[[NB09-001]]

[[BLANK PAGE]]

Outstanding Jobs on the Computer.
1. Spikes on Output Waveforms
2. Fault Sheets outstanding.
3. Photoelectric Tape Reader.
4.

Programme sheets to be filed near control desk.

Maintenance Schedule.

[[NB09-002]]

1-2-52

Almost everything went wrong today.
Last evening it had been decided that a third relay had failed in the Output Units, and for the first couple of hours we swapped relays around between reader and output unit. ~~On restarting~~, Rectifiers were used also then to kill [[swinging]] on these output relays.
There were still faults however and eventually all rectifiers were removed. Two faults were put on in the process of changing relays. In the reader the adjustment of the new relay caused extra end pulses

In the output unit, part of the chassis had to be cut away to accommodate the new relay. Some of the filings found their way in between layers of ~~the~~ an adjacent 6D2 valve holder causing ~~50~~ heater AC short onto ~~the~~ an input grid.
Having sorted out all of this then it was discovered that the same fault was occurring. Eventually it was decided that the cause of the trouble was ~~the~~ an SP61 whose grid was sticking up positive in spite of the -15v applied to its grid leak.

[[NB09-003]]
Thus it was that by midday we had cured a fault which had occurred last evening. Tape Reader trouble now broke out again and JMP spent sometime readjusting same
Eventually P_2 was put on and sailed thro with occasional trouble none of them very serious (one possibly caused by an electric drill)
At the start of P_3 a new tape reader fault developed This time it was a wire off - probably pulled off in the readjusting process.
When I left P_9 was proceeding apace.

In my maintenance schedule I am planning for a voltage amplitude check being made with a repeating programme such as M8. It must be remembered that if a fault occurs subsequent to standard readings being taken ~~then a new slate~~ any modification may increase (or decrease one or more of these pulses.
In order to check on this it would be desireable to keep all the readings in a book so that they can be checked not only against standard readings but also against all previous readings

[[NB09-004]]
a Maint Schedule
b Collater.
c Converter - Annex
d Test Programme sheets
e Output circuit tests
f Clean up units.
g Discuss Spares Position
h Starter Order.
i Test equipt for gast tubes No
j Tape reader. Experiments ?
Relay Replacements
Panel 30.

[[DIAGRAM]]

[[NB09-005]]

Progress Meeting 5-2-52

P

On Friday evening ~~the~~ Leo worked like a dream completing P_2 P_3 by 820 and going on to OJI [[Trajo]] without a stop & completing a good run on them by 1030
On Saturday it obliged with OJ2 Raindrop completing this also without a hitch.
Today all the temporary mods that had been done in conjunction with E & G were cleared up together with one outstanding on the

Coder Units.
Shaw has done some small mods on the Annexe and should be ready to work ~~on the~~ in conjunction with Clawson on the Converter by tomorrow morning.
I have made the necessary arrangements to have the Collater equipment moved out of the way of the STC gang, and will then be able to continue some work on this
Miss Hills has not yet completed working out January results on Time analysis I must complete these by tomorrow.

[[NB09-006]]
(a) Time Analysis
(b) Shift Collater
(c) Annexe / Converter
(d) Maint Schedule
(e) Collater Work.
(f) Frequency Test (?Panel 30)

I am asking for a program which will enable amplitude tests to be carried out on the machine on a [[reordering]] basis.
The snag is that it would be desirable to leave out any part of the machine that might be out of action so that this would not hold up tests.
This would be possible if the programme called for a second tape on which was punched a ref to any section that had to be omitted.

[[NB09-007]]

T A S E S E G

T R E Co

Parl. 23 dig + sign
CRT store
[[scan]] Mag Drum
Active stats fo 0 & 1
2048 x 32 . [[phasing]] wheel . [[??]]

[[DIAGRAM - CIRCUIT]]

[[DIAGRAM - CIRCUIT]]

[[NB09-008]]
To renew tape on [[Reperforts]]
Without removing cover take off old spool and tear off tape leaving a length of 6" at spool end.
Mount New spool inposition and attach end to the end of old tape run through enough tape to remove join. Tear off.

Collater for Mr TRT
~~Thursday~~ Wednesday next week

LEO Demonstration 3rd March

C 27-
Tape Reader
W16
Output Unit
Reconverter Hook up.

[[NB09-009]]

Test Recordings

In order to record on a loop of magnetic tape any repeated patterns using Collater Equipment
(a) Translate the pattern from Leo code to Binary +16 thus.

Leo Code	Binary + 16
S	2
L	25
CR	18
LF	15
+	1
0	29
1	13

2	9
3	0
4	26
5	17
6	5
7	12
8	28
9	19

(b) Perforate tape with single ~~group~~ pattern using this conversion
(c) Connect Autotransmitter up to Collater Control box 6 7 & 8 pins

connected to corresponding sockets on Control box. Do not plug in directly but Cross connect with leads.
(d) Form Punched tape into loop & set up on autotransmitter ready for transmitting.
(e) Feed thro sufficient tail into tape box to form ~~the~~ sufficient blank tape for ~~the~~ a tight outer loop
(f) Start Autotransmitter & thus commence recording.
(g) Read back recording onto collater teleprinter.

[[NB09-010]]

12-2-52.

Completed my first attempt at a maintenance schedule yesterday.
There is constant conflict these days for time on the machine. Programmers have always jobs outstanding. At present it is OJI the trajectory routine for MOS (that is in addition to normal routine work.
At the same time the Annex is being linked to the Converter. This is a sore point as it means that while the machine is being used for other jobs Clawson of STC is standing

idle unless the brief moment when ~~the~~ Leo is used with the converter has shown up ~~sho~~ some shortcoming that can be put to rights.
One of the difficulties with the STC gear up to yesterday was that of recording suitable message on tape to be converted. I happened to mention this to [[Mitch]] while at Cambridge on Thursday last and he suggested using the Autotransmitter with a loop of punched tape.
At first I though this would be a bit awkward as it involved a code translation from

[[NB09-011]]
binary to Leo Code, but it was tried yesterday and found to be very effective The routine has been noted down, prior to this note.
I have had another try at establishing a routine for checking ~~the~~ tape recordings using the collater Miss Coles being the Guinea pig. So far we have had little success.
The idea of marking the proof sheet in pencil is very difficult to carry out. I have put a pointer on the outer case of the Tp ~~but~~ and although this makes the position a little clearer it also makes

it rather more difficult to operate a pencil. I am seeking an alternative method of indication

---

14-2-52

Had a rather sad day today Starting off with faults on the Character Generator which were unsolved at the time Shaw and the Annexe occupied most of the machine time for the morning. He is having troubles on the clearing waveforms being used to clear the feeder resulting in corruptions in the patterns being received

[[NB09-012]]
from the Converter.
On the whole the Converter has come out of it very well and the only troubles on the STC side seem to be the tape machines which were once again giving trouble today.
I have been doing some thinking on the Collating question and have probably arrived at some sort of solution.
Mr TRT brought his "laymen" class down for a demonstration of the Collater today. I had had every sort of trouble previously but just managed to get it going in time. Everything went well

until the Collation started when the clutch control relay decided to pack up.
I fiddled this, and there-after it produced the goods satisfactorily.
The biggest gain from this episode is that Miss Coles who was operating had a much needed boosting of her confidence in the machine in spite of the fault

[[NB09-013]]

Collation

The proposal concerning the method of marking the proof sheet arises out of the difficulty in writing anything legible on the paper while it is in the teleprinter.
It is proposed to have a rubber stamp hinged to the carriage in such a way that when a fault or other operation such as insert or remove includes a non printing character, an imprint of

sp cr lf in ex

is marked on the paper and the appropriate one is marked in pencil so as to indicate what character has been dealt with

for example suppose that a space has been ~~se~~ interchanged for a character

1 2 3 4 5 sp 6 7 8
should be 1 2 3 4 sp 5 6 7 8
The proof sheet will look like this

1 2 3 4 5
[] []
5 6 7 8

When the rubber stamp is used the effect will be :-

1 2 3 4 5
. . (sp) cr lf in ex
5 6 7 8 (~~sp~~) cr lf in ex

meaning that in the first fault a space had been inserted and in the second case a space had been removed.
Similarly, suppose that the

[[NB09-014]]
proof sheet calls for the removal of a line of type including ~~bina~~ carriage return and line feed.

1 2 3 4 . 5 6 7 8
brig 1 2 3 4 . 5 6 7 8
9 0 1 2 . 3 4 5 6

1 2 3 4 . 5 6 7 8
1
9 2
. 0)(3 4 sp 5 6 7 8 (sp) (cr) lf in ex
9 0)(1 2 . 3 4 5 6 sp cr (lf) in ex

Supposing however that a correction where a space was inserted on the same line as a CR was removed
eg.
1 2 3 4 sp 5 6 7 8
should be 1 2 3 3 4

~~1 2 3~~
~~[] 4 (sp) cr lf in ex~~
~~3 []~~
~~4)(5 6 7 8)(~~

~~1 2 . 3 4 . 5 6 7 8~~
~~9 0 1 2 . 3 4 5 6~~
~~Sbe~~
~~Sbe 9 0 1 2 . 3 4 5 6~~

~~1~~
~~9 []~~
~~0)(sp 3 4 5 6 7 8~~

It seems that if the indication of a space is only used when it is involved in a fault, while the indication of a cr or lf is used ~~either~~ in a fault, insertion ~~of~~ or a removal, then there should be no confusion

[[NB09-015]]

Reliability Trials

E & G Panel 29
? AC Flip Flop. is this reliable

[[Long]] ~~gr~~ run on Computer

Maintenance Schedule

Time

Reconverter

Step Pulse
? Amplitude of Marker Space Pulses.
Transition source.
Block End
[[E]]

[[NB09-016]]

15-2-52

Progress
Output Unit grid restoration
Control Desk Lamps to prevent shorting 50 volt ? fuses.
Character Generator

~~Monday~~

Annexe to Reconverter.
- Reconverter Theory
  Collation Practise
- Mod to Second Reader.
- Mod to Output Unit
  Storage Junction Units Mod

18-2-52

Put first Maintenance schedule into practise
Dry Joint Test
Valve Currents
Valves + 10 mA

19-2-52

A few mods done yesterday
(a) Cleaning up output Units
(b) Control Desk (Lamps.)
(c) Annexe
(d) Second reader started.
(e) Storage Junction Units started

[[NB09-017]]
The struggle for clarification of the Collating position goes on
I have almost given up hope of getting Miss C to produce any specimins worth discussing She seems to be hypnotised by the machine and inevitably makes several false starts on any job.
Yesterday was an unfortunate day generally as there were two occasions when almost the whole job had been done when the supplies to the teleprinter were cut off and the job had to be restarted

TRT is beginning to study the job more closely and it is receiving attention from JP &

DC as well.
To me it is becoming increasingly obvious that.
(a) The line feed error indication is desirable
(b) A printing character is necessary to separate short numbers
(c) It would be desirable to have a simple character for ~~CP~~ CR & LF with a separate line feed available for the error indication
On second thoughts it would be possible to make the fault reset key ~~for~~ locked with the manual line feed so that by resetting a line feed is put

[[NB09-018]]
in manually

19-2-52

Reconverter

A big milestone passed today. The High speed payroll programme has been carried out successfully with the Converter Annex linked satisfactorily
I personally [[do not appear]] to have got very far but Mr Harold gave Shaw & I the first ~~of~~ [[glimmerings]] of the reconverter. We are well on the way to starting tests with the [[reconverter]] now.

I have given up in despair trying to get Miss Coles to produce some specimens of collating. ~~She seems to have been hypnotised by the~~
Tomorrow, Caminer is providing a new chap Woods from the Wages office who will eventually be taking charge of the Tape Machine control. After a short exercise on the teleprinter from Miss Coles he will be given the job of preparing the specimens I need.
I must try and get some smaller rubber stamps so as to make the job more realistic

[[NB09-019]]
Mr Ridler brought a gas tube expert (Mr Jackson) to see us today and we talked about gas tubes and the testing of some. We will soon be having some test gear of our own to deal with the trigger tubes, but it will be some time before there is anything to deal with the 10 cathode tubes.

I gave Miss [[Ledger]] a rather complicated block schematic of the Converter to be ironed out but she is convinced that it is not possible to produce

a readable diagram from it. This evening I hope to prove her wrong.

Failed

[[NB09-020]]

Converter

Switching On
Power switch.

Test S, CR, LF

Faults Time
M
Translater Resolvers
Visual

Check Marking into Digit &
[[lemon]] [[ND &]] ~~CRT~~ (No T pulses)
Thus by setting up digits on switch check that correct binary from marked up on 0D1 1D1 etc.

Resuming Total Req

Send in 7 and 0.
to give 70.

Fault Finding on the Converter

1. Power Switch On.
2. Using test set send S. CR. LF to give normal start conditions
3 Send various combinations of the first two intelligence elements to check Translator Resolvers Visually
4 Follow up by sending various combinations of remaining elements & check that Resolvers are stepped round correct no of places

[[NB09-021]]

21-2-52

Although we had some measure of success in our tests with the High Speed Payroll job on Tuesday evening and although we talked of Clawson returning to STL this weekend, we have had several setbacks in the annex testing since then.
The main trouble has been when testing for the making up of the number ends by the convertor. We seem to get the correct number of NE pulses but the number itself or corruptions [[of]] it appear in ~~the~~

other positions of the annex than those desired. I think I have worked out the reason for this and it depends on the reaction & shape of WCT during the making up process At this time the WCT waveform will be happening much more frequently than normal and the level rises then it may fail to close the clear gate of the annex tube
This will result in two paths for the numbers, one via feeder and the other by the normal circulation via A link and clear gate

[[NB09-022]]
x C17±
Output Unit Grid sticking
~~S~~ -ve outputs from Decoder.
Storage Junction Units
Transfer Unit

[[DIAGRAM - CIRCUIT]]

Switching on Converter

~~Assume (a) That one tape machine is to be operated.~~

~~1. Switch on the tape machine~~

(a) Working without tape machine

1. See that KSM switch is in the "up" position, ie that the test panel is connected to the converter

~~(b)~~ 2 After a delay of 2 or 3 minutes the HT will be switched on and the converter can be tested by setting up characters on the test panel switches

See tests.

~~(c)~~ 3. Before operating my tests the normal preparatory checks

[[NB09-023]]

C.R., LF., should be sent.

4 ~~Then~~ Any characters can now be sent from the tests set

When it is required to use the Converter with tape machines, it is necessary to carry out the same procedure as above 1 2 & 3. Before switching to KSM

(4) Switch on tape machine and see that the necessary tube of the TMA TMB pair is alight.

(5) Check correct relay actions have occurred.

A Diode Characteristic [[Meter]]

It is possible to get a rapid visual check on the characteristics of [[omr]] gating & zero restoring diodes by means of an oscilloscope.

Required is an isolated AC supply of some 50-100v & the circuit is

[[DIAGRAM - CIRCUIT]]

It can be seen that the resistance R and the diode order test forms a potential divider acros the AC input

[[NB09-024]]

however the voltage across the two halves will not be linear with input in the same way as if D_1 was a pure resistance

When A is positive with respect to B then D_1 will behave as a very low resistance.

When B is pos with respect to A then D_1 will be a very high resistance.

Consider the case when A & B are at same potential then the scope will show a spot at centre of the screen. As A goes positive C & B will remain at earth (D_1 assumed to act as a short circuit), while A will go positive ie the spot will rise vertically. As the

PD between A & B falls to zero again the spot will return to the centre of the screen. When B begins to go positive D_1 will cut off so that R will be small compared with the resistance of D_1 the spot will now move to the left or right. [[Then with]] a perfect rectifier the spot will trace out a form with two lines at right angles to each [[other]] With an imperfect rectifier the trace will deviate from the vertical and horizontal to a more or less extent.

As a check against the amount of deviation a switching systems ~~b~~ can be included in

[[NB09-025]]
the circuit to give a constant reference to earth zero for both vertical and horizontal difflections

27-2-52

This circuit has been tested and found to be very suitable for measuring [[chars]] of Diodes & metal rectifiers. I am working one or two changes to the original circuit so as to make it more flexible
A calibrated potentiometer will be provided to give a ~~comparison~~ measure of impedance and an amplifier is included to give variation in the range of the trace. I hope to have a

whole series of AC voltages available for use from about 10v peak to peak upwards to 100v
The relays used to give the switching one perhaps not entirely suitable and I think I may need to go to a vibrater to get the correct picture the circuit is now something like :-

[[DIAGRAM - CIRCUIT]]

[[NB09-026]]
Tests on the reconverter are now proceeding and once ~~again we are experiencing~~ trouble due to new and untried circuits which have been failing to produce the required waveforms at the required time. It seems pretty definite that most of the time we have spent on the testing of the Converter & reconverter has been due to shortcomings in circuits which have been put into our units without a great deal of thought and mainly with a view to saving a valve or two here and there.

28-2-52

For some time I have been thinking around the idea of a high speed printing device. I have at last had an idea which may or may not contain the germ of what we need. It is proposed to dispense with the [[spacing]] carriage and retain only the line feed facility. Alternatively the carriage might be retained.
The principle consists of a revolving drum which when a character is printed comes in contact with the paper (thro the ribbon) is such a way that ~~either the~~ contact time is just the time needed for the character

[[NB09-027]]

[[DIAGRAM]]

to pass the paper. During the time of contact it will not in fact pass the paper as it will be arranged to engage ~~the~~ a gear which will ensure that either the carriage or the type drum will move during contact period
The revs of the type head will be continuous so that the speed of printing one character will presumably be ~~two~~ an average of one rev of the drum altho the actual time of contact will probably be only 1/30 of the [[time]]
This scheme would obviously be used to produce a really

fast line _at_ a time pointer by arranging for the required number of heads to be set up for each line and then printing and line feeding all in one operation.

It would seem that the whole scheme depends upon a simple means of selecting one out of 32 ~~heads~~ characters by means of the five digit code

[[DIAGRAM]]

[[NB09-028]]

[[DIAGRAMS]]

[[DIAGRAMS]]

[[NB09-029]]

29-2-52

Progress
Converter
Make up No end still to be check
Alarm " "
Change Storage Junc Units
Charact Gen Mod required.
HS Reader.
C17± Not yet Further Invest
Storage Junct No
Starter & Tape reader Digit [[reveal]]
complete

Maintenance schedule

Char Gen Mod next weeks install following week.

Note to Mr Clements re bollard.

Storage J.U. Try out mod.

Diode testing circuit
Logarithmic 20K pot
Vibrater

Output Unit cathode loads

[[NB09-030]]
10
7.5v RMS
9
8 14v
30
35
1) Selenium Rectifier M3.5 8 volts RMS
Resistance 9,000 ohms
2) 15 volts ~~15v~~ RMS ~~15 volts RMS~~
Resistance 7,000 ohms

3) 35 volts RMS
Resistance 5,000 ohms
4) 45 volts RMS
4,500 ohms

<u>Selenium Rectifier M3.8</u>

1) 8 volts RMS
Resistance 4,600 ohms
2) 14 volts RMS
Resistance 3,400 ohms

3) 32 Volts RMS
Resistance 2,800 ohms
4) 40 Volts RMS
Resistance 2,700 ohms

Selenium Rectifier M3.3.

1) 2 40 volts RMS
Resistance 2,400 ohms
2) 30 volts RMS
Resistance 2,600 ohms
3) 14.5 volts RMS
Resistance 3,300 ohms
4 7.5 volts RMS
Resistance 4,600 ohms

[[NB09-031]]
Germanium CG1c

1) ~~Resistance 150 ohms~~
7 volts RMS
<u>Resistance</u> 150 ohms
2) 12.5 volts RMS
Resistance 80 ohms

CG1c 12.5 volts RMS
Resistance. 80 ohms ~~RMS~~
7 volts RMS
Resistance 90 ohms
<u>CG6</u>
7 volts RMS
Resistance 110 ohms
12 volts RMS
Resistance 110 ohms
<u>GC6c</u> 7 volts RMS
Resistance 125ohms ~~7 volts RM~~

12 volts RMS
Resistance 125 ohms
<u>Diode 6D2 no 1048.</u>
A B
1. 2 285 ohms 285 7 volts RMS

2.	225	255	12 volts RMS
3.	235	235	20 volts RMS

Diode 6D2 no 257

	A	B	
1.	34 ohms	390 ~~34~~ ohms	7 volts RMS
2.	315 ohms	475	12 volts RMS
3.	300	400	20 volts RMS

[[NB09-032]]

Average Forward Resistance

Ac Volts RMS	6D2 Ohms	Ge Ohms	Xtal	Selenium Ohms	
		CG1	CG6	M3.5	M3.3
7	300	90	115	9K	4K5
14	275	80	115	7K	3K3
20	250				
30	-			5K	2KY
40	-			4K5	2K5

| | | An idea is developing in my mind for the decoding of the binary form of a character into ~~one~~ the selection of one key. I have also been considering the process whereby the typeface can be brought into contact with the paper. On close examination it becomes obvious that it is necessary to provide some means of forcing the type against the plates by some more local means that just by [[lining]] it on the periphery of a drum, due to the fact that the radius of the drum itself is likely to be too large to give enough pressure without spudges appearing from adjacent characters. It so happens that a decoding

[[NB09-033]]
arrangement can be conceived which provides a small movement of the selected type head out towards the paper.
The type heads are held in a drum in a rather similar way to the teleprinter except that the type ~~head~~ [[fares]] away from the centre of the drum. At the point nearest the paper, part of the type [[runs]] between two rollers one of which is tending to force each piece of type away from the centre and towards the paper. The second roller which is resisting the movement of the type ~~awa~~ towards the paper & composite and provides the decoding

arrangement. This roller consists of Five rollers stuck on a common shaft the positions of which on the shaft are controlled by coding bars. These Coding bars are set up by the binary number sent to the output unit for printing. The postion of these five rollers permits one and one only of the type heads to be forced towards the paper by the first roller.

[[DIAGRAM]]

[[NB09-034]]

5-3-52

A sad blow - TRT produced today a press cutting describing a high speed printer in use on a machine in America. From the rather vague description it seems to be identical with my idea - printing by a rolling action.
It seems that there might be a chance however of developing something in our own workshop if I can modify the scheme so that the line at a time model can be made to work on the same basis as the

tape printer ie continuous rotation of the type head.
Now on the face of it this seems impossible as ~~the~~ it is necessary to change the relation of one type head ~~with~~ to its neighbours.
On the other hand if the paper remains stationary each typehead could conceivably roll on the paper so that the whole line would still be printed in the time of one revolution. This would call for a very ingenious drive to each type head and is not easy to imagine.

[[NB09-035]]
If typehead were of different nature with each piece of type pivoted then the rolling action could be done by the type itself.

[[DIAGRAM]]

Each piece of type must be able to describe a complete circle and have two resting positions. "At Rest" and Reading
In the "at Rest" position it linesup with the circumference of

the type head and does not come in contact with the platen. When any piece of type is selected it is pushed out into the ready position so that when it comes round into the printing position it catches against the platen and is rolled against the ribbon which is thus ~~brought~~ pressed into contact with the paper.
After each revolution of the head the platen is line fed.

[[DIAGRAMS]]

[[NB09-036]]

<u>Collater</u>
<u>Report for Meeting with S.C.T</u>

Most of my troubles with the Collater have been in trying to lay the foundations for a training scheme for operations and checkers
On this point it would seem that two mods to the design of the collater would put a completely new face on the whole problem.
(a) The provision of a back spacing device which will enable both recorder and checker to correct a known error immediately after it has been made

(b) The changing of the error indication from line feed to ~~obl~~ nonspacing oblique strokes

On the technical side there have not been very many troubles that cannot be put right or have not been put right by slight modifications
What faults there have been, have been easy to correct or have been so infrequent

that it has not been possible to follow them up.

[[NB09-037]]
Collater

Relay Contacts. (HS)
R & C Output Trigger Pairs.
Occassional reset failures
Power Failures

Tape Machine

Pile Ups (Treated tape is great improvement but? warping of perspex)
Slipping clutch
Dry Joints
Tick
Maintenance Technique — Careful positioning of Backstops for
Oiling of bearings — drive pulleys.

Cabling to positions in BSO
Paignton Plugs & Sockets

2 Collaters Delivered Tested and operating Beginning of many

Oblique instead of line feed

Converter on off
Control

Test Facilities

[[NB09-038]]

40x5
200 relays

[[DIAGRAMS]]

[[DIAGRAMS]]

Paper feed during setting up of next line

[[NB09-039]]

[[DIAGRAMS]]

1 MS. 40mS.
20 rps

Converter

Switched on with KSM up SST Down.

Occassional [[flukes]] on LF 1243

LF AB.

These settled down but Time scale was permanently on

[[NB09-040]]

Progress

Clem . Teleprinter Major

Gibbs . Char to be installed next week.

Self Diode Tester
Vibrater tests.

Diode Testing on whole of machine

[[DIAGRAM - BANG]]

10-3-52

I have been asked to consider what could be done to make my suggested prototype HS Printer a suitable test prototype for a page printer. The short comings of the original suggestion is that the same ~~model~~ idea copied into a page printer makes for a stop start operation.
I have considered this and I think I have found a way of incorporating the two ideas. The principle will be a drum ~~of~~ comprising a number (possibly 40 or 60 type heads all locked together. The

[[NB09-041]]

printing will still be a rolling action but the paper will be stationary during the printing and line feed will occur after the complete printing of a line of type. ~~The typing of each character~~ One line will be typed for each revolution of the type head drum but each character will be printed at varying times during the revolution according to its position on the type head.
Each type face will be attached to a hinged sling which when selected with project out above the normal levels of type so that it actually comes into contact with the plates

when it passes the printing position
The act of striking the paper will cause the type to rotate on its hinge imparting the rolling action of the type face against the paper.
The system to be used to select a particular piece of type will be determined by the whole organisation of the output system.
In view of the fact that it is a serial machine that is being considered, it is obvious that only one output digit can be dealt with at a time so that if the eventual line of printing is say 10 lines

[[NB09-042]]

of type per second then there can be no longer than 100ms available in which to set them up. if each digits of the line requires a millisecond for selection then this ~~take~~ is likely to take 60% of the revolution.
If however the action were a two step affair, then setting up of a line being accomplished while the previous line was being printed then the whole of the 100ms

will be available for selecting the digit to be printed and setting up the head!
This could be done by ~~either (a)~~ reducing the ~~tape~~ speed of revolution to 5 per sec

and having two prints per sec ~~or by spec~~.
This means that each type head would have two sets of type.
Now ~~if~~ the method of selection of type ~~is~~ can be assumed to be one of selecting a particular time in the cycle and triggering off a release mechanism which causes the selected type to be projected forwards.
This can be achieved by a commutator with one segment for each piece of type then provided a pulse of power be synchronised to the moment when a particular

[[NB09-043]]
segment is passing the brush the release mech can be actuated.
This calls for a "time-place "decoding system similar to that of the store except that ~~a ne~~ all type head must be selected in parallel
Thus each binary pattern which corresponds to a character to be printed must be [[staticised]] as representing a particular time in the printer cycle while some other decoding arrangements must allocate each character to a particular head.

Progress ~~12~~ 14-3-52

Reliability
9 to 740 MT
9 to 430 Wed
430

|| OJI 40½
|| Bakery 5
|| Maint. 5
Phone Miss Phillips
Specimin Block Schematics.
Mods to teleprinter
(a) Print out to be non space
(b) Printing space.
Mod to Collater to give oblique line for error indication.

[[NB09-044]]

14-3-52
For some time I have been trying to formulate some decoding system which will permit a reasonably simple system for loading a high speed line at a time printing device.
I am constantly being brought up against the ~~abnormal~~ terribly large amount of equipment that would be needed owing to the need to staticise some forty ~~digits~~ characters to be printed ~~and sele~~ each being selected from a choice of 32.
On the present system of output from the computer each digit would need at least a millisecond

to trace in the store and present to the output device and then each digit will need to be stored in the rest of the 40 characters are selected.
This suggests a minimum of 50 m.s before the characters comprising the line of type

are ready to be selected on the type heads. Assuming a time of 1 m/s to select any one of 32 characters on the head there will be a further 32 (say 50) m/s for this operation and then the process can be recommenced.
An alternative method would be to utilise a complete tank of ~~each~~ information ~~of a~~ containing 32 characters

[[NB09-045]]

[[DIAGRAMS]]

6 inch [[lean]]18 inches
= ½ inch per character

[[DIAGRAM]]

Late Duty Officer
Reliability 24 - 29.

	Monday	EJK
.	Tues	EHL & Dutton
.	Wed	JMMP
	Thur	RTS
.	Friday	EHL
	Saturday	

Every Wed
Every Thurs
Every Saturday

[[NB09-046]]

17-3-52

Have had more than our share of trouble during last week. Most of the trouble was in storage units and several of these have been rejected Unfortunately in many cases the units used to replace them have themselves showed faults which fact suggested that the trouble might lie in the tanks themselves. I have arranged for Gibbs to check all the tanks now being used so that for next week we will have a clear mind on this score.

Clawson has modified the Converter to provide satisfactory [[staging]] with 8 character per second recordings. I was able to produce the fault which had been troubling me and he is investigating this.

18-3-52

Fault not said to be due to three faulty gas discharge tubes

[[NB09-047]]
Collater modified for new fast releasing clutch

18-3-52

Second thoughts on HS Printer.
Doubts have been expressed on the damage to moving parts due to speed of operation.

The periphery of the type head will be moving at 1700 ft per minute & Clements [[rightly]] questions the wear on the pin of the rotating type slug and on the side of the type slide.
I have had a new idea developing out of this

[[DIAGRAMS]]

[[NB09-048]]

[[DIAGRAMS]]

[[DIAGRAMS]]

[[NB09-049]]

[[DIAGRAMS]]

Use Vibrating contacts to provide frequency doubling effect i.e. operate relay twice to every complete swing of vibrater

Progress

O.J.I.
Store test
Teleprinter smudge

M
Daily M5 M6 S25 M8
Tap.
Clean Tape Readers.
Frequency Control Monday
Teleprinters Monday
General Test M5 S25

[[NB09-050]]

Interface & Cathode Life
Wireless World Dec 51
Feb 52
IEE
Electrical Communication June 51 pp95/102
(Eaglesfield)
Wireless Engineer Oct 49 331/337
(W Randorf)
" " March 50 100/101
(A Eisenstien)
Proc phys Soc Vol 50 p345 (1938)
Benjamino Huck & Jenkins

24-3-52

The computer has been in trouble now for nearly two weeks. The bakery Sales job

for the week before last was completed on Monday last, and for last week we have still to do P_2 & P_3. A multitude of faults has been brought to light since the trouble first started but apart from the discovery of several valves/diodes and EF50) which ~~might have~~ seem to be loosing their efficiency I can find no general cause for so many failures. So much time has been spent on testing new STC gear, that

[[NB09-051]]
only a comparatively short time is given to the machine as a whole, and after several days of Reconverter work, the P programmes are put on with a flourish, and they just dont get done properly.
The worse effect I think is the demoralising effect upon myself and the programmers. For two weeks a new trial programme OJI has been comtemplated ~~but to~~ consisting of 30 hours of computer time, but this has been put off twice due to failure. It seems now that only a complete check on the machine

(marginal checks etc) can give ~~sufficient~~ a lead as to the real trouble.

25-3-52
Had a good set to with the machine today. After finding a spike on the output of LC42 (input) which was occassionally causing trouble on multiplication it seemed certain that we had cured the fault. But No.
OJI was used again as a test and produced wrong results.
This evening I was determined to find something so I confined myself to complicated multiplication After calculating 10^8 quite happily

[[NB09-052]]
in binary form, I ~~used~~ found ~~I left~~ that the result was occasionally wrong. Eventually this was located down to the last of 3 left shifts which was being cut short and so making the answer wrong. This is apparently due to a flip flop producing W5 being reset too early infact it is being reset by a step on which the correct reset pulse stands
I cannot believe that this can be the same trouble as has caused us so much worry on OJI as it affects the most significant end of the number and the errors found were quite small.

However after drawing flack for so long it is a great relief to have found something. It was too late after finding this to test OJI again (10.30) so I will hope that tomorrow brings a better day.

26-3-52
It was not the trouble and I have just left Shaw & JP doing attenuator tests after a fairly hectic day.
At one time today it seemed that another definite fault had been found to cure our trouble. We had put on A4 for attenuator checks and

[[NB09-053]]
had got 100% failure of A. This was located down to an apparantly faulty SCC33 in one of the accumulators. This was causing a breakthro of W1+ into the ACC IO. This valve was replaced and the improvement was so definite that it seems obvious that at last the fault had been found, but a new run on OJI disproved this. On checking

the valve it was found to be reasonably good ~~but~~ and so it was replaced. The apparent fault had disappeared and we wer back where we were

Considering the testing of valves. After due consideration I have come to the conclusion that this needs to be done in two ways
(a) A test to decide whether the valve is suitable for the job.
(b) If not then what is wrong with it.
These two aspects of the tests can be quite separately considered. The first is an urgent one and must be carried out quickly. The second can be a more leisurely affair and is [[needed]]

[[NB09-054]]
for statistical purposes. If the ~~latter dis~~ results of tests
(b) tend to disprove those of (a) then nothing is lost and the particular valve can be reconsidered for replacing in the machine.
The various jobs we ask of valves (are :-
Double Diodes
1. Gating
2. Zero Restoration
3. Missing
4. Clamping.

Double Triodes
1. Pulse Cathode Follower
2. Waveform Cathode Follower

3 Pulse Amplifiers
4 Waveform amplifiers
5. Relay Operation.

Pentodes SP61
1. Pulse Cathode Followers
2. Waveform " "
3 Pulse Amplifier
4 Waveform Amplifier
5 Relay Operation

Pentodes EF50
1. RF Amplifier
Pentode EF55
1. RF Power Amplifier

[[NB09-055]]
Pentode RT61
1 Power Cathode Follower Pulse
2 " " " Waveform

Pentode 6F32

1. Suppression gate.

28-3-52

Still in trouble over OJI Today I started by having valve currents in the computer checked. This resulted in one valve being rejected with a large [[gain]] current. This could have affected shifting operations but there are still errors in OJI Results.
The errors are very small and it seems to be impossible to provoke the machine to any sort of errors except in OJI
Caminer insists that the programme is too complex to permit shrinking it down into small repeated sections

[[NB09-056]]
but it becomes more [[obvious]] every day that this is one of the few avenues left for us to follow
I have tried various small programmes calling for multiplication of long numbers but these do not show up anything.
The small significance of the errors makes it probable that a digit in the lower left of a number is being corrupted I dont think that anyone has observed whether the errors are always making the output larger or smaller. This might be [[worth knowing]].
Another thing that would be worth trying is the square root routine on

its own.

31-3-52

There are two lines to follow up this morning.
One is the reported presence of an [[p+]] occasional digit in the least significant position of the accumulator in a position where no digit can ever get except as a result of right shifting The second is that if digits in the shifting units are examined during OJI they are not very consistent in amplitude
JMP also suggests that a programme which multiplies x by y and y by x compares

[[NB09-057]]
the results and then in both halves fod the accumulator is desirable

```
 0 H 16 L      multiply x by y
 1 V 18 L
 2 T U 20L     Copy top half into 20
 3 L     .
 4 L     .     Transfer lower half into 24
 5 L     .
 6 T 24
 7 H 18L       Multiply y by x
 8 V 16L
 9 U 22L       Copy top half into 22
10 L     .
11 L     .     Transfer lower half into 26
12 L     .
13 T 26L
14 E  0
15
16      x
17
```

18 y
19

It seems reasonable to look for the trouble in that part of the machine that is least used by other jobs. The ~~oe~~ most important of these is the lower half of the accumulator.
At one time I had a~~n~~ fault which may have caused an end around carry into the lower half from the upper half it arose as a result of putting in an additional digit

[[NB09-058]]

1-4-52

Yesterday was another day without much real progress in our search for trouble on OJI.
Started with a fault in the shifting units which showed promise at first but after curing had not removed the trouble.
Hemy Kaye & I stayed on in a vain hope of getting the programme itself broken down but although we established points at which errors became apparent long before any printing took place, it is obvious that there is an enormous task awaiting anyone who wants to

break it down further.
We used a small tape to cause ~~the~~ a conversion of the original programme into a square rooting loop and observed the result of rooting one pair of numbers continuously. This seemed to prove that the rooting routine was not the cause of the trouble but that the numbers had been corrupted before the routine started.
However, in despare, Kaye began to tap various parts of the computer and disclosed a beautiful dry joint in Half Adder No 1.
I would be prepared to wager

[[NB09-059]]
a months salary that this had nothing to do with the fault, but it raised our spirits and we left at 10.30 in quite good spirits

---

W6 is it every triggered incorrectly ?
Query reset of Complementer ff
Query clearing of Micand. If anything remains here and a shift operation takes place, then ~~the~~ it will be added into the accumulator.
Check odd & even digit pulses for spikes fore & aft which may pre trigger sequences.
Reconsider spike from Input and input gates of store

Spec for Line Printer.
(Ideas [[Pile]].)

60 positions (possibly 96 [[tabs]].)
32 characters (possibly 64 on mod)
Period of feeding (0 to 40 mS.)
Five wire to each printing [[pen]]
Received [[20]] pulses binary patterns +50 volts 15 ms long
consecutively to each print position at 0.6 mS. per char.
8 [[nd]] of line signal 50v & < 15 mS

Negative spike on Store clear gates due to crossovers will clear D1
Positive spike on input store gates corresponding with pulses from input unit

[[NB09-060]]

3-4-52

Last night but I spent the whole evening going thro all my notes in the hope that one of the faults of the past might give me a clue to the source of our present difficulty. The time was not wasted. This afternoon we completed a run of 26 ~~trajecto~~ repeats of the same trajectory without an error.
It seems the fault was due to inefficient clearing of the micand tank follower by a shifting order.
The facts are as follows

If there is a number in the multiplicand tank during a shifting order, then there will be a partial multiplication of this number by the contents of the multiplier tank.
This effect was noticed about a year ago and a revised method of clearing to micand was devised. Recently this method had been [[embargoed]] by JP (rightly I think) as on occasions the clearing waveform had to last ~~of~~ over stage I and stage II resulting in rather a droopng shape. A modification was made which appeared

[[NB09-061]]
to be satisfactory on 20th March ~~It.~~ This caused the waveform to be set only in stage II and reset by the next end of coincidence pulse.
This meant that for the most part the waveform did not last for more than the coincidence seeking time but in some cases where no number was called out of the store it would be reset during the next Stage 1.
~~The flip flop was an AC one and it~~
It was recognised that this situation was not desirable so that provision for resetting by

an R2 pulse where there was no coincidence waveform in stage II but this was not put in.
It was noticed that on some occasions the flip flop was setting in its own time ie before the next coincidence pulse but as it was always longer than a minorcycle this did not appear to be detrimental.
This morning having established that in some cases there was only a space of two microseconds between the clearing of the micand and the W3 waveform letting something out of the micand

[[NB09-062]]
I put on a programme of

0 A 4 L	in order to
1 U 6 L	inspect the clearing
2 G 0	waveform. It
3 E 0	was a lacking choice
4 -1	of orders as looking
5	

at the contents of the micand compared with the clearing waveform it could be seen that after the clearing waveform had started there was a group of emaciated pulses

left which rose and fell with the beating of the mains. It appears that the lack of coincidences end pulse caused a [[droop]] on the waveform which caused

partial failure when next called upon to clear.
The AC flip flop was resetting in its own time and as the time of resetting varied & the breakthro pulses rose and fell.
The cure was to mix R_2 with EoC pulse as a reset and this not only cured this effect but apparently removed the bogey that had been haunting us for the past 2 weeks.
Today we completed P_1 for period ending 31 March Tomorrow afternoon P_2 & P_3 will be attempted but it

[[NB09-063]]
is not known when there will be sufficient data to warrent a start.
In the morning however I mean to restore the condition in the micand clearing gate so that the fault can be reintroduced Then I hope to make the condition worse. In this state it should be possible to devise a programme that will test for it and show it up

4-4-52

(a) Tests
~~(b) Remove R_2 from W11 reset~~
~~(c) 6J is such a wa~~
(b) Provide a means of accentuating the effect noticed yesterday
(c) OJI on with original set up.
(d) Worsen Conditions
(e) Restore Cure.
(f) Work out programme for producing result of this effect

[[NB09-064]]
Lessons to be learned from past weeks work.
1. Any known shortcoming in machine must be listed prominently and must be taken into consideration when faults develop.
2. Valve current testing must proceed as regular weekly maintenance
3. Valve Testing to be made regular.
4. Draw up scheme for [[attr]] tests using relays.
5. Draw up set of small programs to use with pulse shape & waveform shape tests.
6. Draw up a fault finding routine as comprehensive as possible

7. Start card index system for fault analysis.

Diode testing to date.

Units tested
44 Storage Units
2 Half Adders
1 Digit Pulse Generater

515 diodes tested 83 replaced.

[[NB09-065]]

Card Index Ref System for Faults

(a) Machine stops
- 1 Stage 1 FF up
- 2 " 2 ff up
- 3 " 1 & 2 ff down
- 4 " 1 & 2 " up

(b) Machine in a loop.
- 1. No escape
- 2. Very slow count

(c) Errors

(d) Machine will not start
- 1. Initial orders not stocked
- 2. " " incorrect
- 3. Fails to act on legitimate order

Store Faults
1. extra digits
2. dropped digits

Computer faults
- Negative Nubmers
- Zero Restoration
- Shifting
- Additional Digits
- Flip Flop failure

Input Corruptions
Output Corruption
Coordinator Faults

[[NB09-066]]

8-4-52

We should have started out OJI Production week yesterday but trouble once again interfered. After doing two or three of the test trajectories correctly, one was found to be wrong. Once again the error was very small but this time the results after first going wrong were consistent. This appears to be a completely different type of fault and I tackled it as such. It appears that it was due to a dry joint in a new input decoder which has just been installed. This was causing tank 20 to be

cleared or partially cleared.
I fear that this is going to be yet another reason for casting doubts upon the reliability of the machine. This fault coupled with that of last week is all the ammunition required for anyone who wishes to cast doubts upon us. One fault was [[insufficiently]] frequent to be decoded reliably and the second produced consistently wrong results ~~of~~ with the error so small as to be undetectable without doing the job several different ways.

One way of detecting the

[[NB09-067]]
second error would be to sum the contents of the store.

Calculater Testing - Research Programmes

Converter testing.

Relays for marginal checks

Routine Maintenance

Diode Tester

(a) Chassis & Cabinet from Imhoff.
Dutton to organise
[[DIAGRAM]]

(b) Decide Voltages required & order Transformer
(c) Order Potentiometer and [[Ivorine]] for calibrated dials.
(d) Terminal Fuse holders
Neon Holders etc.

[[NB09-068]]

[[DIAGRAMS]]

1. Set Shaw to Classify Fault sheets preparatory to cross ref system.
2. Cathode followers for Control desk monitoring. incorporated in new mods.
3. Consider Relay positions for marginal checks
4. Possible mods for amplifier margin checks
5 FF Indicators
(query accuracy of JP statement that only one reference valve is needed.

[[NB09-069]]

[[DIAGRAM]]

Diode Tests.
12 Spring Loaded Terminals
1 sq ft of [[ivorine]] for calibration
1K5 pot linear
1 Meg pot logarithmic
1 x 6 volt HS relay
Rectifiers & smoothing for 300v and 6v DC.
Switches for various
Fuse Holders neon indicaters

15-4-51

After all our trouble last week we eventually settled down to a fairly trouble-free run on OJI and on ~~Frid~~ Thursday when I left for Easter holiday an unbroken run of 6 hours computing was still proceeding.
We appear to have been very unfortunate in the number of troubles that have cropped up but in another way it has drawn attention to deficiencies in our maintenance and testing routines (if any) and we can now claim more time for this sort of work. The store has given us greatest trouble

[[NB09-070]]
with one or two tanks developing "lump" disease. This effect is quite sinister as a resulting extra digit on one occasion turned a 21 order into a 23 order which cleared almost the whole of one tank.
Fortunately it did not clear the tank holding the offending order so that the [[coince]] could be reconstructed
It does not require much imagination to think of the completely solutionless fault where the order [[21/0/30/0]] is held in first position tank 0 and becomes corrupted to a 23 order

The last two compartments of tank 0 become cleared and no evidence is left to show why

---

Order Transformer and remaining pieces for tester.

[[NB09-071]]

Add [[to]] Sign Digit

Consider effect of removing additional sign digit and what modifications would be necessary to circuit

---

Policy discussion :-
Aim at Demonstration on 29 April !!!
(a) Converter.
(b) Reconverter (new [[valve]]
Collater required for preparation of fata
Modifications to be carried out as far as possible by W.K. with new units being pressed for as urgently as possible.

Jointly with Caminer to produce a manual of instruction on the use of the collater.

Gibbs has traced the cause of the "lumps" in panel 1s to ~~an~~ the diode capacity in the rectifier circuit. A ~~che~~ filter circuit put after the diode clears the trouble completely on the specimin while being examined
The exact machinery by which the lump is caused [[&]] follow the normal pulse by approximately a pulse interval has not been completdly explained.

[[NB09-072]]
OJI had another good run today with a breaddown due to a faulty panel 1 at dinner time

[[DIAGRAMS - CIRCUITS]]

Removal of Extra Sign Digit
LC17 Reset to be odd D35
LC22 Suppr pulse Even D0
LC23 Dr will now be 1 pulse earlier
LC26. Dr to be ad Odd D35
LC28 AD2 Not required
LC31 Reset to be Odd D35
LC33 AD2 Not required
output 13 not required
input 15 not required
LC17 Subtrahend out not required
LC34 Gate No ~~with~~ from 22^8 with Odd D35
LC37 Suppression circuit not required
LC49 No change
LC40 No change

[[NB09-073]]

Maintenance Desirable

(a) Valve Current checks [[& lecorts]]
(b) " " over 10 mA
(c) Readers
(d) Teleprinters
(e) Pot settings.

16-4-52

After more store trouble again this morning OJI got under way again but so far not a great deal of work has been done on it. It seems that the whole of tomorrow at least will be needed to complete the job. I have been working on the collater and the converter today.
On the collater I have repaired a fault in one of the power packs which was due to an ark between the transformer chassis at -110v and earth.
On the converter only a

[[NB09-074]]
few simple tests have been carried out and after replacing a gassy rectifier which blew a mains fuse these seemed reasonably satisfactory. I must print off on the collater tape machine the contents of the various tape I propose to use in conjunction with the Inlet annex tests which should commence next week.
I have a number of [[instability]] jobs awaiting completion
(a) Lecture for tomorrow
(b) Checking of circuit diagrams
(c) Patent Precis

(d) Collater & mixer reconsideration (mods)
(e) STC Collater
(f) STF Converter.
(g) Photo electric reader.
(h) Maintenance - get under [[weigh]]
(i) Fault sheet analysis.

(j) Manual on Collater
(k) Test modified panel 1 again.
(l) Diode Tester Parts.
(m) Find fault on Miss Clearing.
(n) Alarm system.

[[NB09-075]]

23-4-52

I have been making an effort to get the converter to work with the Annexe this week but I am being frustrated at all turns.
(a) Fault on Coverter causing extra block End pulses.
(b) Fault on Converter causing double Numberends
(c) Fault on Converter causing incorrect conversion.
d Fault on Collater Tape machine causing corruption on recorded data
(e) Fault on Collater tape machine (med speed only) putting collater out of action

for two days
(f) Fault on Collater causing incorrect recording from Collater to tape.

I have spent overlong tracing the fault on the Converter and this is mainly due to lack of knowledge of the control circuits of the converter.
In particular I am not wholley familiar with the condition required for making up number ends.
The tape I am using, has a simple long number followed by three line feeds, the second of the three line feeds being the

[[NB09-076]]
signal which will cause all the extra number ends.
The second line feed steps LF1 to LF2 and as LFA is up this causes BED to set. ~~at~~ CRE is set by all line feeds so that at O72 NE counting occurs every circulation of the time scale
When NEC is stepped round to NEC9 BED should be reset thus preventing any further stepping of NEA or NEB NEC is stepped round to NEC1 from NEC9 at 182 on time scale.
If BED fails to set at NEC9 however CRE will not be reset and NE, will continue to be generated and Block ends will

be sent at NEC8 and NEC10
It seems therefore a simple case of failure to reset of the BED BER pair which can be effected by either NEC9 or 10 gated at 762

Store Extension

Slow speed Timebase
Parts for Diode Tester
[[DOODLE]]

[[NB09-077]]

30-4-52

I have been wrestling with the Converter for the past week and eventually had to resort to getting Mr Clawson from STC to help out. It was just as well as two of the main troubles I was chasing were obscure design faults which he corrected eventually by modifications to circuit diagrams. Two other faults were cleared one was due to ~~wh~~ wear on one of the rollers on tape machine B which ~~wh~~ was causing timing errors in taking off information from tape

~~The second was in the recent modification he has~~
The second was due to valve failure.

1-5-52

Yesterdays tests with the Annex and Converter showed that apart from some occasional failure apparently due to bad gas tubes the converter is again operational. The annex on the other hand still has much wrong.
I left Shaw to carry on investigation yesterday.
Work is proceeding towards bringing the second half of the store into play.

[[NB09-078]]
and already we have got the Coder II gate operational and there is really not much more required to be done.
One defect is shown up by this [[investigation]].
The hanging over of the TNSRs by the R_q pulse produces a spike which is not held down by the coincidence waveform. This spike ~~should~~ would normally occur at D_0 but owing to extra capacity of new wiring it is now extending into D_1 position resulting in a D_1 being put into store in varying positions

2 May 1952

The spike referred to was removed completely yesterday by delaying one of the resets to TNSR by 2μS
Another tank in battery 4 was written off yesterday this makes 2 u/s and one doubtful in a new battery
Faults on character generator - failing to start corrected by mod by Gibbs.
A rectifier in main power supply started to get warm and arcing was noticed. This rectifier was replaced by a spare hustled from STC.

[[NB09-079]]
This raised the point of being able to shed the HT load in parts without the tedious business of having to pull out lots of plugs.
Converter is in trouble again ~~today~~ yesterday, apparently corrupting information from the tape.

Later
Probably due to Clutch Trio as replacing EDC & RDC cures effect.

Mod Stamp for Units
Programmers to have standby Jobs

[[DIAGRAM]]

Remote Control Crock Clip

[[DIAGRAMS]]

[[NB09-080]]
It seems necessary to have all the gas tubes on the converter tested as soon as possible so that present working conditions ~~S~~ can be judged.
Faults still occurring in output of Converter but these may be due to reading from tape. A more definite test could be made if it were possible to send a series of numbers with appropriate block end indications from a test sender instead of from tape.

Consider rotary switch on which a set of characters can be presented

[[DIAGRAM]]

Required
S | L. No C.R L.F |
up to 16 times

[[NB09-081]]

4-5-52

Last two Racks of Store to be powered up this morning. This will permitt us to make an effort to balance up the load which is having a serious effect on HT smoothing.
I think the best way of balancing up will be to bring on volts without HT (this should be a balanced load anyway) And balance the filament load.
Today tests on the reconverter are commencing and I will use the opportunity

to prepare a report on the converter.
I think
(a) All valve must be tested
(b) Test gear must be devised to simmulate tape machine output
(c)

[[NB09-082]]

[[Protoly]] Computer.

Input	JRMS.	DR.
Out	TRT	Hemy
Computer	Lenaert	Fantl
Coord	TRT	JP
Starter	DC	Hemy
Testing	Kaye	Shaw
Store	JP	Barnes

Arithmetic in mixed B.D.

Addition

	dcba
1054	0100

7549

add 1001
1101
add 110
~~0~~0001 0011

[[DIAGRAM - LOGIC]]

0101 | 0100
0100 | 1001
1001 | 1101

Subtraction 0101 0100
0100 1001 sub
0000 1011
110 sub
0000 0101

[[NB09-083]]

d c b a

Stirling

1:17:5
2:19:8

0001|10001|0101
0010|10011|1000
100 00100 1101
01100 100
100|1001|0001

7-5-52

Yesterday saw the inauguration of the special committee considering the building of the second Leo.
TRT spoke to the whole of the team (technical & programming) first explaining how the proposed committee would work and asking that anyone with ideas on any aspect of the problem to put them forward for consideration.
Then the committee went into its first meeting.
The panel is to work in pairs on the different aspects of the job, each pair working as a fact finding body to put their ideas and findings to the

[[NB09-084]]

committee as a whole who will then criticise and probably decide upon which course for the panel to take.
The divisions of the jobs are made into the usual natural parts ie Coord Computer Input Output etc I ~~have~~ with Fantl have been honoured (?) by being given the Computer and auxiliary computer.
There are one or two general points which have to be settled first before one can get ones teeth into the real job.
for example.

Short or long numbers
Is the negative number to be

held as a complement
Single or Multiple Address Code.
Decimal or Binary Notation

In considering the computer specially two of these must be settled before much thought can be given to the main job. These are :- Is the machine to work in Binary, Decimal, or mixed Binary Decimal and Are negative numbers to consist of the complement of the number or the number and its sign. On the latter point a good deal of discussion went ~~of~~ on yesterday resulting in ~~the~~ complete unanimity on the desirability of eliminating the complement

[[NB09-085]]
It is assumed that at first that no detail will be prepared and ideas will be kept to general principle but it is obvious that something which may be agreed in principle may be negatived when details are worked out. One of these is the question of whether the computer should be a serial or parallel operated mechanism.
Items for immediate consideration for Fantl and myself are
1 Binary or Decimal or B/D (Starting)
2. Negative Numbers
3

An arithmetic unit working in mixed Binary Decimal and Sterling could be conceived fairly easily if the number could be held in a mixed series parallel form with each of the four binary digits of a decimal digit travelling on a separate wire.
The difficulty appears to be to link such a scheme to an inexpensive store system.
If the store was completely serial however but with the individual binary digits of ~~a~~ decimal digits interleaved then the scheme presents a more [[favourable]]

[[NB09-086]]

d c b a d c b a d c b a d c b a d c b a

A keyboard converter

Pilot
1.
2.
4.
8.
16.
32.
64.
128.
256.
512

[[DIAGRAM]]

Required to be able to set up the binary equivalent of a decimal number by a keyboard operation Keyboard is assumed for simplicity to be a typical sunstrand

keyboard with ~~10~~ 9 keys for each decimal digit and as a prototype provision for only two decimal digits ie 18 keys on depressing any unit key a binary counter is operated which adds the number of pulses corresponding to the key (8 in the case of the "8" key to a register.
When a ten key is depressed then the binary form 1010 is added the appropriate number of times
This [[illegible]] can obviously be reported indefinitely

[[NB09-087]]
Keyboard operation

[[DIAGRAM]]

[[DIAGRAM]]

[[NB09-088]]

13-5-52

Last Friday ~~OJ~~ P_2 & P_3 proved too much for the machine and I spent Saturday Trying to find out why. This lead to a general inspection of store and thence to a general reshuffle of tube position as it became clear that ~~the~~ most of the trouble was due to Battery No 5 being much too long (.011 oversize) This battery is now out of service and awaiting dismantling so that the girder can be ground to size.
Battery No 1 is also out for servicing.
After this reshuffle OJI was

tried and found to produce errors. Yesterday evening Fantl and I stayed to sort things out ~~but~~ and it seemed that a new store test S26 which does everything to one tank was going to lead us to trouble. At one time it seemed that the G order was at fault but this morning OJI is the only programme that failed.
The lowspeed in high speed out payroll programme was tried and this showed that the reconverter is in fairly good shape but the programes failed on the [[computer]] side

[[NB09-089]]
on some occasion as a result (apparently) of interference between the Block end Condition in the Annex circuits and the computer.
I have left Shaw working with DC on the OJI trouble
Valve testing
This is becoming a serious problem and it has been suggest[[ed]] that valve positions should be segregated into critical & non critical grade 1 & 2 and only thoroughly reliable valves used in grade 1 position. All valves when new will be regarded as grade 1 but when, as sometimes occurs, a valve

is suspected of causing trouble and the bench tests shows no faults then it should be down graded and used in a non critical position.
I am suggesting that critical or Grade 1 position should be marked on the chassis with red paint. Then if down graded valves are marked with a band of yellow it is only necessary to see that no yellow valve is placed in a red position.
Grade 1 position I am suggesting should be as follows :-

[[NB09-090]]

Double Diodes	Gates
	Catching Diodes
	Mixers
Double Triodes	All Coordinator [[Cets]]
	Amplifiers
	Relay Valves
S.P.61	All Coordinator circuits
	Amplifiers & Reversers
	Flip Flop Pairs
	Relay Valves
6F32 ----------	All classed as grade 1
KT61 & EL33	
	All Coord Circuits
EF50 & 55	No Grade 1 circuits

It is proposed as an experiment that A set of valves specially marked (Red Bands?) should be available so that on any one day all the valves in one unit are replaced ~~and~~ for checking without holding up work on the machine. The following [[smashing]] all the valves shown to be OLC are replaced on their positions together with new valves where faulty ones have been found. The test set are then used to replace those in another unit.
This interchanging of valves must be done at a time which permits a [[complete]] check on the machine to be made

[[NB09-091]]
afterwards.
It is important also that ~~if~~ when replacing valves after checking that they are replaced in the same position as before For this reason a note of valve position must be made when removing valves.
A preprinted pad of slips representing the layout of a standard unit could be used for this purpose

Valve Tester
1. Detect intermittent effects
2. Compare with standard

Switch between std & specimen with varying grid volts & [[hioa]]

[[NB09-092]]

15-5-52

Battery	No 1 out
	No 5 out
	No 4 4 duds
	No 2 2 duds

2
3

4

26-5-52

After a week holiday it is very gratifying to find every thing working satisfactorily.
Transfer Unit has been changed and is now ready to accept and deliver to new store.
Zero test unit almost working.
Interview with TRT this afternoon on very pleasant subject with something of a pep talk on direction of effort

II

[[NB09-093]]

Valve tester
Vibration test with trigger circuits operating alarm if characteristic falls above or below specified standards
Probably the safest method of testing is to apply pulse tests similar to condition prevailing in typical circuits
eg. SP61 tested in input to gate circuit
(a) with pulse applied with failure indicated by lack of output
(b) without pulse applied with failure indicated by presence of output

[[DIAGRAMS]]

[[NB09-094]]
Complete Picture of Coordeinater

Jobs on Land
(a) Supervise routine work on calculater
(b) Prototype Calculator
(c) Collater, Converter Reconverter
(d) Diode Tests
(e) Development work on Calculator
(f) Design Valve testing.
(g) put into operation scheme for valve testing and grading.
(h) Shaw & Gibbs
(i) A keyboard converter
(j) Mainenance schedule
(k) Manuals on Collater and Converter
(l) Fault sheet analysis
(m) Alarm & Paging System

[[BLANK PAGE]]

[[NB09-095]]

[[BLANK PAGE]]

[[BLANK PAGE]]