

Controller of Stores
Govt Stores Dept
Perth
W.A.

Sir,

I have the honor to
acknowledge receipt of case containing
Invar Pendulums forwarded from
the Perth Observatory on loan.

Yours faithfully

Govt. Astronomer
Per WER

18-522 4-12-1912

Dear Mr Dodwell,

That was a good idea of yours
To make prints of the Harvard plates.
I am afraid however that these plates
Are not suitable for the purpose in
Any form, for several reasons, the
Most important being

It is very difficult to find the

actual centre.
Do the actual scale
Do the actual orientation

And finally the curvature would be
Quite serious.
They are splendid pictures, but
unsuitable for measuring purposes.
I cabled to Dyson re intermediates
& he wired a reply referring me to Hough.
So as a mail goes today to the Cape
I have written asking him if those
For our zones have yet been selected,
and if not suggesting that I should do so.
I fancy the best method will be to
take the stars from the charts of our
own transit which are now being
prepared, or else start afresh altogether,
*select our ref *s from the rejected*
plates, chart them, & then select the
intermediates from those. I really think
This latter is the proper thing, but it is
a little delay.

18-555 (IMG 3949)
Geo. Robertson & Co. Ltd.
Bookseller
Pitt Street
Sydney
Sir,
Will you please supply
the Observatory with
Solenoid Electromagnet & Electromag-
netic Windings by C. R. Underhill
Published by Constable & Co 10
Grange (?) Street Leicester Square
London WC
Yours faithfully
Govt. Astronomer
Per WEC

18-588
Mr Kirkby.
Sir,
Please supply four
more relays similar to the last,
100 ohm No. 28 wire. I should lLike to have them as quickly as possible.
Yours ?
W.E. Cooke
Govt. Astronomer

18-638
February 14 th. 1912
Dear Sir,
Will you kindly supply six (50 Ohms each coil) Electromagnets with iron cores and three six-tenth inch screws, similar to the last four supplied by you to the observatory.
Please return sample, after ?king measured
Yours faithfully
Govt Astronomer
per WER

18-624

The Under Secretary for Public Instruction
Dear Sir,

One of the most important practical functions of the Observatory is the maintenance of standard time, ? of course, always receives most careful attention. I think, however, that its distribution leaves much to be desired.

At present the only ways in which the public are put in touch with the Standard clock at the Syd. Observatory are as follows

1st. The timeball is dropped at 1 pm and the gun fired.

2nd. Two watchmakers, ----------Hardy Bros and Allerding, ---------- special time signals when required.

3rd. The Officer in charge of the ---------- at Newcastle receives a signal once a day.

4th. The Post Office receives a special service & distributes it to a few paying subscribers once every day.

You will see from the above that practically no provision is made for the general public.
I think this can be easily remedied if we can secure the cooperation of the Federal Postal Department and beg to propose the following scheme.

A special clock at the Observatory is ------now being fitted with apparatus which will enable it to transmit definite

18-625

time signals automatically continuously. It is proposed that these should be sent to the Post Office instead of the present series once a day, that they should then pass through a suitable sounder placed in front of an ordinary telephone transmitter, and that this piece of apparatus should be treated by the Telephone Department as an ordinary subscriber. So that if anybody wishes to have correct time he simply asks the exchange for time, & he is switched on to this piece of apparatus, as he would in ordinary

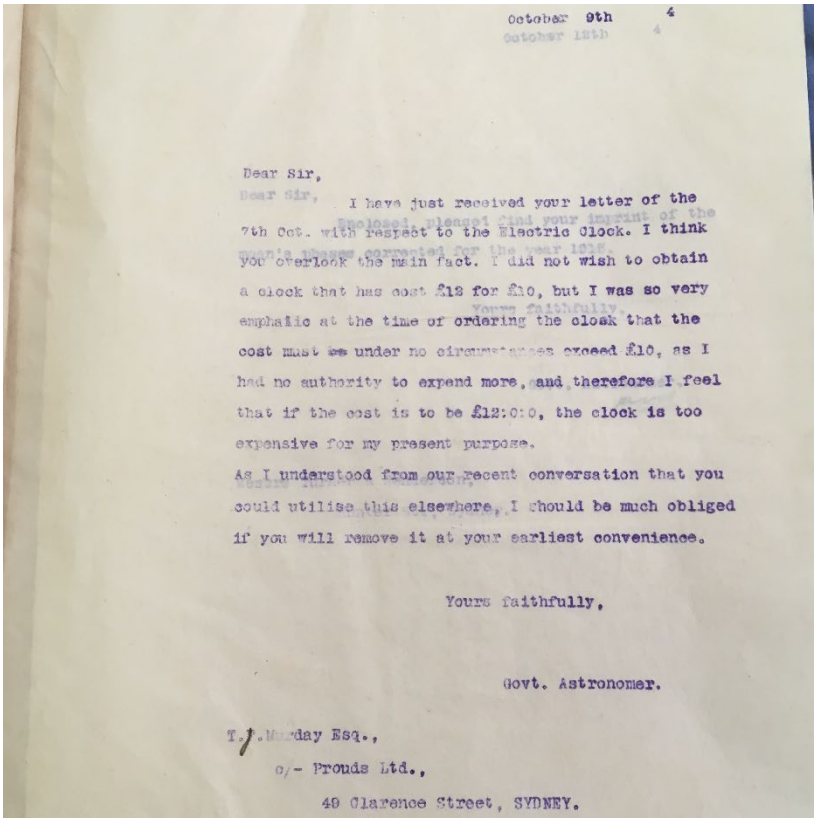
circumstances be switched on to some other number.

I beg to submit a rough diagram showing how the connections might be made, but this of course can be modified to -------the requirements of the Post Office Department.

I think you will agree, Sir, that in Sydney especially, a knowledge of the correct time is almost a necessity to every business man, & it seems such a pity that although it is always “on tap” at the Government institution, yet the public at present have practically no means of obtaining access to it.

I should feel obliged, therefore, if you will recommend this matter to the ---------- consideration of the Commonwealth authorities.

I have the honour to be
Sir,
Your obedient servant
WE Cooke
Government Astronomer



October 9th 4

Dear Sir,

I have just received your letter of the 7th Oct. with respect to the Electric Clock. I think you overlook the main fact. I did not wish to obtain a clock that has cost £12 for £10, but I was so very emphatic at the time of ordering the clock that the cost must under no circumstances exceed £10, as I had no authority to expend more, and therefore I feel that if the cost is to be £12:0:0, the clock is too expensive for my present purpose.

As I understood from our recent conversation that you could utilise this elsewhere, I should be much obliged if you will remove it at your earliest convenience.

Yours faithfully,

Govt. Astronomer.

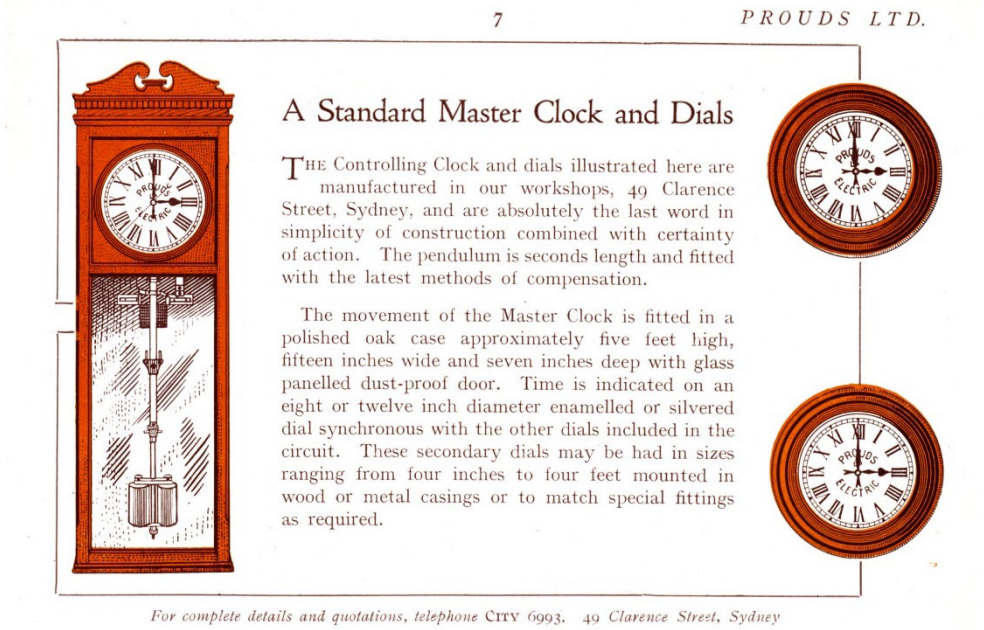
T.J. Murday Esq.,
c/- Prouds Ltd.,
49 Clarence Street, SYDNEY.

IMG 946

T.J. Murday Esq., October 9th, 1914
c/- Prouds Ltd.,
49 Clarence Street, SYDNEY
Dear Sir,
I have just received your letter of the
7th Oct with respect to the Electric Clock. I think
you overlook the main fact. I did not wish to obtain
a clock that has cost £12 for £10, but I was so very
emphatic at the time of ordering the clock that the
cost must under no circumstances exceed £10 as I
had no authority to expend more, and therefore I feel
that if the cost is to be £12:0:0, the clock is too
expensive for my present purpose.
As I understood from our recent conversation that you
could utilise this elsewhere, I should be much obliged
if you will remove it at your earliest convenience.
Yours faithfully.
W.E. Cooke, Govt. Astronomer

This is the only direct communication found between Cooke and Murday, but it is clear that this letter is just the formal end of a long conversation. Unfortunately, Murday's letter has not been preserved.

It is interesting to speculate on the nature of the Murday electric clock that Cooke rejected in 1914 on the basis of cost (£12 rather than £10). Was it an electric regulator as advertised by The Standard Time Co. in 1902? Or was it a Prouds clock like this, as advertised in a brochure from a little later.



7 PROUDS LTD.

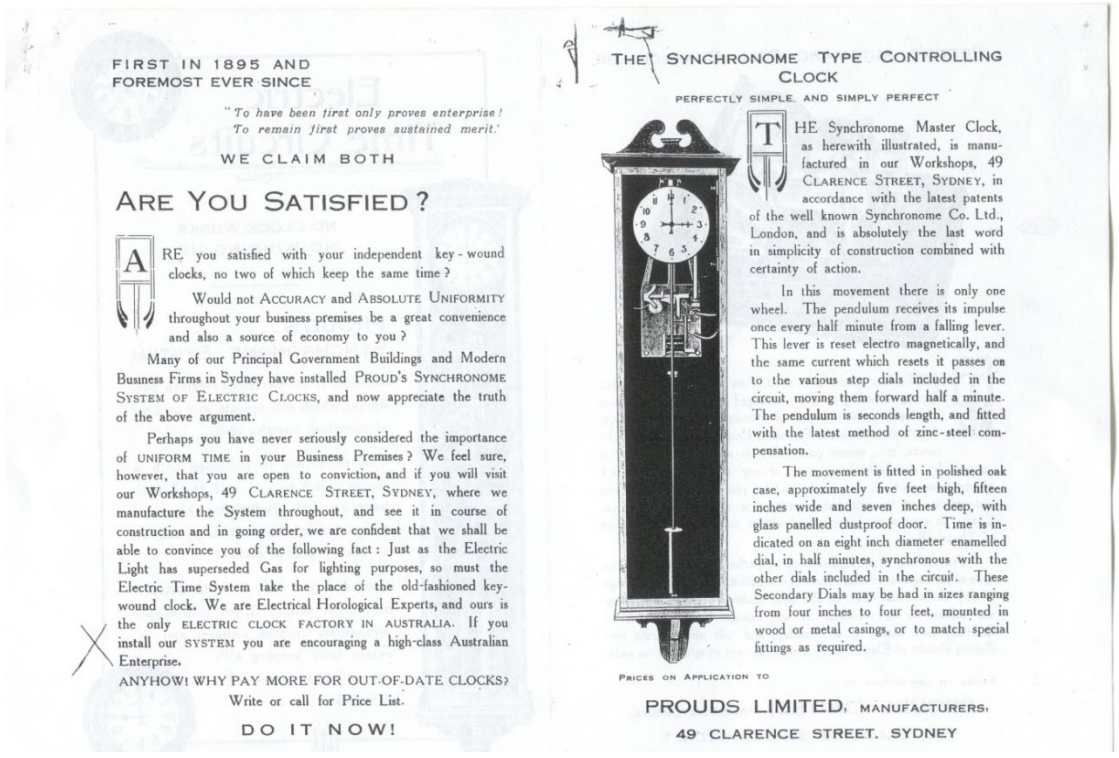
A Standard Master Clock and Dials

THE Controlling Clock and dials illustrated here are manufactured in our workshops, 49 Clarence Street, Sydney, and are absolutely the last word in simplicity of construction combined with certainty of action. The pendulum is seconds length and fitted with the latest methods of compensation.

The movement of the Master Clock is fitted in a polished oak case approximately five feet high, fifteen inches wide and seven inches deep with glass panelled dust-proof door. Time is indicated on an eight or twelve inch diameter enamelled or silvered dial synchronous with the other dials included in the circuit. These secondary dials may be had in sizes ranging from four inches to four feet mounted in wood or metal casings or to match special fittings as required.

For complete details and quotations, telephone CITY 6993. *49 Clarence Street, Sydney*

Or a 'Murday Synchronome'?



FIRST IN 1895 AND
FOREMOST EVER SINCE

"To have been first only proves enterprise!
To remain first proves sustained merit."

WE CLAIM BOTH

ARE YOU SATISFIED?

ARE you satisfied with your independent key-wound clocks, no two of which keep the same time?

Would not ACCURACY and ABSOLUTE UNIFORMITY throughout your business premises be a great convenience and also a source of economy to you?

Many of our Principal Government Buildings and Modern Business Firms in Sydney have installed PROUD'S SYNCHRONOME SYSTEM OF ELECTRIC CLOCKS, and now appreciate the truth of the above argument.

Perhaps you have never seriously considered the importance of UNIFORM TIME in your Business Premises? We feel sure, however, that you are open to conviction, and if you will visit our Workshops, 49 CLARENCE STREET, SYDNEY, where we manufacture the System throughout, and see it in course of construction and in going order, we are confident that we shall be able to convince you of the following fact: Just as the Electric Light has superseded Gas for lighting purposes, so must the Electric Time System take the place of the old-fashioned key-wound clock. We are Electrical Horological Experts, and ours is the only ELECTRIC CLOCK FACTORY IN AUSTRALIA. If you install our SYSTEM you are encouraging a high-class Australian Enterprise.

ANYHOW! WHY PAY MORE FOR OUT-OF-DATE CLOCKS?
Write or call for Price List.

DO IT NOW!

THE SYNCHRONOME TYPE CONTROLLING CLOCK

PERFECTLY SIMPLE AND SIMPLY PERFECT

THE Synchronome Master Clock, as herewith illustrated, is manufactured in our Workshops, 49 CLARENCE STREET, SYDNEY, in accordance with the latest patents of the well known Synchronome Co. Ltd., London, and is absolutely the last word in simplicity of construction combined with certainty of action.

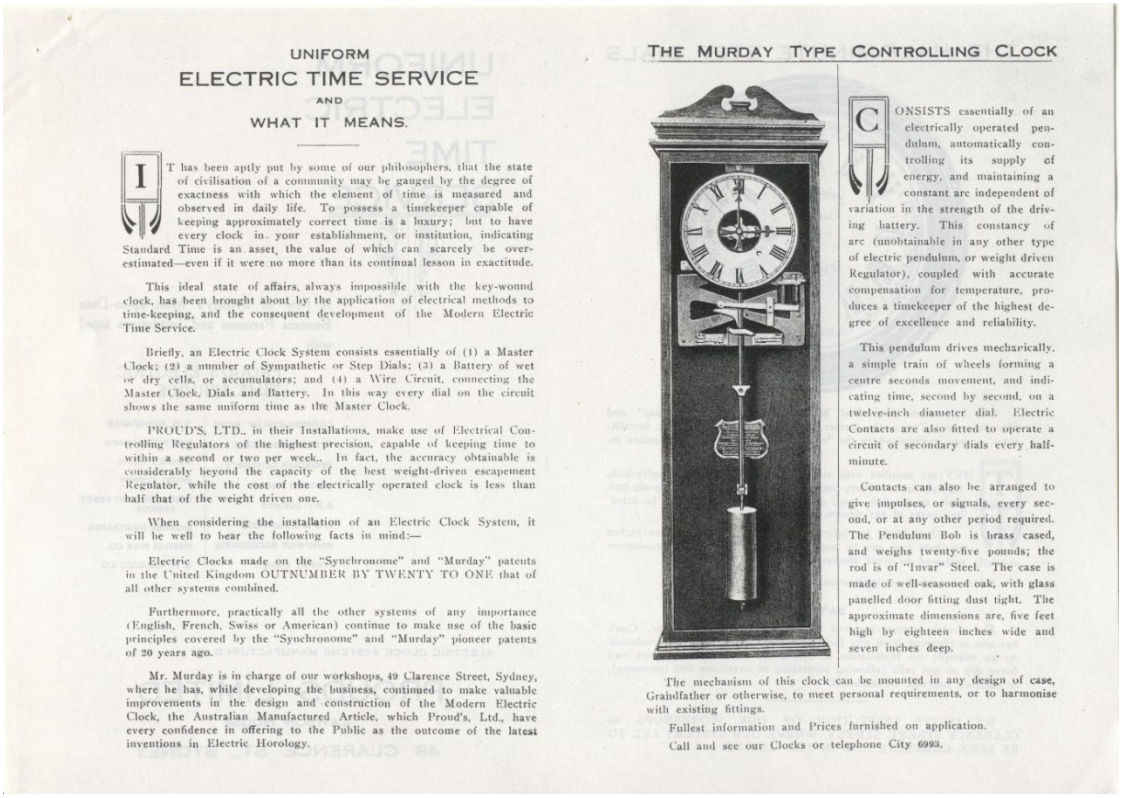
In this movement there is only one wheel. The pendulum receives its impulse once every half minute from a falling lever. This lever is reset electro magnetically, and the same current which resets it passes on to the various step dials included in the circuit, moving them forward half a minute. The pendulum is seconds length, and fitted with the latest method of zinc-steel compensation.

The movement is fitted in polished oak case, approximately five feet high, fifteen inches wide and seven inches deep, with glass panelled dustproof door. Time is indicated on an eight inch diameter enamelled dial, in half minutes, synchronous with the other dials included in the circuit. These Secondary Dials may be had in sizes ranging from four inches to four feet, mounted in wood or metal casings, or to match special fittings as required.

PRICES ON APPLICATION TO

PROUDS LIMITED, MANUFACTURERS,
49 CLARENCE STREET, SYDNEY

Or the ‘Murday Type Controller’



UNIFORM
ELECTRIC TIME SERVICE
AND
WHAT IT MEANS.

IT has been aptly put by some of our philosophers, that the state of civilisation of a community may be gauged by the degree of exactness with which the element of time is measured and observed in daily life. To possess a timekeeper capable of keeping approximately correct time is a luxury; but to have every clock in your establishment, or institution, indicating Standard Time is an asset, the value of which can scarcely be over-estimated—even if it were no more than its continual lesson in exactitude.

This ideal state of affairs, always impossible with the key-wound clock, has been brought about by the application of electrical methods to time-keeping, and the consequent development of the Modern Electric Time Service.

Briefly, an Electric Clock System consists essentially of (1) a Master Clock; (2) a number of Sympathetic or Step Dials; (3) a Battery of wet or dry cells, or accumulators; and (4) a Wire Circuit, connecting the Master Clock, Dials and Battery. In this way every dial on the circuit shows the same uniform time as the Master Clock.

PROUD'S, LTD., in their Installations, make use of Electrical Controlling Regulators of the highest precision, capable of keeping time to within a second or two per week. In fact, the accuracy obtainable is considerably beyond the capacity of the best weight-driven escapement Regulator, while the cost of the electrically operated clock is less than half that of the weight driven one.

When considering the installation of an Electric Clock System, it will be well to bear the following facts in mind:—

Electric Clocks made on the "Synchronome" and "Murday" patents in the United Kingdom OUTNUMBER BY TWENTY TO ONE that of all other systems combined.

Furthermore, practically all the other systems of any importance (English, French, Swiss or American) continue to make use of the basic principles covered by the "Synchronome" and "Murday" pioneer patents of 20 years ago.

Mr. Murday is in charge of our workshops, 49 Clarence Street, Sydney, where he has, while developing the business, continued to make valuable improvements in the design and construction of the Modern Electric Clock, the Australian Manufactured Article, which Proud's, Ltd., have every confidence in offering to the Public as the outcome of the latest inventions in Electric Horology.

THE MURDAY TYPE CONTROLLING CLOCK

CONSISTS essentially of an electrically operated pendulum, automatically controlling its supply of energy, and maintaining a constant arc independent of variation in the strength of the driving battery. This constancy of arc (unobtainable in any other type of electric pendulum, or weight driven Regulator), coupled with accurate compensation for temperature, produces a timekeeper of the highest degree of excellence and reliability.

This pendulum drives mechanically, a simple train of wheels forming a centre seconds movement, and indicating time, second by second, on a twelve-inch diameter dial. Electric Contacts are also fitted to operate a circuit of secondary dials every half-minute.

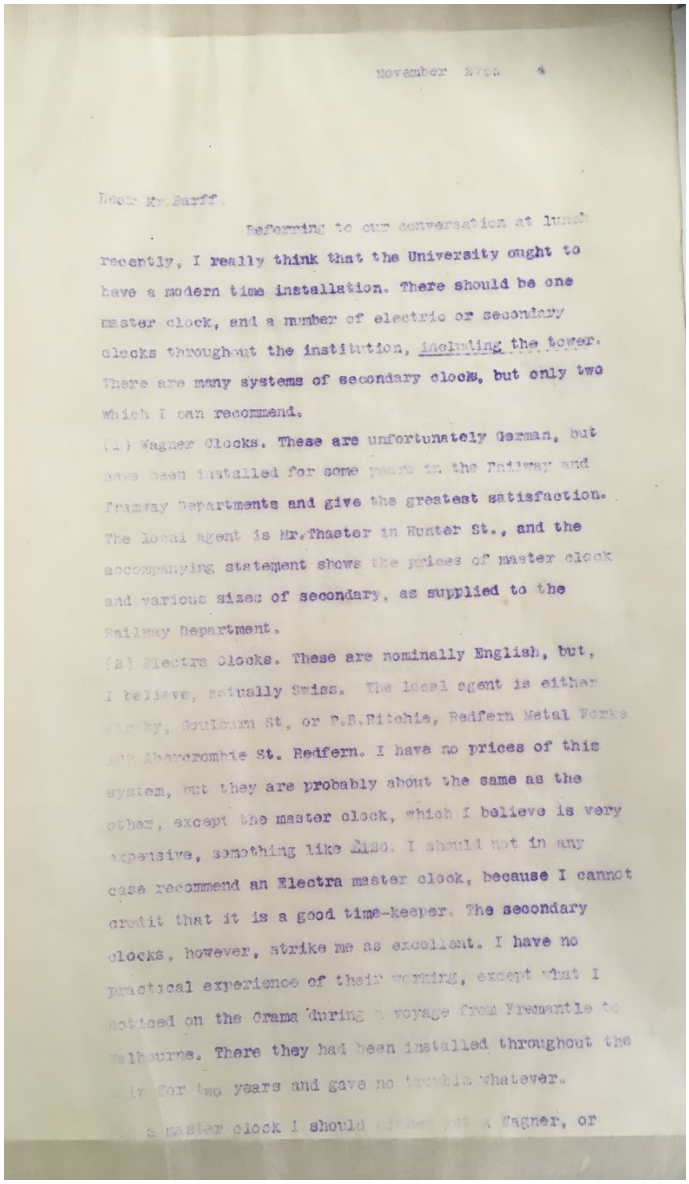
Contacts can also be arranged to give impulses, or signals, every second, or at any other period required. The Pendulum Bob is brass cased, and weighs twenty-five pounds; the rod is of "Invar" Steel. The case is made of well-seasoned oak, with glass panelled door fitting dust tight. The approximate dimensions are, five feet high by eighteen inches wide and seven inches deep.

The mechanism of this clock can be mounted in any design of case, Grandfather or otherwise, to meet personal requirements, or to harmonise with existing fittings.

Fullest information and Prices furnished on application.

Call and see our Clocks or telephone City 6093.

Or could it have been one of the new horizontal balance wheel clocks used at the ferry terminal? Probably not. It is too expensive to be one of the domestic style pendulum or balance wheel clocks Prouds was retailing.



November 27th 4

Dear Mr Barff,

Referring to our conversation at lunch recently, I really think that the University ought to have a modern time installation. There should be one master clock, and a number of electric or secondary clocks throughout the institution, including the tower. There are many systems of secondary clock, but only two which I can recommend.

(1) Wagner Clocks. These are unfortunately German, but have been installed for some years in the Railway and Tramway Departments and give the greatest satisfaction. The local agent is Mr. Thaeter in Hunter St., and the accompanying statement shows the prices of master clock and various sizes of secondary, as supplied to the Railway Department.

(2) Electra Clocks. These are nominally English, but, I believe, actually Swiss. The local agent is either [illegible], Goulburn St, or R.B.Ritchie, Redfern Metal Works [illegible] Abercrombie St. Redfern. I have no prices of this system, but they are probably about the same as the other, except the master clock, which I believe is very expensive, something like £130. I should not in any case recommend an Electra master clock, because I cannot credit that it is a good time-keeper. The secondary clocks, however, strike me as excellent. I have no practical experience of their working, except that I noticed on the Orama during a voyage from Fremantle to Melbourne. There they had been installed throughout the ship for two years and gave no trouble whatever.

For a master clock I should either get a Wagner, or

IMG 933

November 27 4

Dear Mr. Barff,

Referring to our conversation at lunch recently, I really think that the University ought to have a modern time installation. There should be one master clock, and a number of electric or secondary clocks throughout the institution, including the tower. There are many systems of secondary clock, but only two which I can recommend.

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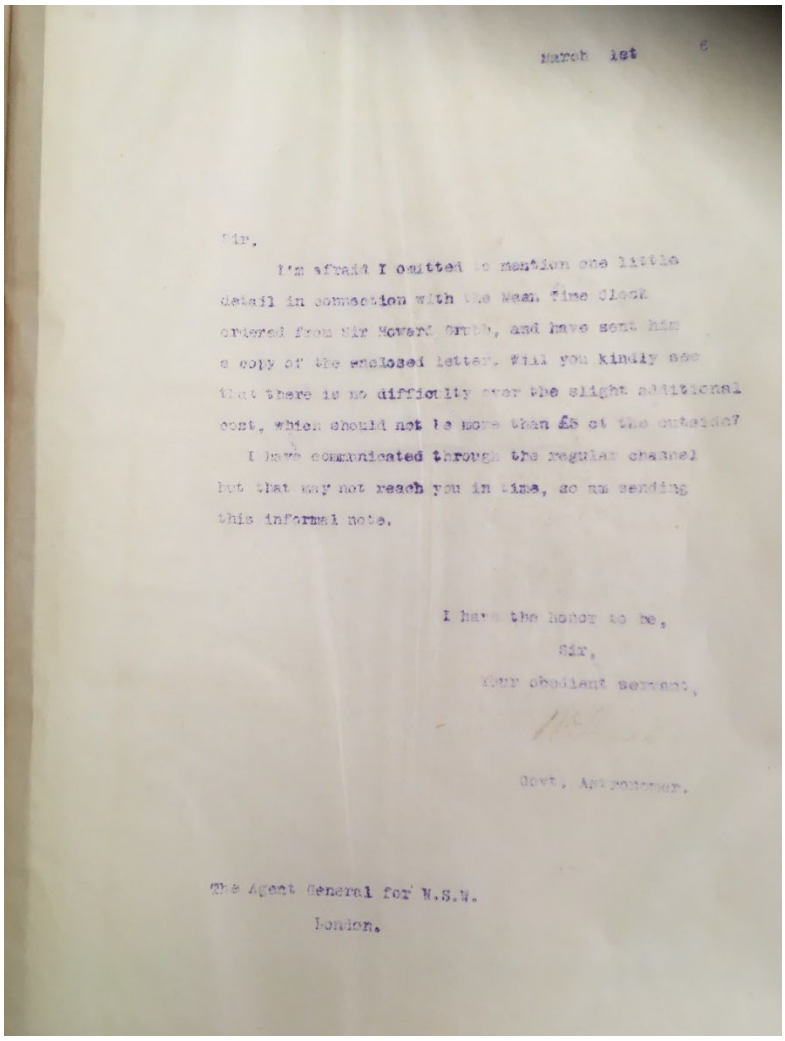
(2) Electra Clocks. These are nominally English, but, I believe, actually Swiss. The local agent is either XXXXly, Goulburn St., or P.B. Ritchie, Redfern metal Works XXX Abercrombie St. Redfern. I have no prices of this system, but they are probably about the same as the other, except the master clock, which I believe is very expensive, something like £120. I should not in any case recommend an Electra master clock, because I cannot credit that it is a good time-keeper. The secondary clocks, however, strike me as excellent. I have no practical experience of their working, except what I noticed on the Orama during the voyage from Fremantle to Melbourne. There they had been installed throughout the ship for two years and gave no trouble whatever.
For a master clock I should either get a Wagner, or convert any good clock so as to send out suitable alternating current signals. This could probably be done by some of the University mechanicians. Now that clock ticks direct from the Observatory are "on tap" on the telephone it should be an easy matter to rate the parent clock. And this would insure correct time throughout the University, a great desideratum.

Yours faithfully,
W.E. Cooke
Professor of Astronomy

IMG 934

Here Cooke is in his role as Professor of Astronomy at the University of Sydney.
Again, he advocates alternate polarity impulse dial systems. He also confirms that 1s pulses are available from the observatory. These would have been ideal to synchronise the local master clock in the Harbour Trust Building. Andrew Jacob pointed out that Barff was Registrar and Librarian of the University and son-in-law of H.C. Russell.



March 1st

Sir,

I'm afraid I omitted to mention one little detail in connection with the Mean Time Clock ordered from Sir Howard Grubb, and have sent him a copy of the enclosed letter. Will you kindly see that there is no difficulty over the slight additional cost, which should not be more than £5 at the outside?

I have communicated through the regular channel but that may not reach you in time, so am sending this informal note.

I have the honor to be,
Sir,
Your obedient servant,

Govt. Astronomer.

The Agent General for N.S.W.
London.

IMG 930

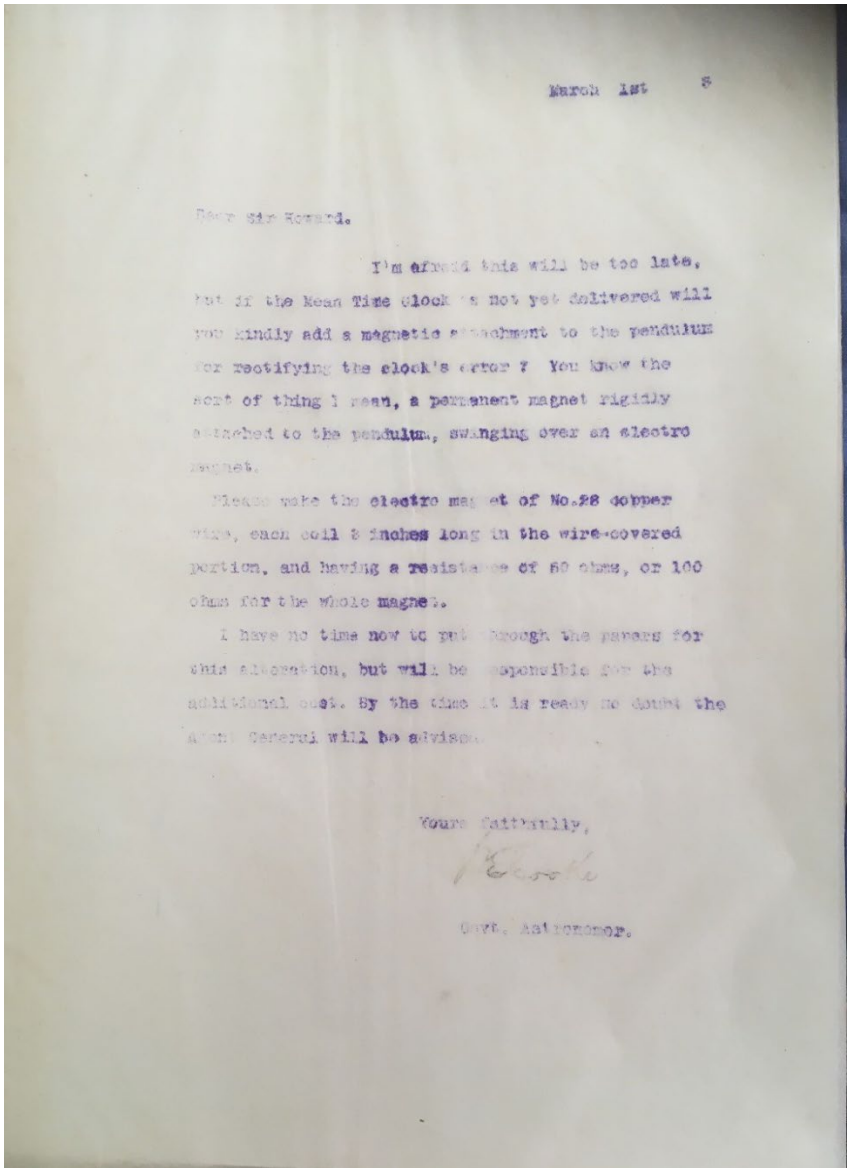
March 1st
The Agent General for N.S.W.
London
Sir,

I'm afraid I omitted to mention one little detail in connection with the Mean Time Clock ordered from Sir Howard Grubb, and have sent him a copy of the enclosed letter. Will you kindly see that there is no difficulty over the slight additional cost, which should not be more than £5 at the outside?

I have communicated through the regular channel but that may not reach you in time, so am sending this informal note.

I have the honor to be,
Sir,
Your obedient servant,
W.E. Cooke
Govt. Astronomer

Cooke is asking for a last-minute addition to the mean time clock being constructed by Grubb.It is just an electromagnet, but it is not clear whether it will generate pulses by induction, or will be used to influence the pendulum, presumably not to synchronise it, but to adjust the rate.



March 1 1

Dear Sir Howard.

I'm afraid this will be too late,
but if the Mean Time Clock is not yet delivered will
you kindly add a magnetic attachment to the pendulum
for rectifying the clock's error? You know the
sort of thing I mean, a permanent magnet rigidly
attached to the pendulum, swinging over an electro
magnet.

Please make the electro magnet of No.28 copper
wire, each coil 3 inches long in the wire-covered
portion, and having a resistance of 60 ohms, or 100
ohms for the whole magnet.

I have no time now to put through the papers for
this alteration, but will be responsible for the
additional cost. By the time it is ready no doubt the
Astron. General will be advised.

Yours faithfully,

Cooke

Govt. Astronomer.

IMG 931

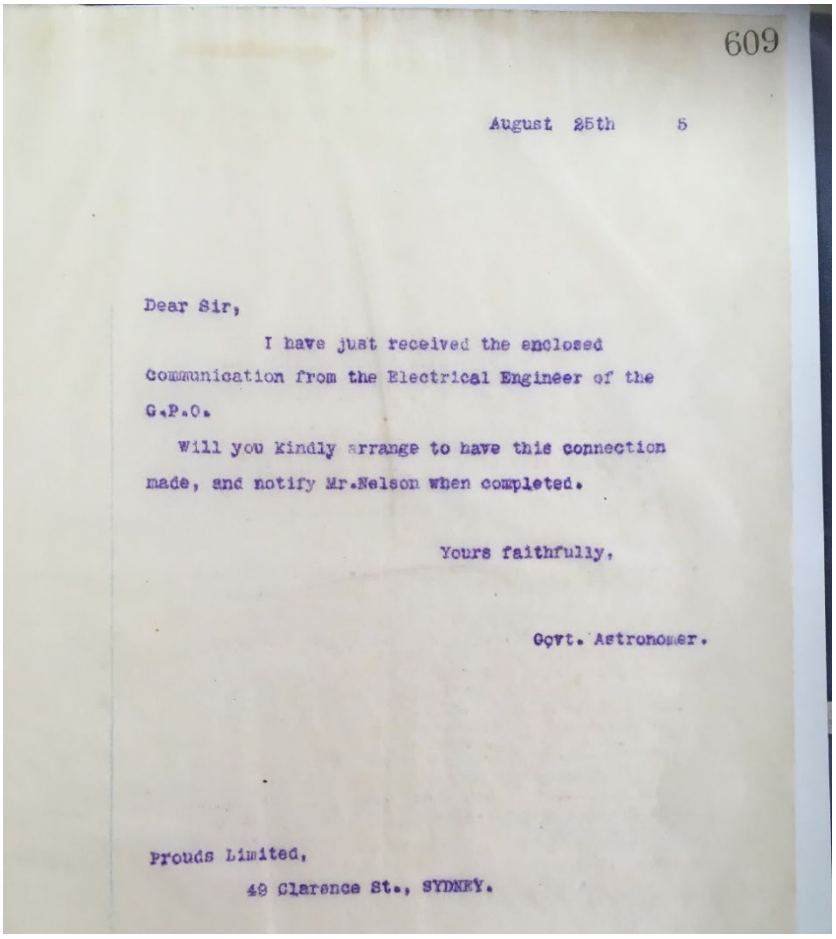
March 1st 1915?
Dear Sir Howard,
I am afraid this will be too late,
But if the Mean Time Clock is not yet delivered will
you kindly add a magnetic attachment to the pendulum
for rectifying the clock's error? You know the
sort of thing I mean, a permanent magnet rigidly
attached to the pendulum, swinging over an electro
magnet.
Please make the electro magnet of No. 28 copper

wire, each coil 3 inches long in the wire-covered portion, and having a resistance of 50 ohms, or 100 ohms for the whole magnet.

I have no time now to put through the papers for this alteration, but will be responsible for the additional cost. By the time it is ready no doubt the Agent General will be advised.

Yours faithfully,
W.E. Cooke
Govt. Astronomer

This letter makes clear that the purpose of the extra magnet is to adjust the rate of the clock..



609

August 25th 5

Dear Sir,

I have just received the enclosed Communication from the Electrical Engineer of the G.P.O.

Will you kindly arrange to have this connection made, and notify Mr.Nelson when completed.

Yours faithfully,

Govt. Astronomer.

Prouds Limited,
49 Clarence St., SYDNEY.

IMG 925

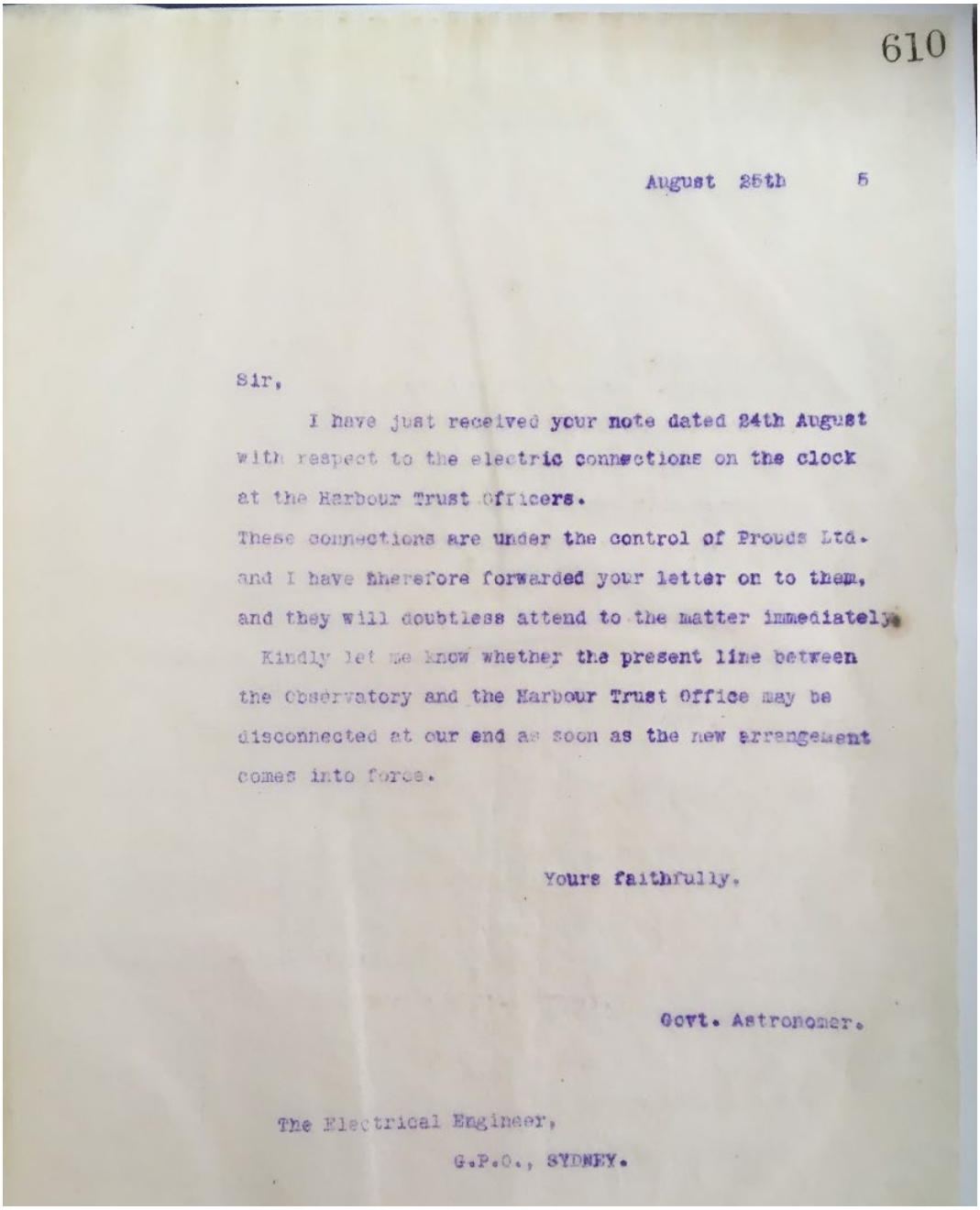
August 25 5
Prouds Limited,
49 Clarence St., SYDNEY
Dear Sir,

I have just received the enclosed communication from the Electrical Engineer of the G.P.O.

Will you kindly arrange to have this connection made, and notify Mr. Nelson when completed.

Yours faithfully,
Govt. Astronomer.

Unfortunately, the enclosure was not recorded, but the next letter is a reply.



610

August 25th 5

Sir,

I have just received your note dated 24th August with respect to the electric connections on the clock at the Harbour Trust Officers.
These connections are under the control of Prouds Ltd. and I have therefore forwarded your letter on to them, and they will doubtless attend to the matter immediately.

Kindly let me know whether the present line between the Observatory and the Harbour Trust Office may be disconnected at our end as soon as the new arrangement comes into force.

Yours faithfully,

Govt. Astronomer.

The Electrical Engineer,
G.P.O., SYDNEY.

IMG 926

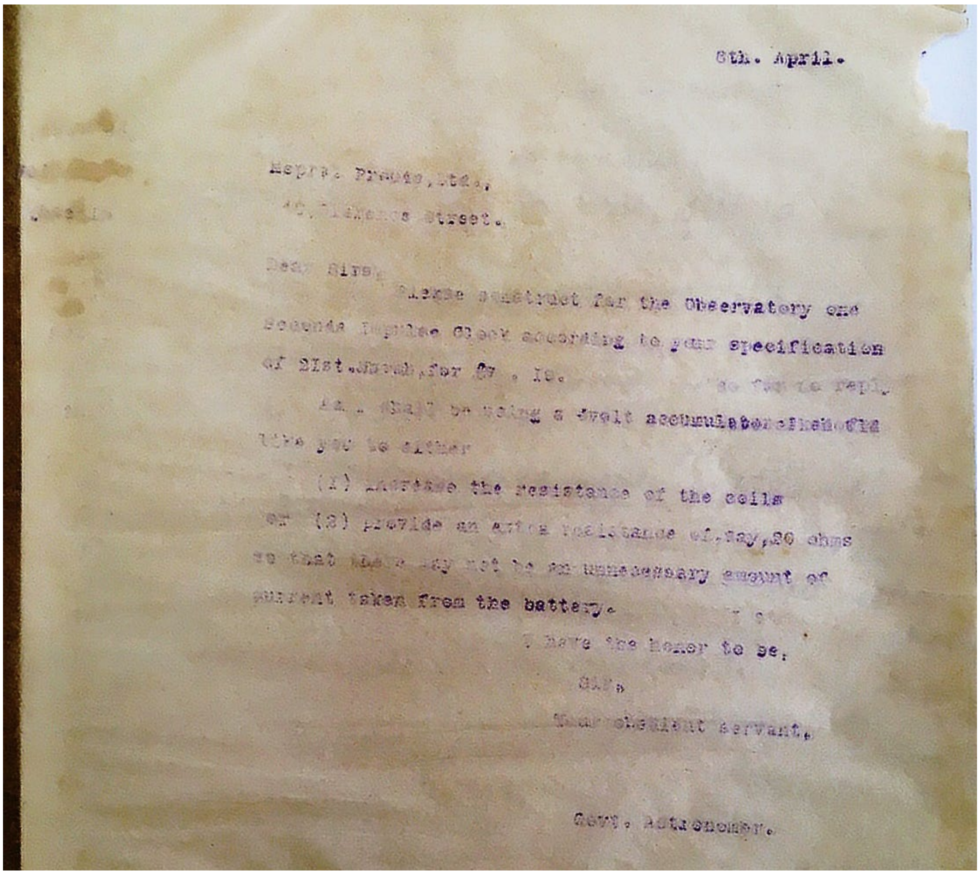
August 25th 5
The Electrical Engineer,
G.P.O., SYDNEY.
Sir,
I have just received your note dated 24th August
with respect to the electric connections on the clock
at the Harbour Trust Officers (sic).
These connections are under the control of Prouds Ltd.
and I have therefore forwarded your letter to them,
and they will doubtless attend to the matter immediately.
Kindly let me know whether the present line between
the Observatory and the Harbour Trust Office may be

disconnected at our end as soon as the new arrangement comes into force.

Yours faithfully,
Govt. Astronomer

Prouds Ltd.,
49 Clarence Street,
Sydney.

This is definite evidence of the existence of a line from the Observatory to the master clock in the Harbour Trust building. Probably, a direct line was considered by the PMG to be a violation of the rules, and they wanted the signals to go through the PMG for revenue purposes. Lawrence Taprell commented that the system in the Customs House worked well for many years apart from times when PMG technicians removed connections they did not understand.



6th. April.

Messrs. [illegible]

[illegible] Street.

Dear Sirs,

[illegible] for the Observatory one [illegible] according to your specification of 21st.[illegible], for £7 . 10.

[illegible] accumulator [illegible]

[illegible]

(1) [illegible] the resistance of the coils

or (2) provide an [illegible] of,say,20 ohms

so that [illegible] unnecessary amount of

current taken from the battery.

I have the Honor to be,

Sir,

Your obedient servant,

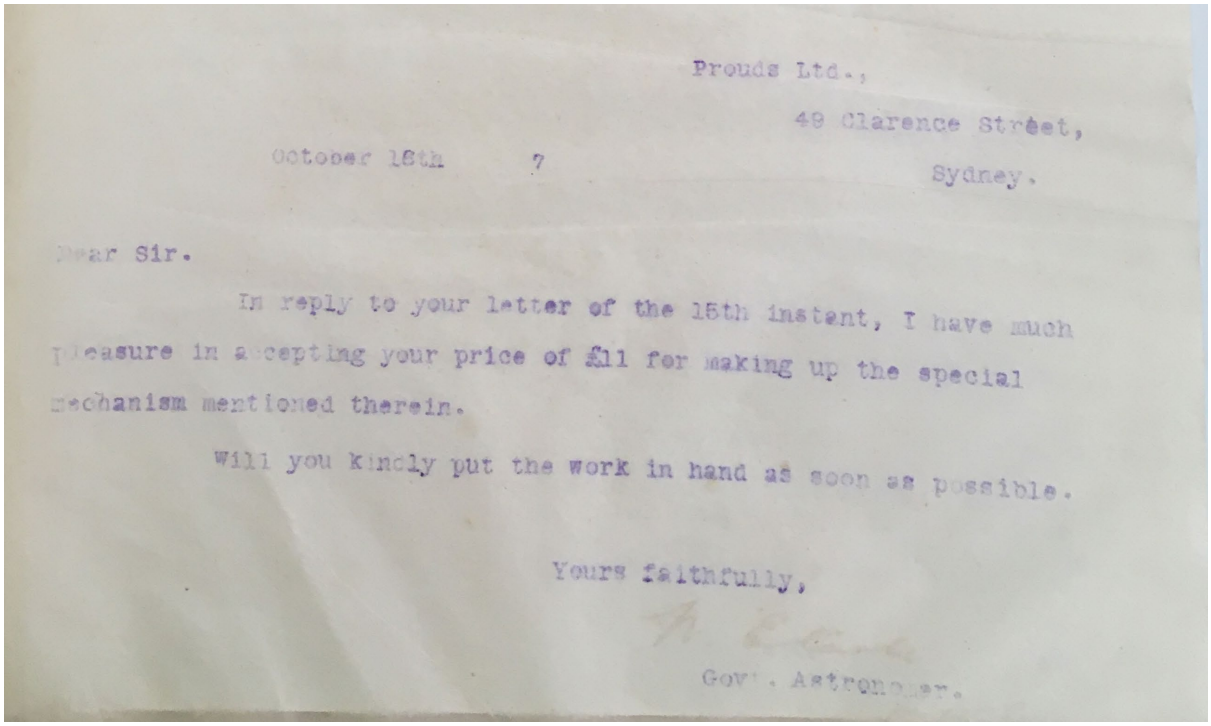
Govt. Astronomer.

IMG 921

6 th. April 1918 (?)
Messrs. Prouds Ltd.,
49 Clarence Street.
Dear Sirs,
Please construct for the Observatory one
Seconds impulse clock according to your specification
of 21st March for £7.10.
As I will be using a 3V accumulator xxxxxxxx
ask you to either
(1) Increase the resistance of the coils
or (2) provide an extra resistance of, say, 20 ohms
so that there may not be an unnecessary amount of current
current taken from the battery.

I have the honour to be,
Sir,
Your obedient servant
W.E. Cooke
Govt. Astronomer

Unfortunately, the specification has not survived. It might be the so-called 'Gross clock' (H10013-1) which is also a seconds impulse master clock but the present case and wiring are much later.



Prouds Ltd.,
49 Clarence Street,
October 16th 17 Sydney.

Dear Sir.

In reply to your letter of the 15th instant, I have much pleasure in accepting your price of £11 for making up the special mechanism mentioned therein.

Will you kindly put the work in hand as soon as possible.

Yours faithfully,

Govt. Astronomer.

IMG 921

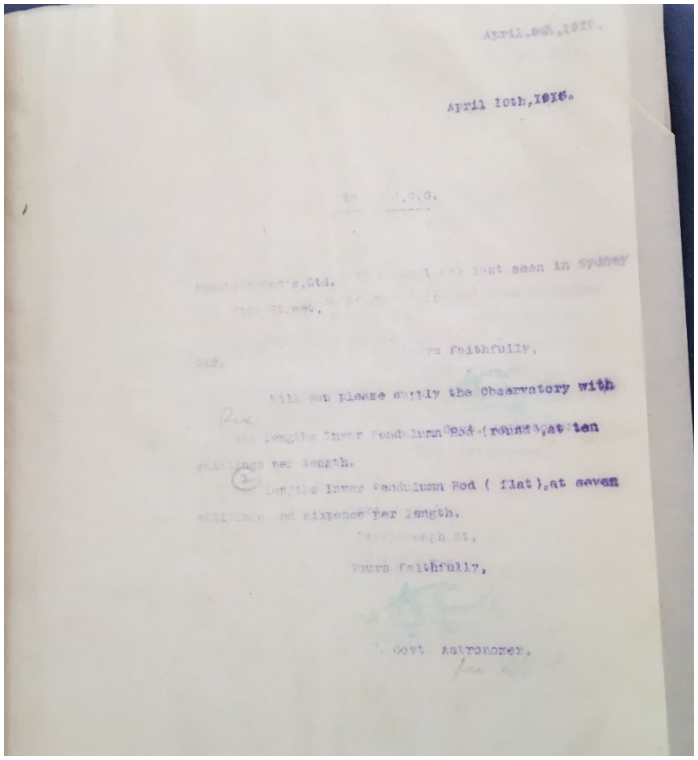
October 16, 1917

Dear Sir,

In reply to your letter of the 15th instant, I have much pleasure in accepting your price of £11 for making up the special mechanism mentioned therein.

Will you kindly put the work in hand as soon as possible.

Yours faithfully,
W.E. Cooke
Govt. Astronomer



April 10th,1916.

Will you please supply the Observatory with

Six lengths Invar Pendulum Rod (round),at ten

Two lengths Invar Pendulum Rod (flat),at seven

Yours faithfully,

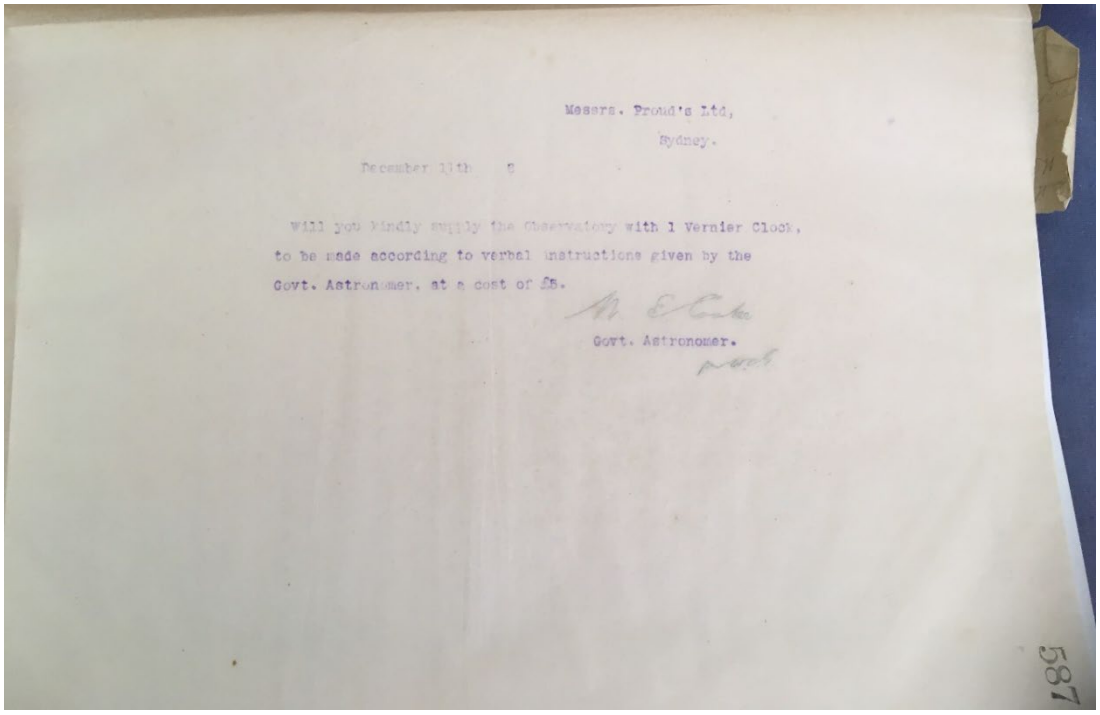
Govt. Astronomer.

IMG 924

April 10th 1916?
Messrs. Proud's Ltd.
Xxxxxxxxxx Street
Sir,
Will you please supply the Observatory with
Six lengths Invar Pendulum Rod (round), at ten
shillings per length.
Two lengths of Invar Pendulum Rod (flat), at seven
shillings and six pence per length.

Yours faithfully.
W.E. Cooke
Govt. Astronomer
Per xxx

It is not clear why the observatory needed so many invar rods unless they were building clocks themselves. But Cooke is buying complete clocks from Prouds. Perhaps he wants to retrofit other clocks in the observatory. Prouds often used flat pendulum rods in their commercial master clocks.


Messrs. Proud's Ltd,
Sydney.
December 11th 8
Will you kindly supply the Observatory with 1 Vernier Clock,
to be made according to verbal instructions given by the
Govt. Astronomer, at a cost of £5.
Govt. Astronomer.
587

IMG 923

Messrs. Proud's Ltd.
Sydney.

December 11 th 8
Will you kindly supply the Observatory with 1 Vernier clock
made according to verbal instructions given by the
Govt. Astronomer, at a cost of £5.

W.E. Cooke
Govt. Astronomer.
Per WEG(?)

Unfortunately, 'vernier clock' is not a standard term in astronomical horology, although there is a history of using a second clock ticking 59 times a minute so that the ticks come into coincidence once per minute, allowing the minutes to be counted without a dial. Item ZAA0544.19 at Greenwich Observatory was a Shortt Synchronome slave clock used to distribute such signals by wireless and was referred to as a 'vernier clock'. It dates from 1926, and Cooke was interested in wireless and may have been doing preliminary experiments. In fact, reference was made to wireless measurements in the 1920 Annual Report, and the one for 1921 reports new determinations of the longitude of Sydney Observatory. Yet the price of £5 would suggest something simpler.

Appendix 3. Timeline for Circular Quay Installation.

NB entries from Events table (4 columns) are interspersed between entries from Letters table (6 columns, in italics), all in approximately chronological order.

Date	Event	Remarks	Comments		
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
1904	Photo of Circ Quay with ferries				In 'ferry project'
1904	Prouds Ltd founded	Bought Goldstein's, partners , W.J., E.I & G.D.O. Proud	Obit SMH 24/3/1931		
21-11-1906	Synchronome fits electric clocks to ferry wharves		Daily Mail Only have Jackson clipping, not available online		
27-09-1910	SHT wires from Obs to one-o'clock gun	City of Sydney Archives	A-00238956		
1910	Annual report	Govt Astr. Position vacant			
1911	Murday migration to Australia	The Afric arrived in Sydney on 22/7/1911 where the Murdays disembarked.	Ship Manifest		
1911	W.J. Proud	187 Pitt St (Sands?)			
11/11/1911	Prouds Pty Ltd registered	(dereg 10/07/1999)	ASIC		
1911	Annual report	Govt Astr. Position vacant		Raymond	
1912	STC brochure	'our clock beating synchronous with the Mean Solar Clock at Greenwich Observatory'	Such Great…. by James Nye and David Rooney, AH, Dec 2007, 516.		

Date	Event	Remarks	Comments		
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
14-??-12	*?*	*965*	*18-638*	*Per Raymond*	*Magnets for synchronisation?*
04-04-12	*Sydney Ferries*	*927*		*W.E. Raymond*	*Telephone time – Raymond synchronisation*
1 September 1912	Article in Sun (P279)	Article on Micro-barograph (Installed in Melbourne.)	Aka microbarometer. Photograph.		
1912?	Prouds Ltd brochure 17pp 336 Kent St	Electric Clocks *(based on Reason catalogue)*	Copy from Taprells		
1912	First (?) installation	Master and 13 dials for Sun newspaper			
1912	Letter and brochure	Synchronome NSW still in operation	City of Sydney archives	1912	
25-09-12	*Perth Obs (Dodwell)*	*963*		*Govt. Astronomer Per W.E.R.*	*Return of papers on Synchronisation of clocks*
26-09-12	*Baracchi*	*956*	*18-380*	*W.E. Cooke*	*Magnetically controlled clock*
28-??-12	*Public Instruction*		*18-392*	*W.E. Cooke*	*Summary of time services*
19-11-12	*Dodwell*	*959*	*18-489*	*W.E. Cooke*	*Synchronising clocks by electromagnetic impulses*
02-12-12	*Perth*		*18-512*	*Raymond*	*Invar pendulums received*
04-12-12	*Dodwell*		*18-522*		*Harvard plates*
23-12-12	*Robertson*		*18-555*	*Cooke*	*Order Underhill electromagnet book*
23-12-12	*Robertson*		*18-555*	*Cooke*	*Order Underhill electromagnet book*

Date	Event	Remarks	Comments		
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
1912	Cooke appointed	Proposes telephone time service and wireless time signals			
01-03-?	*Grubb*		*343*	*W.E. Cooke*	*Magnetic attachment for clock on order*
?	*Kirkby*		*18-588*	*Cooke*	*Order four more relays*
14-02-12?	?		18-638	Raymond	Order six more relays
?	*Agriculture*		*18-721*	*Cooke*	*Sundial*
02-09-1912	Plan for elec. Mains to Obs. Park	A-00250137	City of Sydney Archives		
1913???	Prouds 49 Clarence St brochure	Electric Time Circuits *(Synchronome Type Controlling Clock)*			
1913	Prouds purchase business of Synchronome Electrical Coy	Supposedly from records of William Proud	John Seymour Proud via Stan Proud.		
?-02-13	*Public Instruction*		*18-624*	*W.E. Cooke*	*Advocates telephone time service*
10 February 1913	First electrical turret clock built in Australia	Murday, inventor of Micro-barograph, has just completed.. includes photo.	Sun, 10/02/1913, p5 (P274)		There is a Photograph separately
March 1913	Astronomical Association of NSW	Murday explains pendulum device. Similar has been fitted up at Mr Beattie's observatory.	Sun, 22/03/1913 p12 (P273)		

Date	Event	Remarks	Comments		
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
21-03-1913	British Astronomical Association	Murday explains pendulum device	Daily Telegraph		
18-04-13	*Andrews*		*18-731 -735*	*W.E.Cooke*	*Wireless longitude determination details*
22-04-13	*Harbour Trust*		*18-738*	*Raymond*	*Tide services*
?	*?*		*18-749*	*Raymond*	*Time and latitude and longitude*
30-06-1913	SHT Commissioners' Thirteenth Report'	Changes at CQ	'The Commissioners are about to fix at all ferry jetties in the Quay, synchronised clocks which will be	connected to the Observatory, this securing uniform and correct time.	
25 September 1913	Newspaper report	Athletograph described	Mudgee Guardian etc		
02-09-1913	Worker (Wagga)p5	Clocks connected to the observatory..	Just 4 lines		
28-10-1913	Evening News P9	Letter from Murday re unsanitary streets			
13 December 1913	Fire in Kent Street	Prouds next door at 336 Kent Street had some damage	Sun, 13/12/13 p7. (P276)		
1913?	Installation at Circular Quay	Synchronised balance wheel clocks, turret clocks, connection to observatory	Electric Clocks: Uniform Electric Time Service and What It Means		
28-12-1913	Sunday Times, p3	What Harbour Trust are doing	Mentions synchronised clocks to be installed		

Date	Event	Remarks	Comments		
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
08-01-1914	Evening News	Installation for Circular Quay	System for correct time	extensive	
09-01-1914	Correct time	Daily Telegraph			
13/01/1914	All clocks will be automatically kept in agreement	Clarence and Richmond Examiner			
10/2/1914	Letter to ed. SMH p5		Henry Daly		
17/2/1914	Letter to ed. SMH	Circular Quay clocks being installed,	Arthur J. Vogan		
17/2/1914	Letter to ed SMH p5		A.W. Tournay-Hinde		
18/2/1914	SMH p11	Rebuttal by Cooke			
Easter 1914	Prouds exhibited Murday's system of synchronised clocks.	RES catalogue page 540			
08-04-1914	Hall of Industries	SMH p33	Prouds clocks, athletograph, microbarometer		
14 May 1914	MECHANICAL AND ELECTRICAL CLOCKS	A.W. Tournay-Hinde Lecture to Engineering Association of NSW. Murday demonstrates and answers questions.	Minutes (P261) Includes all electric clocks in Sydney		
15/05/1914	SMH p10	ELECTRICAL CLOCKS	Report of Tournay-Hinde's EANSW talk		
09-10-14	*T.J. Murday*	*946*	*19-109*	*Govt. Astronomer*	*Rejection of clock*
27-11-14	*Sydney Uni*	*933/4*		*W.E. Cooke, Prof*	*Uni clocks-ticks available now for correction*
1915	SHT installation	Date given in 'The Modern Electric Time Systems' list >1940			

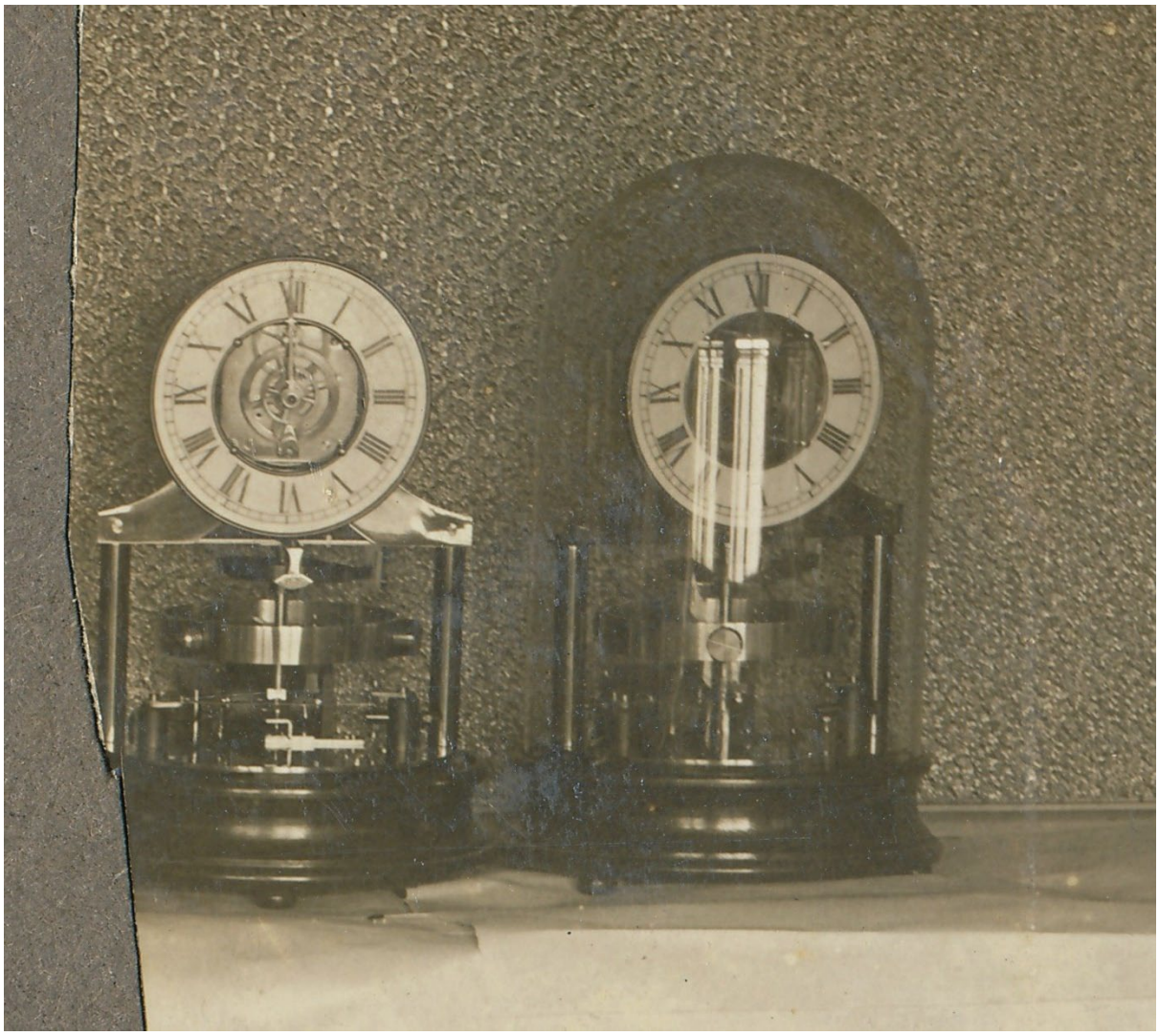
Date	Event	Remarks	Comments		
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
01-03-15	*Agent General*	*930*		*Govt. Astronomer*	*Mean Time clock*
01-03-15	*Sir Howard (Grubb)*	*931*		*W.E. Cooke*	*Magnet for Mean Time clock*
25-08-15	*Elec Eng, GPO*	*926*		*Govt. Astronomer*	*Harbour Trust clock connection*
26-08-15	*Prouds*	*925*	*19-609*	*Govt. Astronomer*	*Copy to Prouds*
14 January 1916	CLOCK-LIARS. SYDNEY BEHIND THE TIMES	Quotes Murday,. Lists several 'synchronising installations'	Sun 14/01/1916, p2 (P269) Trade Fair in Town Hall.		
17-04-1916	Prouds photographs mailed to Jackson in Brisbane	In Robert Jackson folder			
1916	Murday quoted on Weather Gun	Sun, 16 July 1916 (P282);			
1916	Annual report	No mention of time service			
16-10-17	*Prouds*	*920*		*W.E. Cooke*	*Accepts quote for mechanism*
1917	Annual report	'time distribution…worked smoothly as usual'			
1917a	Enquiry response	'certain public clocks now controlled by the Observatory standard', also telephone service			
>1917	Brochure 4pp 49 Clarence St	Uniform Electric Time Service *(Murday Type controlling Clock)*	Copy from Brisbane files		
08-04-18	*Prouds*	*921*		*Govt. Astronomer*	*Order for one seconds impulse clock*
10-04-18	*Prouds*	*924*		*W.E. Cooke per?*	*Order for Invar rods*

Date	Event	Remarks	Comments		
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
11-12-18	*Prouds*	*923*		*W.E. Cooke per?*	*Order for Vernier clock*
1918	Installation at Kingaroy School of Arts.	Turret clock with 3 dials, now in Kingaroy Heritage Museum	Restored N Heckenberg, A Roberts, J Blyth end 2009.		
28/04/1919	DT article	City of Sydney archives	A-00206675		
1919?	Panorama of CQ with ferries and trams	Probably from SHT Handbook			
1921	Annual report	Wireless vernier signal sent			
>1923	Brochure 16pp 49 Clarence St	Electric Clocks: Uniform Electric Time Service and What It Means	Original from Brisbane?	Supplied to Govt Astronomer over ten years	
1924	Photo of tram patrons at CQ	Photo1924.jpg			
1924	Obs. Annual report	List of time services	Includes control of clock in GPO	Includes control of clock at Quay	
>1925	Brochure 4pp 422-424 Kent St	Electric Time Systems	Copy from Taprells		
31-05-1926	Sydney Ferries Record	Biggest service in the world	No mention of Prouds		
04-06-1926	Sydney ferries record	Nambucca and Bellinger News			
10-06-1926	IPO of Cooke's Sunclocks Ltd	Cooke and W.J. Proud two of directors	Prospectus. Hope-Jones helped with publicity		
1927	Nangle replaces Cooke	Obs downsized	Time service continued but no mention of Circular Quay		

Date	Event	Remarks	Comments		
Date	*Addressee*	*IMG*	*page*	*writer*	*Remarks*
1928	Frank Rozzoli starts at Prouds	. Murday in charge of chronometer rating for Prouds.	Recounted by Ron Rozzoli.		
Circa 1930	Prouds installation list	Many at CQ Also marine master and 4 dials on SS Kai Kai ferry			
Circa 1931	Photograph of German wharf and ferry wharves	Includes Harbour Bridge			
>1935	Brochure 16pp, 422-424 Kent St	Modern Electric Time Systems	Copies from Taprell and Fellner		
19 February 1938	Thomas John Murday died. lived at 54 Read St, Waverley (now Bronte)	Now a modern bungalow style probably 1970's. Viewed house March 2008	Death notice Sydney Morning Herald, Monday 21 February 1938. Funeral Notice, same paper.(P278)		
1940	Brochure 20pp 168 Day St	Time; Modern Electric Recording Mechanisms. Stamped Alan Crook Electrical Co Pty Ltd Includes installations with dates.	Copy from Taprell		
09-05-1946	Photo of CQ railway works	Can see new jetties	Railway1946.doc		
1949	archivePix	No2 (Manly) wharf			
21/03/1996	Customs House Clocks	Lawrence Taprell	Includes description		

Appendix 4. An unusual Sydney variant of the Murday Horizontal Balance Wheel Clock.

A photograph in an album related to Prouds' early work held by the Taprell family shows a table covered with parts used to construct early master clocks in the foreground but in the background can be seen two balance wheel clocks.(see enlargement below)



They differ from most others in several ways.

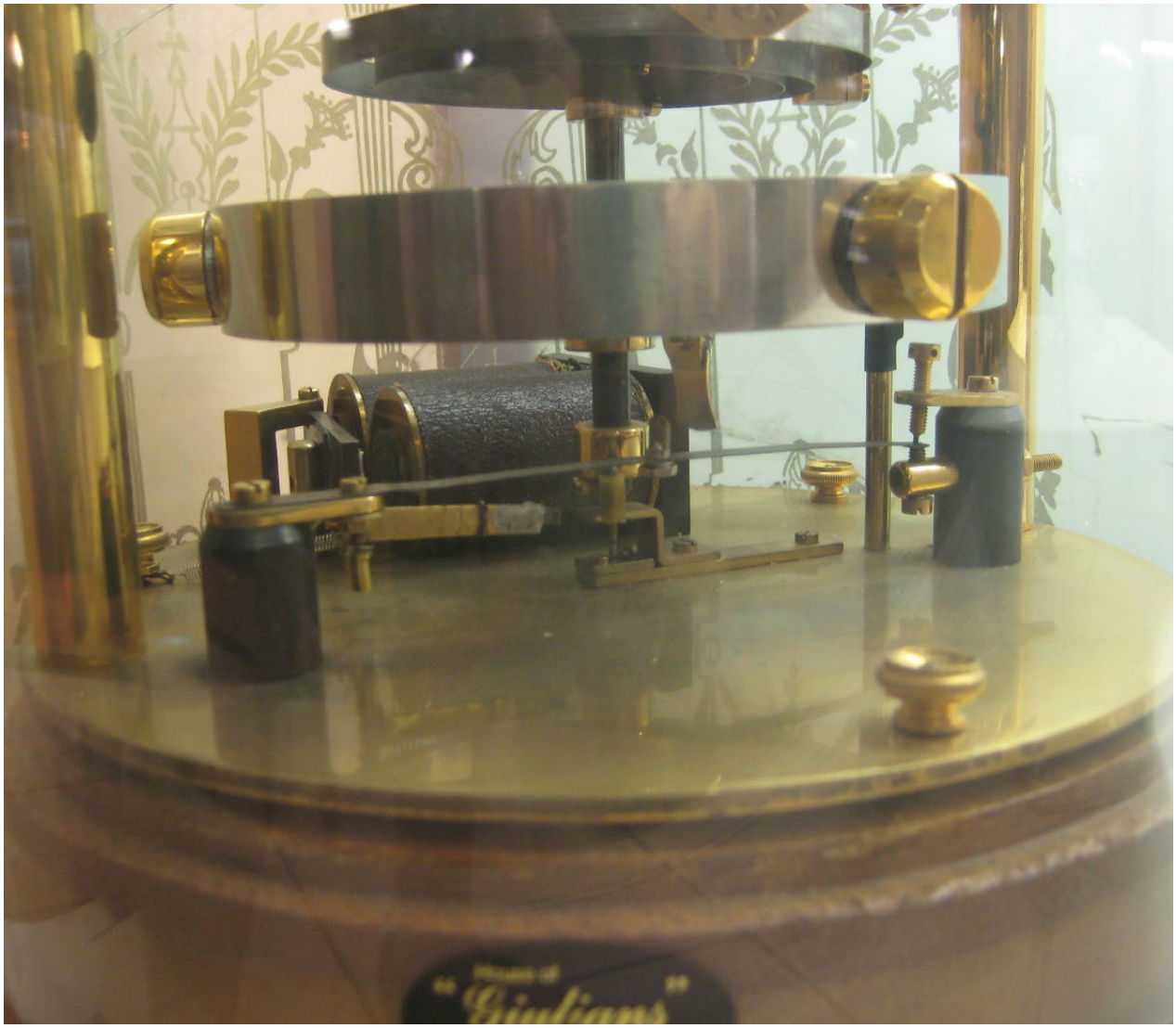
1) The dial assembly is supported by a vertical bracket rather than the usual bent strap.
2) The balance wheel has no weights apart from large screwheads at the ends of the spokes.
3) The rate adjustor has a diamond-shaped flag at its end.
4) The lower balance staff pivot is much thinner with a bracket to hold it in place.
5) The insulating posts carrying the contact assembly are dark coloured.
6) There is no Reason/ Murday maker plate.

There have been other sightings. LawrenceTaprell had one without a dial or clockwork module.

There was one in the window of Giulians watch repair shop in the arcade off Bridge St., Sydney before *c.*2010.

Its hands are standard *fleur de lys* but the dial is white material with no outer dress ring. There is no maker plate. I think the base has been modified to take a replacement dome. As

well as the unusual lower pivot, the armature seems to be held by a cock and the impulse arm seems peculiar. The coils have brass ends.



Another clock of this type was displayed at a NAWCC Chapter 72 meeting by the late Jim Hawkins. He claimed that it had been associated with the clock installation at Circular Quay.

Photo by Lindsay Bramall.

In March 2023, I was able to inspect this clock.

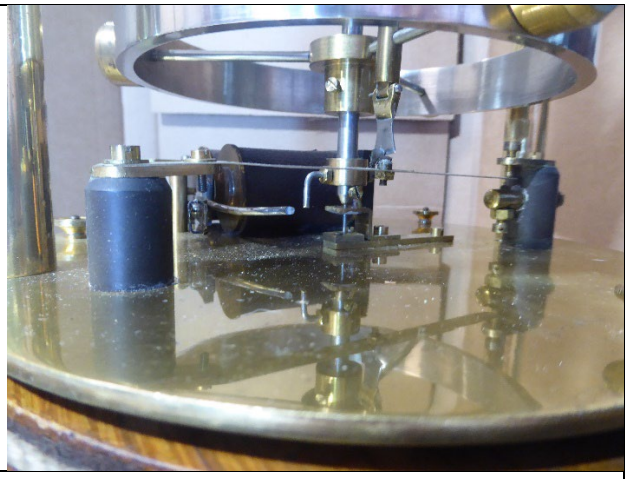
It was not running but looked to be in excellent condition. Unfortunately, the serial number on the clockwork module was covered by the supporting bracket. As in the 'Giullians' example, there is no nameplate and no threaded holes for one. The wooden base looks similar and of standard shape. There is no sign of any printing on it. The square hole in the base goes right through and the clock is lifted off it to access the battery compartment. The dial looks like milk glass with black or exceedingly dark blue markings on the front. There are dress rings inside and outside. The dial is fixed with slotted posts. The electromagnet coils are 29 mm diameter and 47 mm long, with brass end plates. The resistance of the pair is 16 ohms. The armature is pivoted rather than held by a flexure mount and has a spring to return it. The toggle looks standard but the strike plate is very peculiar. The balance spring is 6.3 mm wide and there are 7-8 turns. The balance wheel is 11.5 cm diameter.

It was not possible to dismantle the lower pivot, but it looks like a gramophone needle fitted to the balance wheel arbor, captured in a fabricated bracket. The upper pivot is similar, and there is no mechanism to lift the pivot for transport. The clockwork module looks standard, with an 8-leaf pinion on the countwheel arbor and a knurled nut to hold the minute hand. The transfer lever from the wheel to the clockwork module is far simpler than on the standard version. It lacks the flip-flop over-centre lever system. The Giullians example was almost certainly the same.

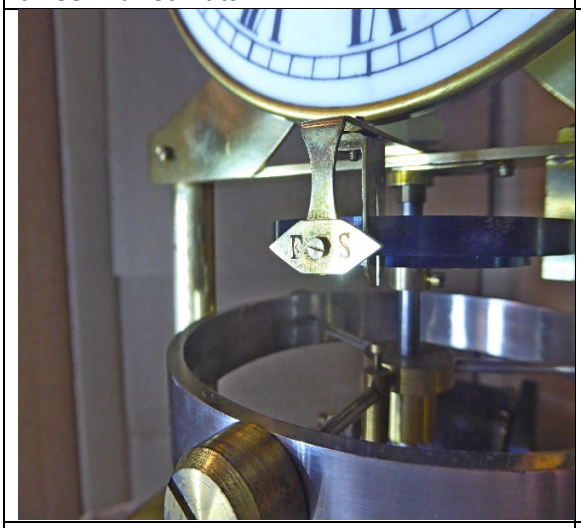
Back view

Front view

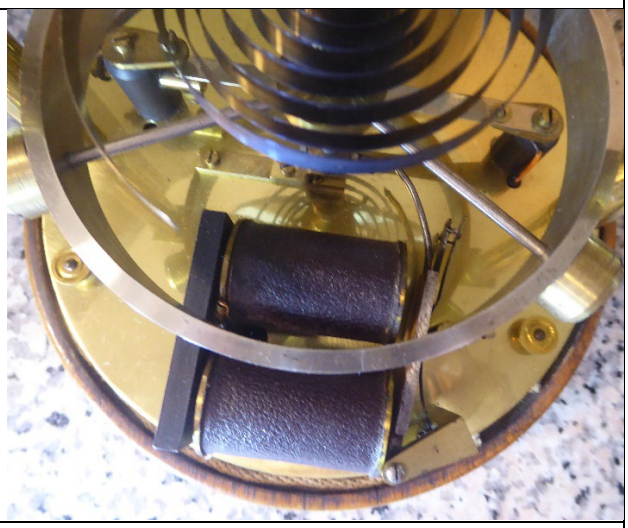
The clock is held on the wooden base by three knurled nuts



The lower pivot looks like a gramophone needle.



The characteristic diamond on the regulator arm



The coils have brass endplates and a leatherette covering

The armature is pivoted rather than being mounted on a flexure

The armature has a return spring

The transfer lever system is very simple

The serial number on the clockwork module is covered by the mounting bracket.

The impulse arm is very elaborate

The dial and hands

Unfortunately, no one was able to add anything about any link of the clock to Circular Quay. To me, it seems unlikely that it was part of any installation there, but it is a certainty that Murday used electric balance wheel clocks at Circular Quay, and it seems very likely that this is one of the clocks shown in the pre-WW 1 photograph. It was probably built in Sydney using mainly components from the Reason Manufacturing Company in Brighton, but with significant changes, either to compensate for unavailable parts, to improve performance or to simplify manufacture.

Norman Heckenberg

March 2024

Appendix 5. Electric clocks in Sydney in 1914

On 15 May 1914, the *Sydney Morning Herald* reported on a lecture to the Engineering Association of NSW, titled 'Mechanical and Electrical Clocks'. It was presented by A.W. Tournay-Hinde, late Chief Engineer of the Sulphide Corporation and Director of the Newcastle Nut and Bolt Co. Four years later he appeared in this photo, standing next to A.G Jackson, proprietor of the Synchronome Electrical Company of Australasia.

Group of Delegates to Engineering Conference, Melbourne, February 1918. Individuals have been identified left to right. Front row - A. Farrer, A. McCowan, Jas. A. Smith, Maurice E. Kernot, D.F.J. Harricks, A. McKinstry, G.A. Julius, Prof R.W. Hawken, W.R. Pulver. Second row - A.C. Mountain, W.J. Newbigin, Geo. A. Taylor, J.G. McEwin, J.P. Tivey, T.H. Kirkpatrick, A.E. Burgess, A.S. Kenyon, H.R. Harper, J.J.C. Bradfield. Top row - P.G. Tait ("Commonwealth Engineer"), D.L. Stirling (secretary), C.E. Wright, J.J. Swain, Prof. R.W. Chapman, F. Fairley (secretary, Electrical Association of Australia, Victorian section), J. Vicars, A.G. Jackson, A.W. Tournay-Hinde, (press representative).
Inscription: With title 'Group of Delegates to Engineering Conference, Melbourne, February, 1918' and names underneath.

The minutes of the meeting were published and later digitised and are available at openjournals.library.usyd.edu.au.

The report runs for 15 pages and is of great interest as Thomas Murday was present at the meeting, demonstrated several of his clocks, and answered questions. The first six pages are historical, but do mention *'Homan's Solar Chronometer'* and that *'by an ingenious method of adjusting the dial to suit the date, this sun dial gave readings in 'Mean Time' instead of Solar Time.'*(p69) It would be interesting to compare this with W.E. Cooke's Heliochronometer.

He credits Foucault with suggesting the principle of the Hipp toggle (p.71), adding that:

> Mr T.J. Murday had given a great deal of attention to this form of escapement, and had designed and patented many modifications of it during the last twenty years.
>
> Through the courtesy of Messrs. Prouds, Ltd., the author was able to exhibit several forms of Mr. T.J. Murday's latest modification of the Hipp Electric Escapement. It would be noticed that in some cases, instead of the impulse being imparted to the pendulum solely by magnetic pull, Mr. Murday made use of a lever pivoted about its centre, which carried at one end of it an armature and at the other end a small wheel, the whole arrangement being so contrived that the pull of the armature to the magnet depressed the end of the lever carrying the small wheel, which latter struck an impulse pallet attached to the pendulum. Mr. Murday informed me that he considered this a better method than relying on the magnetic pull.
>
> Although reference had only been made to pendulums operated electrically, many of the devices referred to were also used to drive balance wheels, similar to those used in watches, but on a much larger scale, a notable example of this being the "Eureka" clock, which could now be purchased at almost any clock dealer's shop. In this case the balance wheel drove the train of wheels that operated the hands.(p.72)

Tournay-Hinde then went on to describe Synchronome clocks and the work of W.H. Shortt on his so-called 'inertia escapement' that had 'somewhat similar governing properties to that possessed by the Hipp and Murday Electric Escapements previously described.'(p74)

Next, he addressed time distribution systems, citing the Standard Time Company, and the Normal Zeit Gesellschaft with its 'reporting back' function. He then made the surprising claim that 'This method of reporting back was first developed by Mr. Murday for the Standard Time Company of London and afterwards adopted by the Normal Zeit Gesellschaft.'

An appendix (see below) was attached that listed 'the electric clock installations running in Sydney so far as the author had been able to obtain the information.' This includes a number of Grau-Wagner systems, and six by Synchronome including Orchard's Jewellery Store, as well as a number of Murday systems.

The Circular Quay installation is included, but the synchronising connection to the Observatory is not mentioned. This could be just for want of space in the table. (fig 5.1)

In the Discussion section, it is explained that 'MR. MURDAY, who was present as a visitor, very ably explained several of his inventions and additions to the clock shown that evening, and his remarks met with heartiest approval of all the members present.'

Questions about spark suppression and invar were also addressed.

78 MECHANICAL AND ELECTRICAL CLOCKS

LIST OF ELECTRIC CLOCK SYSTEMS AT PRESENT IN OPERATION IN SYDNEY.

Establishment.	Master Clock.	Turret Dials	Ordinary Dials.	Location of Dials, &c.
Crau-Wagner System				
Tramway Office, corner of Elizabeth and Hunter Streets	Weight driven electric wound	...	36	Circular Quay, Fort Macquarie, Traffic Superint'd't's Office
Central Railway Station	Weight driven hand wound	...	18	On Railway Platforms.
Ultimo Power House	,,	...	8	At Ultimo Power House and later on at White Bay Power House.
Saunders' Jewellers Shop	,,	3	6	On premises.
Grace Bros. Store, Glebe	,,	4	16	,,
Farmer & Compy., Market Street	,,	...	46	,,
Murday's System				
Harbour Trust Offices	Murday-Hipp Electric Regulator.	6	...	Electrically driven Turret Clocks at Ferry Wharf Circular Quay. Synchronised from Electrical Regulator in Harbour Trust Office.
Public Works Dep.	,,	...	6	On premises, also controls programme of electric bells at fixed hours. Special programme on Saturday and silent on Sunday.
Tooth's New Brewery	,,	...	6	On premises.
Proud's Jewellery Shop	,,	...	3	,,
T. A. Edison, Ltd.	,	...	2	,,
Hotel Sydney	,	...	9	,,
Synchronome System	Synchronome			
General Post Office	Elec. Regulator	...	16	,,
Registrar Gen'r'l's Department	,,	...	23	,,
A.M.P. Society	,,	...	16	,,
Anthony Hordern's Store	,,	...	50	,,
Tooth's Old Brewery	,,	...	7	,,
Orchard's Jewellery Store.	,,	2	5	,,

Fig. 5.1. Table listing electric clock installations in Sydney in 1914.

Appendix 6. Lawrence Taprell

The late Lawrence Taprell began his apprenticeship at Prouds in 1939.

This would have been after Murday's death but he must have learned something about him from his workmates.

Taprell went on to found the company Scientific Clocks with another Prouds ex-employee, Cecil Gross, and they maintained many public clocks installed by Prouds. He also carried out work for MAAS. Over the years he collected many Murday relics, many of which his son Peter passed on to Anthony Roberts and Norman Heckenberg after his death. Lawrence's wife and daughter also lent us photographs and documents to copy.

One photograph shows Lawrence with a Murday horizontal balance wheel clock (missing its upper part) of the type discussed in Appendix 4.

One of the documents looks like notes for a presentation on the history of the clock in the Customs House, also installed by Prouds, which Lawrence and Peter both worked on. He does not mention working on the Circular Quay clocks so they may no longer have been working after the Second World War. The 'photo attached' may or may not be the one shown above.

P35

HISTORY OF THE SYDNEY CUSTOMS HOUSE CLOCKS - CIRCULAR QUAY

AND OTHER SYDNEY CITY CLOCKS at ↗.

BY LAWRENCE S.TAPRELL

ELECTRICAL HOROLOGIST

The 6 foot single faced Turret Clock was installed soon after the completion of the Customs House building in 1887, probably to coincide with the Centenary of the foundation of the colony of New South Wales.

The contract to supply and install a public clock was given to Angelo Tornaghi, a Scientific Instrument and Clock Maker, who conducted a business and workshop at No. 312 George Street, Sydney (near Hunter Street). Angelo Tornaghi was born in Milan, Italy in 1824. After supporting General Garibaldi in his military campaigns of 1848-49, he migrated to London, England and began working with the firm, Negretti and Zambra, Scientific Instrument Makers. Tornaghi arrived in Sydney in 1858, apparently to supervise the installation and adjustment of instruments supplied by Negretti and Zambra to Sydney's new Observatory and also acting as their agent in N.S.W.

"The Sands Directory of 1861", is the first record of Tornaghi's 28 Bridge Street, Sydney, business. Because of Tornaghi's London connections with scientific instrument and clock makers and the obvious business and financial support of Negretti and Zambra, Tornaghi was in a strong position to quote for the supply and installation of clocks.

The weight driven 8 day turret clock installed at Customs House has the name "Tornaghi" cast in the main frame. This at first would indicate that this was the name of the "maker", but not so. It was not an uncommon practice for local clockmakers to arrange to have their trade or personal name on an imported clock frame and in most cases on clock dials of small and large clocks. Tornaghi imported quite a number of clock movements from England. Most of the Turret clocks were made by Gillett and Bland in Croydon, London. It would appear that the Turret Clock at Customs House was made by Gillett and Bland also.

Soon after Federation, in 1901, the traffic flow increased in the Port of Sydney,and together with a rising population, the demand for uniform time became most important. The clocks around the Circular Quay area were as follows:

* The Customs House Turret Clock ~~at the ferry wharf~~.
* A Turret Clock at the site of the Old German Wharf (Overseas Terminal).
* A 4ft face, striking Turret Clock at the A.S.N. building in George Street Nth, behind the Overseas Terminal.

(This clock was removed, as was the Turret clock on the Old German Wharf during 1920 and 1930. A new A.S.N. Clock and Bell Striker was built and installed by Scientific Clock Company Pty Ltd in 1993.)

*AS DOUBLE SIDED APROX 3FT CLOCK WAS INSTALLED ON ONE OF THE FERRY WHARFS. THE DRIVING MOVEMENT WAS DESIGNED BY T.J. MURDAY, (MODIFIED BALANCE WHEEL TYPE) SIMULAR TO CLOCKS MADE BY THE BRIGHTON CLOCK CO, ENGLAND. PHOTO ATTACHED. TO THE MURDAY PATENT" 21-2-96 LJT

Page 2

* A large neonised 30 ft motorised, master controlled Clock was built for Dairy Foods. (Claude Neon was the major contractor and Scientific Clock Company and I.B.M. the sub contractors for the clock mechanisms.) This clock was situated on a building at the East end of the newly opened Cahill Expressway.

* Prior to the building of the Opera House, the site was used as a tramway terminal and offices. A German polarised 24 volt G.W. System was in use from the early part of the 20th century. (G.W. Clocks were made in Baden Baden.) A similar system was used by the N.S.W. Railways. ½ MINUTE PULSE.

In the early part of the century, Mr W.J. Proud the Jewellers of King and Pitt Street, Sydney, established an all Australian Clock making company to supply the needs of commerce and industry. (The author, L.S.Taprell, served his apprenticeship with this company from 1939 till 1944-45.) Prouds Ltd brought together a number of people in their factory at 422-24 Kent Street and 168 Day Street, Sydney, people such as C.R.O.Gross, George Gough, A.L.Franklin and the eminent British Electrical Engineer and Horologist T.J.Murday.

The synchronisation of the Clocks at Circular Quay was done by using a common Master Clock together with telephone cables and a common bank of dry cell batteries. The Master Clock designed and built by T.J.Murday, was situated in the ~~Maritime Services Building~~ HARBOUR TRUST BUILDING ? (corner of George and Alfred Streets - now demolished). The Clock at Customs House had the escapement removed and an electric escapement designed and fitted to the clock, this mechanism received a pulse each !/2 minute from the Master Clock. The idea worked very well, until P.M.G. telephone linesman, who did not have any knowledge of the special function of this circuit, assumed it was a telephone connection and often interrupted the circuit. To overcome the interference, a Synchronome master clock was at Customs House, a number of extra slave clocks were added to the circuit and the system set going again.This arrangement worked well for many years. The Turret Clock had to be wound once a week, as before. During the 1960's, A.C. power supply was extended to the area. Prior to this time the power supply was D.C. ~~The Public Works Department asked~~ Scientific Clock Company to quote for a motorised unit to drive the motion works, instead of having to wind the clock each week. (Scientific Clock Company was established in 1947 by C.R.O.Gross and L.S.Taprell.) As the Sydney area was subject to odd power interruptionsat this time, it was suggested by Scientific Clock Company that a new A.C. motorised driving movement, incorporating a 2 hour impulse accumulator, controlled by the existing Master Clock, be manufactured and installed. This work was carried out.

In 1994, (after The Customs Department had relinquished control of the building), the Synchronome Master Clock and Slave Clocks inside the Building were removed (by Peter Taprell of Scientific Clock Company) and placed at Sydney City Council Archives in Rosebery. Scientific Clock Company then supplied and installed a 240 volt synchronous impulse unit to restore the Turret Clock to working order for the general public.

NOTE
* Commonwealth Dept of Works) or CWD
- not the State P.W.D.

L. Taprell.

Appendix 7. Thomas Murday and BAA (NSW)

In March 1913, brief meeting reports appeared in the *Daily Telegraph* and *Sun* that Thomas Murday had demonstrated a clock at a meeting of the NSW branch of the British Astronomical Association.

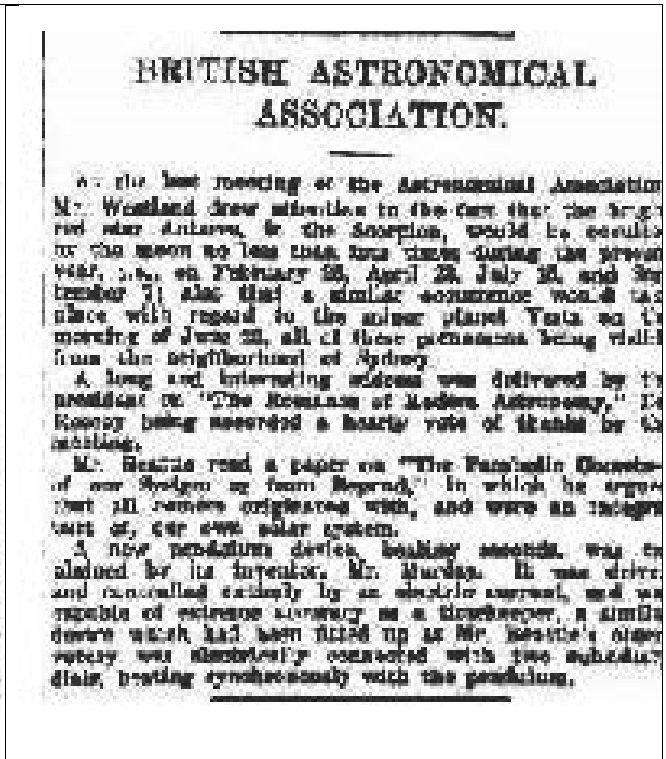
ASTRONOMICAL ASSOCIATION.

NEW SOUTH WALES BRANCH.

At the last meeting of the British Astronomical Association at the Royal Society's Rooms Mr. Westland drew attention to the fact that the bright red star Antares in the Scorpion would be occulted by the moon no less than four times during the present year, i.e., on February 28, April 23, July 18, and September 7; also that a similar occurrence would take place with regard to the minor planet Vesta on the morning of June 23, all of these phenomena being visible from the neighborhood of Sydney.

A long and interesting address was delivered by the president on "The Romance of Modern Astronomy." Dr. Roseby being accorded a vote of thanks. Mr. Beattie read a paper on "The Parabolic Comets of Our System, or From Beyond," in which he argued that all comets originated with, and were an integral part of, our own solar system. A new pendulum device, beating seconds, was explained by its inventor, Mr. Murday. It was driven and controlled entirely by an electric current, and was capable of extreme accuracy as a time-keeper. A similar device which had been fitted up at Mr. Beattie's observatory was electrically connected with two subsidiary dials beating synchronously with the pendulum.

'Sun', Saturday 22 March 1913, page 12



BRITISH ASTRONOMICAL ASSOCIATION.

At the last meeting of the Astronomical Association Mr. Westland drew attention to the fact that the bright red star Antares, in the Scorpion, would be occulted by the moon no less than four times during the present year, i.e., on February 28, April 23, July 18, and September 7; also that a similar occurrence would take place with regard to the minor planet Vesta on the morning of June 23, all of these phenomena being visible from the neighborhood of Sydney.

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A new pendulum device, beating seconds, was explained by its inventor, Mr. Murday. It was driven and controlled entirely by an electric current, and was capable of extreme accuracy as a timekeeper, a similar device which had been fitted up at Mr. Beattie's observatory was electrically connected with two subsidiary dials, beating synchronously with the pendulum.

Daily Telegraph, Friday 21 March 1913, page 5

Curator of Astronomy Andrew Jacob knew that these meetings were reported in the BAA Journal published in London but I could not find an online version. There are bound copies in the library of the Sydney Skywatchers in the Observatory tower, as well as some other archives.

The report in *The Journal of the British Astronomical Association*, vol XXIII, 7, 312-313 adds a little more to the newspaper report. After a presentation by Mr E.H. Beattie on parabolic comets,

> Mr T.J. Murday exhibited and explained an electrically driven and controlled pendulum invented by himself. The apparatus was similar to that which he recently installed in Mr. Beattie's observatory in Mosman, in which two subsidiary dials were electrically controlled, with centre seconds, one of which was fitted with a bell indicating the commencement of each minute.

Beattie was a very active member of the group and was elected Honorary Treasurer in 1910. He lived in Mosman as did Murday. From a 1909 membership list, we learn that Beattie lived at 'Venezia', Orlando Ave. Other talks in that period included weather matters, like the influence of sunspots, that might have been of interest to Murday.

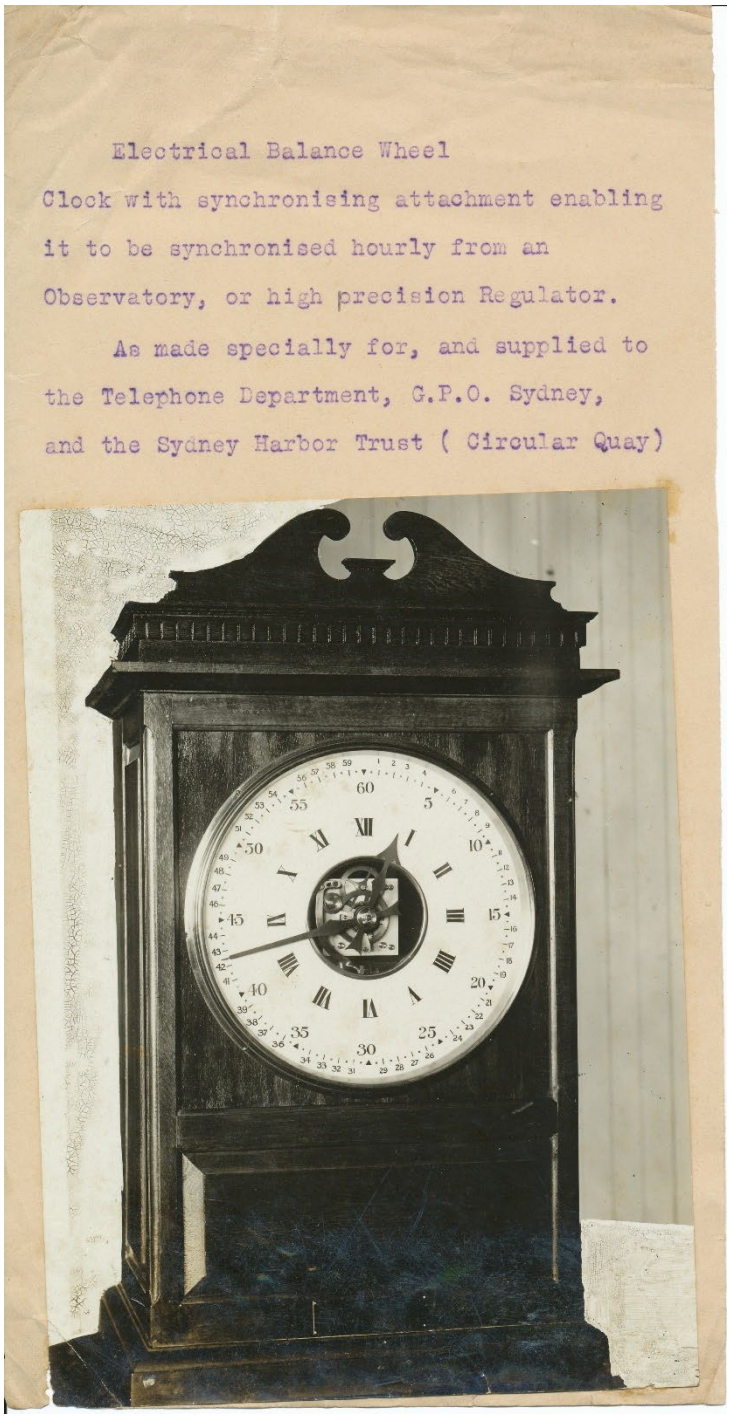
Although a box with the journals in the tower contained original minute books over many years, those for 1911-1927 are not present, and may well have been discarded. These may have contained some more information, but the notes were not usually voluminous. Some financial records are present, and they show that Murday was a financial member for several years.

Page 29 of the financial records, 1912/13, shows Murday paying £1/2/6 in June. That was probably a 5/- joining fee, plus 17/6 annual subscription. On p.39 we find a subscription of 17/6 for 1913/14, and on p.47,1916/17, he paid £1/15/- for 'last and present' years. I could not find any subsequent record of any subscriptions from him, at least out to 1928.I did not see an entry for 1914/15 but may have missed it. Anyway, he was a member for five years, and would have met Esdaile and Cooke there if not elsewhere.

Prouds clock(s) at Sydney GPO

Around 1913, Prouds Electric Clocks and Scientific Instruments installed a network of electric clocks on the ferry terminal at Circular Quay.

These included a special local master clock that controlled clocks visible to the public. This master clock was in turn synchronised to the mean time standard clock at Sydney Observatory. Among the public-facing clocks were several electric horizontal balance wheel clocks fitted with special synchronising attachments that, on receipt of a current pulse on the hour, would move the hands to the correct position, correcting any slight error that had built up over the preceding hour.


Electrical Balance Wheel
Clock with synchronising attachment enabling
it to be synchronised hourly from an
Observatory, or high precision Regulator.
As made specially for, and supplied to
the Telephone Department, G.P.O. Sydney,
and the Sydney Harbor Trust (Circular Quay)

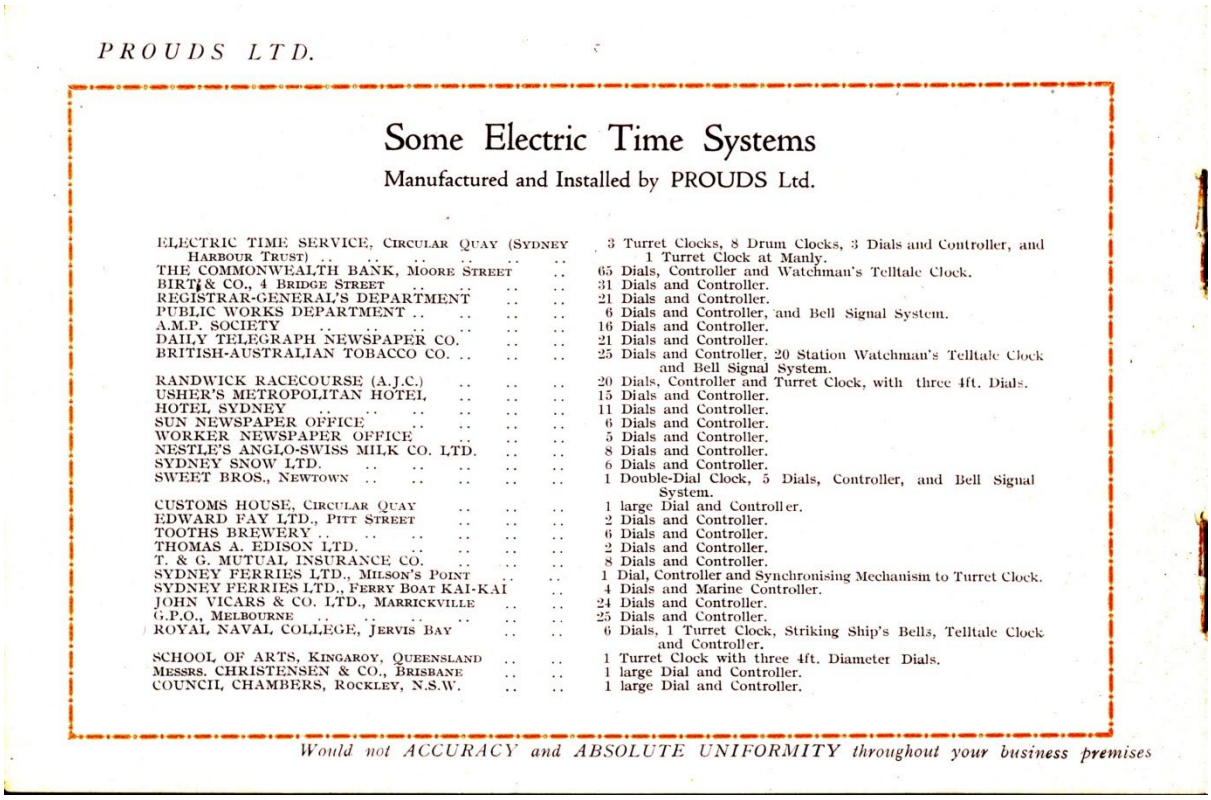
According to Prouds documents and press reports, at least one similar synchronised clock was installed at the GPO, Sydney.

In later years, Prouds became a major supplier of clock systems in factories and offices, Parliament House in Canberra, and some post offices.

A photograph with attached explanation sent by Prouds to A.J. Jackson in Brisbane in 1916.

The installation at the GPO is mentioned in advertising material produced by Prouds:

Circa 1923



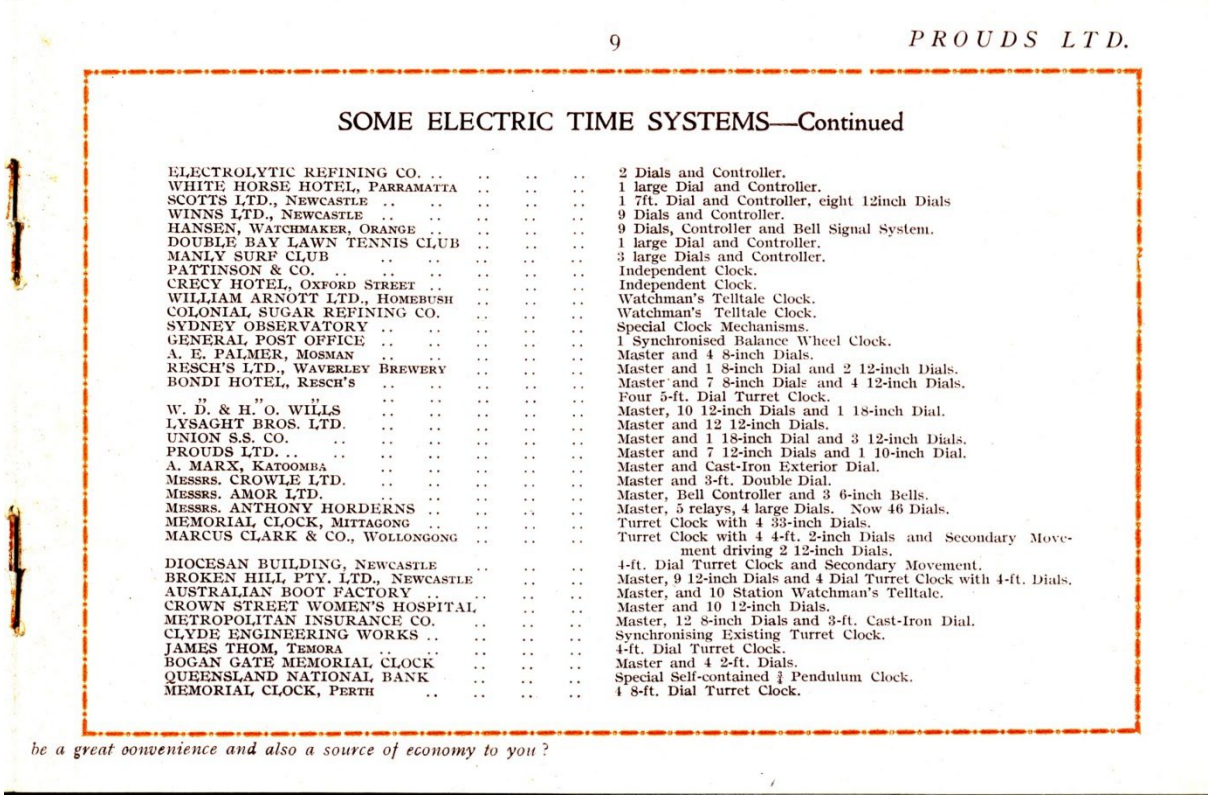
PROUDS LTD.

Some Electric Time Systems

Manufactured and Installed by PROUDS Ltd.

ELECTRIC TIME SERVICE, Circular Quay (Sydney Harbour Trust)	3 Turret Clocks, 8 Drum Clocks, 3 Dials and Controller, and 1 Turret Clock at Manly.
THE COMMONWEALTH BANK, Moore Street	65 Dials, Controller and Watchman's Telltale Clock.
BIRT & CO., 4 Bridge Street	31 Dials and Controller.
REGISTRAR-GENERAL'S DEPARTMENT	21 Dials and Controller.
PUBLIC WORKS DEPARTMENT	6 Dials and Controller, and Bell Signal System.
A.M.P. SOCIETY	16 Dials and Controller.
DAILY TELEGRAPH NEWSPAPER CO.	21 Dials and Controller.
BRITISH-AUSTRALIAN TOBACCO CO.	25 Dials and Controller, 20 Station Watchman's Telltale Clock and Bell Signal System.
RANDWICK RACECOURSE (A.J.C.)	20 Dials, Controller and Turret Clock, with three 4ft. Dials.
USHER'S METROPOLITAN HOTEL	15 Dials and Controller.
HOTEL SYDNEY	11 Dials and Controller.
SUN NEWSPAPER OFFICE	6 Dials and Controller.
WORKER NEWSPAPER OFFICE	5 Dials and Controller.
NESTLE'S ANGLO-SWISS MILK CO. LTD.	8 Dials and Controller.
SYDNEY SNOW LTD.	6 Dials and Controller.
SWEET BROS., Newtown	1 Double-Dial Clock, 5 Dials, Controller, and Bell Signal System.
CUSTOMS HOUSE, Circular Quay	1 large Dial and Controller.
EDWARD FAY LTD., Pitt Street	2 Dials and Controller.
TOOTHS BREWERY	6 Dials and Controller.
THOMAS A. EDISON LTD.	2 Dials and Controller.
T. & G. MUTUAL INSURANCE CO.	8 Dials and Controller.
SYDNEY FERRIES LTD., Milson's Point	1 Dial, Controller and Synchronising Mechanism to Turret Clock.
SYDNEY FERRIES LTD., Ferry Boat Kai-Kai	4 Dials and Marine Controller.
JOHN VICARS & CO. LTD., Marrickville	24 Dials and Controller.
G.P.O., Melbourne	25 Dials and Controller.
ROYAL NAVAL COLLEGE, Jervis Bay	6 Dials, 1 Turret Clock, Striking Ship's Bells, Telltale Clock and Controller.
SCHOOL OF ARTS, Kingaroy, Queensland	1 Turret Clock with three 4ft. Diameter Dials.
Messrs. CHRISTENSEN & CO., Brisbane	1 large Dial and Controller.
COUNCIL CHAMBERS, Rockley, N.S.W.	1 large Dial and Controller.

Would not ACCURACY and ABSOLUTE UNIFORMITY throughout your business premises



9 *PROUDS LTD.*

SOME ELECTRIC TIME SYSTEMS—Continued

ELECTROLYTIC REFINING CO.	2 Dials and Controller.
WHITE HORSE HOTEL, Parramatta	1 large Dial and Controller.
SCOTTS LTD., Newcastle	1 7ft. Dial and Controller, eight 12inch Dials
WINNS LTD., Newcastle	9 Dials and Controller.
HANSEN, Watchmaker, Orange	9 Dials, Controller and Bell Signal System.
DOUBLE BAY LAWN TENNIS CLUB	1 large Dial and Controller.
MANLY SURF CLUB	3 large Dials and Controller.
PATTINSON & CO.	Independent Clock.
CRECY HOTEL, Oxford Street	Independent Clock.
WILLIAM ARNOTT LTD., Homebush	Watchman's Telltale Clock.
COLONIAL SUGAR REFINING CO.	Watchman's Telltale Clock.
SYDNEY OBSERVATORY	Special Clock Mechanisms.
GENERAL POST OFFICE	1 Synchronised Balance Wheel Clock.
A. E. PALMER, Mosman	Master and 4 8-inch Dials.
RESCH'S LTD., Waverley Brewery	Master and 1 8-inch Dial and 2 12-inch Dials.
BONDI HOTEL, Resch's	Master and 7 8-inch Dials and 4 12-inch Dials.
" "	Four 5-ft. Dial Turret Clock.
W. D. & H. O. WILLS	Master, 10 12-inch Dials and 1 18-inch Dial.
LYSAGHT BROS. LTD.	Master and 12 12-inch Dials.
UNION S.S. CO.	Master and 1 18-inch Dial and 3 12-inch Dials.
PROUDS LTD.	Master and 7 12-inch Dials and 1 10-inch Dial.
A. MARX, Katoomba	Master and Cast-Iron Exterior Dial.
Messrs. CROWLE LTD.	Master and 3-ft. Double Dial.
Messrs. AMOR LTD.	Master, Bell Controller and 3 6-inch Bells.
Messrs. ANTHONY HORDERNS	Master, 5 relays, 4 large Dials. Now 46 Dials.
MEMORIAL CLOCK, Mittagong	Turret Clock with 4 33-inch Dials.
MARCUS CLARK & CO., Wollongong	Turret Clock with 4 4-ft. 2-inch Dials and Secondary Movement driving 2 12-inch Dials.
DIOCESAN BUILDING, Newcastle	4-ft. Dial Turret Clock and Secondary Movement.
BROKEN HILL PTY. LTD., Newcastle	Master, 9 12-inch Dials and 4 Dial Turret Clock with 4-ft. Dials.
AUSTRALIAN BOOT FACTORY	Master, and 10 Station Watchman's Telltale.
CROWN STREET WOMEN'S HOSPITAL	Master and 10 12-inch Dials.
METROPOLITAN INSURANCE CO.	Master, 12 8-inch Dials and 3-ft. Cast-Iron Dial.
CLYDE ENGINEERING WORKS	Synchronising Existing Turret Clock.
JAMES THOM, Temora	4-ft. Dial Turret Clock.
BOGAN GATE MEMORIAL CLOCK	Master and 4 2-ft. Dials.
QUEENSLAND NATIONAL BANK	Special Self-contained ¾ Pendulum Clock.
MEMORIAL CLOCK, Perth	4 8-ft. Dial Turret Clock.

be a great convenience and also a source of economy to you?

1929 installation list

GADSBY & CO., Sydney	1-8ft. dial over Paragon Hotel, Circular Quay, Sydney, and Master.
G.P.O., Melbourne	25 dials and Master.
G.P.O., Sydney	1 Synchronised Clock. 7-12in. dials. (Sydney to City South Exchange).
GOVERNMENT SAVINGS BANK, Sydney	40 dials and Master.
GRAND HOTEL, Sydney	3 dials and Master.

Circa 1935

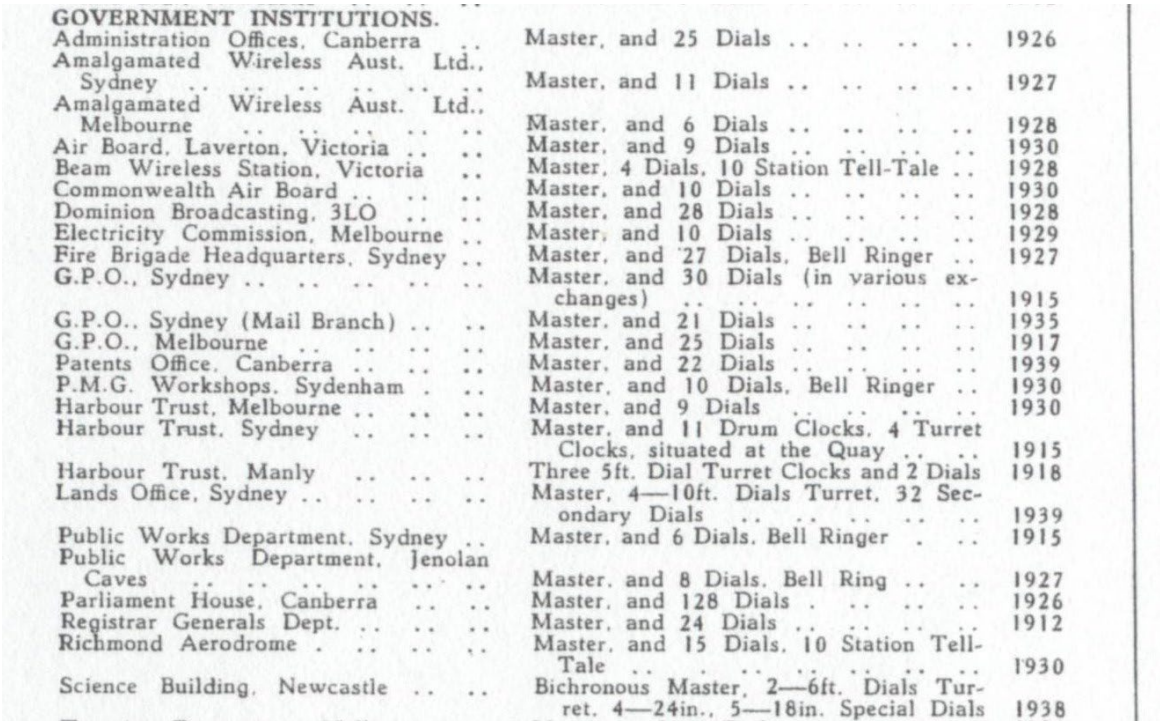
PROUDS LTD. 422-424 Kent Street SYDNEY

MODERN ELECTRIC TIME SYSTEMS

Some of the Important Installations manufactured and installed by Prouds, Ltd.:—

(A.J.C.) RANDWICK RACECOURSE	20 dials, Master, and Turret Clock, with three 4ft. dials.
(A.J.C.) WARWICK FARM RACECOURSE	16 dials (8in., 12in., 18in., 30in.), and Master
A.M.P. SOCIETY	16 dials and Master.
ANTHONY HORDERN & SONS LTD.	46 dials and Master.
AUSTRALIAN BOOT FACTORY	10 Station Telltale and Master.
AUSTRALIAN GASLIGHT CO., Mortlake	14 dials (8in., 12in., 18in.), and Master.
AUSTRALIAN GASLIGHT CO., Sydney	1 dial (24in.) and Master, synchronising 4 Bundy Clocks.
AUSLEBROOK & CO., New Zealand	20 Station Telltale.
BIRT & CO., 4 Bridge Street	31 dials and Master.
BRITISH AUSTRALIAN TOBACCO CO.	25 dials, 20 Station Telltale, Bell System, and Master.
BROKEN HILL PTY. LTD.	10 dials, 4-dial Turret Clock, 4ft. dials and Master.
BATHURST HOUSE	3–12in., 1–24in. (Exterior) dials and Master.
BARRABA MEMORIAL CLOCK	4-dial, 3ft. Turret.
BIRKS & CO., Adelaide	12 dials and Master.
BALMORAL SURF CLUB	1–20in., dial and Master.
COMMONWEALTH BANK, Sydney	65 dials, Master, and Telltale Clock.
CUSTOMS HOUSE	1 large dial and Master.
COUNCIL CHAMBERS, Rockley, N.S.W.	1 large dial and Master.
COLONIAL SUGAR REFINING CO.	7 dials, Telltale Clock, and Master.
CROWLE LTD.	3ft. double dial and Master.
CROWN STREET WOMEN'S HOSPITAL	10 dials and Master.
CLYDE ENGINEERING WORKS	Turret Clock. synchronised.
COMMERCIAL TRAVELLERS' CLUB	7 dials and Master.
CATHCART HOUSE	9 dials and Master.
CIVIL SERVICE STORES	6 dials and Master.
COLONIAL MUTUAL FIRE INS. CO.	2 dials, 2-dial exterior Clock and Master.
CITY TATTERSALLS' CLUB	Master Clock.
COOGEE SURF CLUB	1–20in. dial and Master.
"DAILY TELEGRAPH"	21 dials, one 24in., Exterior, and Master.
DIOCESAN BUILDING, Newcastle	4ft. dial Turret Clock and secondary movement.
DALGETY'S. LTD.	9 dials and Master.
DIXON, ROBERT C., Castle Hill	14 dials and Master, 10 specials.
EDWARD FAY LTD.	2 dials and Master.
ELECTROLYTIC REFINING CO.	2 dials and Master.
EDWARD FAY LTD., Market Street	1–4ft., 2–20in., 1–24in. dials and Master.
"EVENING NEWS" OFFICE	18 dials and Master, Telltale synchronised.
ELLIOTT BROS. LTD.	6 dials and Master, Calendar and 2 Bundy Clocks, synchronised.
FALLON'S HOTEL	3-dial 3ft. Turret Clock and Master.
G.P.O., MELBOURNE	25 dials and Master.
G.P.O., SYDNEY	1 Synchronised Clock, 7–12in. dials. (Sydney to City South Exchange.)
HOTEL SYDNEY	11 dials and Master.

1940 installation list



GOVERNMENT INSTITUTIONS.		
Administration Offices, Canberra	Master, and 25 Dials	1926
Amalgamated Wireless Aust. Ltd., Sydney	Master, and 11 Dials	1927
Amalgamated Wireless Aust. Ltd., Melbourne	Master, and 6 Dials	1928
Air Board, Laverton, Victoria	Master, and 9 Dials	1930
Beam Wireless Station, Victoria	Master, 4 Dials, 10 Station Tell-Tale	1928
Commonwealth Air Board	Master, and 10 Dials	1930
Dominion Broadcasting, 3LO	Master, and 28 Dials	1928
Electricity Commission, Melbourne	Master, and 10 Dials	1929
Fire Brigade Headquarters, Sydney	Master, and 27 Dials, Bell Ringer	1927
G.P.O., Sydney	Master, and 30 Dials (in various exchanges)	1915
G.P.O., Sydney (Mail Branch)	Master, and 21 Dials	1935
G.P.O., Melbourne	Master, and 25 Dials	1917
Patents Office, Canberra	Master, and 22 Dials	1939
P.M.G. Workshops, Sydenham	Master, and 10 Dials, Bell Ringer	1930
Harbour Trust, Melbourne	Master, and 9 Dials	1930
Harbour Trust, Sydney	Master, and 11 Drum Clocks, 4 Turret Clocks, situated at the Quay	1915
Harbour Trust, Manly	Three 5ft. Dial Turret Clocks and 2 Dials	1918
Lands Office, Sydney	Master, 4—10ft. Dials Turret, 32 Secondary Dials	1939
Public Works Department, Sydney	Master, and 6 Dials, Bell Ringer	1915
Public Works Department, Jenolan Caves	Master, and 8 Dials, Bell Ring	1927
Parliament House, Canberra	Master, and 128 Dials	1926
Registrar Generals Dept.	Master, and 24 Dials	1912
Richmond Aerodrome	Master, and 15 Dials, 10 Station Tell-Tale	1930
Science Building, Newcastle	Bichronous Master, 2—6ft. Dials Turret, 4—24in., 5—18in. Special Dials	1938

The ‘synchronised clock’ is not mentioned in the installation list from about 1940, so may have been removed or replaced by then.