SUBJECT: FINAL REPORT RANGE TIMER ANALYSIS PROGRAMS

Mr. H. A. Vaughn
5-ML

Dec. 29, 1950

cc: WA Mattson 5-ML FW Truesdell 1-ML
IF Kinnard 5-ML RB Ross Somers.
CF Savage 5-ML MJ Downey "
JP Dempsey 5-ML LP Hannaway "
NF Schlegel 2-G E DeLamoureaux "

The subject report is presented for purposes of evaluating the advantages of reviewing a device from the material, manufacturing and purchasing points of view.

The following is a resumé of the complete analysis program to date which has been covered by separate initial reports at the time of consideration namely:

1. Material and Purchase Analysis
2. Change from Mounting Nuts to Speed Clamp Fasteners
3. Front and Back Plates change to Preplated Steel
4. Value Analysis

Each suggestion is classified either "In Effect or Pending". In addition the source of acceptability or the reason for pending is given.

The savings are based on the model GEA time switch and calculated on the savings per thousand timers. In addition they are based on the market conditions at the time of acceptance which is the date of the engineering change. The material changes are based on raw material only while the purchasing changes are based on purchase price. Those changes involving bare labor have been calculated by the cost department.

In reviewing the results of this program please bear in mind that it is a cooperative effort of all departments. The efforts put forth by the Engineering, Manufacturing, Production, Planning, Cost and others departments has made this program successful.

SUBJECT: FINAL REPORT OF THE MATERIAL PURCHASE ANALYSIS OF THE RANGE TIMER

This part of the report represents the savings applicable to the Material and Purchase Analysis report of July 6, 1949. For the sake of brevity this report contains only the conclusions reached on each suggestion. For additional information please refer to the original report.

At the time of the writing of the original report the decision had to be made as to whether the T-63 or the then tentative, T-50 model would be given the greater consideration. It was determined that the range timer production would be divided between the two models with the higher percentage to be T-63 and the smaller undetermined percentage to be T-50. A further consideration was that the T-50 design and planning were partially tentative and therefore would complicate the acquisition of a complete set of drawings, and planning cards. On the basis of the above findings it was decided to concentrate on the T-63 and suggested that the T-50 similar part be considered at the same time.

The production program as originally forcasted was changed due to commercial requirements. Therefore, to fully clarify the latest action it is necessary to consider the T-50 with the T-63 suggestions as originally made.

The following is a tabulation of the suggestions as originally made with the addition of the similar T-50 parts and drawing numbers. A brief explanation of the latest action is also included.

I Material Substitutions	In Effect 1.	Pending 2.
A. K-1298407 T-63 Screw For Center Post " T-50 " " " " This project has been changed. It is now planned to replace the center post and screw by either forming a tab in the plate or replacement with a punch press part.		

		1.	2.
B.	L-4136043-P-87 T-63 Spring Pin Washer " " " T-50 " " "	.16/M	
	This part was changed to aluminum by E.C.24-4062		
C.	V-4138894-T-63 Lower Cam Gear M-8903031-T-50 " " "	2.19/M	
	This suggestion was accepted for both the T-63 and T-50 by E.C. 24-3114 and 24-3118 respectively		
D.	V-4138895 T-63 Post Support " T-50 " "		
	This part was changed as suggested. See the attached Tinnerman report for savings.		
E.	V-4138897 T-63 Lower Bearing K-8945106 T-50 Min. Hd. Shaft Bearing		2.26/M
	Awaiting engineering decision. This suggestion was acceptable for the back bearing for the T-63 but due to high inventory and a change to the T-50, the change was not made. There is no statement as to the date of acceptance for the T-50		
F.	V-4138899-T-63 12 Hr. Red Gear " T-50 " " " "	1.91/M	.25/M
	This material specification was changed to aluminum by E.C.24-3019, however a more expensive aluminum B12H24J was substituted rather than the suggested B12H17D.		
G.	K-4138909-T-63 Min. Hand Gear " T-50 " " "	1.24/M	
	This material specification was changed to aluminum B12H24J by E.C.24-3148.		
H.	V-4138918-T-63 Trigger M-8903332-T-50 Trigger	2.70/M	
	This suggestion was accepted by E.C.24-3142.		
I.	V-4138927-T-63 Support for Contact Arm M-8903328-T-50 " " " "		
	See discussion under IV E		

		1.	2.
J.	V-4138930-T-63 Contact Arm Holder " T-50 " " "	.15/M	
	This material specification was changed to aluminum by E.C. 24-4062.		
K.	K-4138932-T-63 Spring Pin " T-50 " "	.21/M	
	This material specification was changed to aluminum by E.C. 24-4062.		
L.	V-4138958-T-63 Hub for Dial & Gear K-8945098-T-50 " " " " "		5.45/M
	Awaiting engineering decision		
M.	V-4138959-T-63 Sleeve for Hr. Hand K-8945105-T-50 " " " "		3.90/M
	Awaiting engineering decision		
N.	V-4138960-T-63 Pivot Arm K-8945114-T-50 " "	.72/M	
	This suggestion was accepted for the T-50 by E.C. 24-3118		
O.	K-4138963-T-63 Upper Cam Shaft K-8945097-T-50 " " "	4.00/M	
	This suggestion is acceptable and it is planned to be put in effect this year.		
P.	K-4143366-T-63 Lower Cam Shaft K-8945096-T-50 " " "	4.24/M	
	Same as suggestion "O".		
Q.	K-8905016-T-63 Terminal " T-50 "	3.25/M	
	This suggestion was accepted by E.C. 24--3128.		
R.	K-8905091-T-63 Hour Hand Gear " T-50 " " "	1.69/M	
	This suggestion was accepted by E.C. 24-3114.		
S.	K-8905095-T-63 Trigger Shaft K-8903309-T-50 " "	3.25/M	
	This suggestion was accepted for the T-50 by E.C. 24-3118.		
T.	K-8905097-T-63 Setting Shaft K-8905423-T-50 " " K-8905248-T-50 " "	5.55/M	
	This suggestion was accepted for the T-50 by E.C. 24-3118.		

		1.	2.
U.	K-8905102-T-63 2nd Red Gear " T-50 " " "	.19/M	
	This suggestion was accepted by E.C. 24-3114		
V.	K-8905103-T-63 1st Red Gear " T-50 " " "	.10/M	
	This suggestion was accepted by E.C. 24-3114		
W.	K-8905382-T-63 Upper Set Gear K-8905132-T-50 " " "	.10/M	
	This suggestion was accepted by E.C. 24-3114.		
X.	K-8945007-T-63 Cook Time Dial Gear K-8903030-T-50 " " " "	.73/M	
	This suggestion was accepted for both the T-50 and T-63 by E.C. 24-3118 and 24-3114 respectively.		
Y.	K-8945117-T-50 Spacing Stud	4.40/M	
	This suggestion was made in July 1950 and was accepted by E.C. 24-3336		
		36.75/M	11.86/M

II Elimination of Parts

A. L-4136041-P103-T-63 Friction Washer
" T-50 " "

B. L-4136041-P85-T-63 Friction Washer
" T-50 " "

Awaiting engineering approval. This project has been delayed pending the change to a lower cost dial spring.

Total for both parts 5.00/M

III Change in Manufacturing Method

A. V-4138918-T-63 Trigger
K-8903332-T-50 "
This part had been planned for coil stock for the T-50. The T-63 was not changed due to insufficient remaining production to liquidate the tools.

B. V-4138930-T-63 Contact Arm Holder
" T-53 " " "

The manufacture of this part is being transferred to the Somersworth plant where it is planned to make the change.

C. K-4138963-T-63 Upper Cam Shaft
K-8945097-T-50 " " "
This suggestion was acceptable as determined by engineering tests, however the tool costs could not be liquidated. It has been suggested that if the tool maintenance costs of the present cam-turning fixture is factored in on the change to aluminum a savings will be realized.

D. K-8905382-T-63 Upper Set Gear
K-8905132-T-50 " " "
This part had been planned for complete blanking for the T-50.

IV Purchasing Negotiation	1.	2.
A. V-4134179-T-63 Retaining Ring " T-50 " " This part was not changed due to special requirements		
B. V-4138915-T-63 Retaining Ring Not required for the T-50. The vendor for this part was changed in January 1950.	1.72/M	
C. V-4138920-T-63 Trigger Spring K-8945107-T-50 " " The vendor for this part was changed in May 1950.	2.80/M	
D. V-4138921-T-63 Trigger Lift Spring " T-50 " " " The vendor for this part was changed in March 1950. Additional savings of $3.10/M has been realized on this part by the Somersworth Purchasing Dept.	6.40/M	

	1.	2.
E. K-4138927-T-63 Support for Contact Arm		7.00/M
K-8903328-T-50 " " " "		
Awaiting engineering tests. Sample parts of sanded and unsanded type 2008 have been presented to the engineering dept. for tests.		
F. V-4138933-T-63 Contact Spring	.30/M	
" T-50 " "		
The vendor for this part was changed in December 1949		
G. V-4138941-T-63 Retaining Ring	1.72/M	
Not required for the T-50. The vendor for this part was changed in January 1950		
H. K-4143378-T-63 Retaining Ring	.30/M	
" -T-50 " "		
This vendor for this part was charged in January 1950.		
The following four items are additional negotiations that have been made since the original report		
I. K-8905104-T-63 Friction Spring	2.70/M	
" T-50 " "		
Re-negotiation with the vendor		
J. K-8905105-T-63 Friction Spring		
" T-50 " "	4.85/M	
Re-negotiation with the vendor		
K. K-8905140-T-63 Friction Spring	.75/M	
" T-50 " "		
Re-negotiation with the vendor		
L. K-8905106-T-63 Contact Armature	2.60/M	
" T-50 " "		
By means of negotiation with the vendor, we now purchase the material for this part in coils rather than cut lengths as previously planned. This change reduced the scrap and allowed the use of a mechanical feed for a labor saving		
	24.14/M	7.00/M
	60.89/M	23.86/M

The total savings of this part of the program is as follows:

In effect	60.89/M
Pending	23.86/M

SUBJECT: CHANGE FROM RANGE TIMER MOUNTING NUTS TO SPEED CLAMP FASTENERS

As a part of the analysis program on the range timer the Tinnerman Products Company representative was requested to visit this office with the results as follows:

In reviewing the timer design for possible applications it became apparent that a slight change in mounting post design would allow a change to a low cost type speed clamp. Samples were requested and adapted to standard plates with a slight change in the post support design. The sample assembly were presented to the Time Switch Engineering department for test purposes.

As a result of these tests the speed clamp type assembly was accepted by the Time Switch Engineering Division by engineering change # 24-3197.

In addition to the Tinnerman Products Company other manufacturers of speed clamps have also submitted samples. All samples have been tested to insure additional sources of supply and further cost reduction. All the samples have been accepted by the engineering department and at least one will result in additional cost reduction.

The following is a comparison of the cost of the two types of assembly. The figures shown are the 1950 standard costs as calculated by the cost department.

Old cost per thousand switches			
Nuts (2 req'd per 8945127 Pt 1 @ $6.50/M		$12.50	
Nuts (2 req'd per 8945127 Pt 2 @ 12.00/M		24.00	
Post Support (4 req'd per 4138895)			
Material (Brass)	$3.80		
Labor & O.H.	3.50		
	$7.30	29.20	
Total Cost			$65.70
New Cost per thousand switches			
Speed Clamps (4 req'd @ $1.87/M		$ 7.48	
Post Support 2 req'd per 8903459 Pt 5			
Material (Aluminum)	$2.30		
Labor & O.H.	3.30		
	$5.60	11.20	
Post Support 2 req'd per 8903459 Pt.8			
Material Aluminum	$2.30		
Labor & O.H.	9.30		
	$11.60	23.20	
Total Cost			$41.88

Material Saving	$23.82
Assembly Labor Saving	1.00
Total Savings per thousand switches	$24.82

In addition to the savings noted above there will be a further saving of $1.20 per thousand timers by changing to the Shakeproof Spring Grip Washer which has been accepted by the engineering department.

SUBJECT: RANGE TIMER FRONT & BACK PLATES CHANGE TO PRE-PLATED STEEL

The subject material substitution was presented to the Time Switch Engineering division for consideration by the Purchasing department as a part of the program of keeping abreast of new materials and new techniques to reduce cost.

Preplated material as suggested for this application has a tradename of Zincgrip. It is a recently developed and patented process of the Armco Steel Corporation and is a greatly improved zinc coated sheet metal that does not peel or flake when severely formed.

The use of preplated steel for this application allows the elimination of a plating operation as well as a reaming operation. It was necessary to ream after plating due to plating build up in the bearing holes. As preplated material requires no plating after blanking there is no need for reaming.

This suggestion was accepted for use on the range timer plates by Engineering Change #24-3196. In addition to the subject change it is planned to change other time switch plates to Zincgrip as soon as additional material is available.

The following figures represent the savings per thousand timers for the model 3T63GEA-20 using the cost figures of June 1950 which was the production date.

1. The net savings using bare labor per thousand timers considering the material increase is as follows:

Material (increase)	$1.20
Bare Labor (decrease)	17.40
Net Savings (bare Labor)	$16.20

2. The total savings on a shop cost basis is:

   $59.20/M timers.

SUBJECT: FINAL REPORT ON THE RANGE TIMER
VALUE ANALYSIS REPORT OF December 11, 1949

Reference: Review of Range Timer Value Analysis dated April 6, 1950

This section represents the efforts of the Value Analysis Group of Schenectady who were invited to assist on the program. The efforts of this group were coordinated with the overall program to prevent duplication of efforts.

This report represents the latest action on the outside vendor consideration as well as our own internal changes. In addition the comparisons are based on facts and cost figures presented by the Somersworth cost department for the April 6, 1950 review.

Each suggestion is classified as to acceptability by "yes" questionable" or "no". The savings shown on the yes or questionable items are in addition to any previously scheduled cost reduction.

There were 27 items recommended for cost reduction in the subject report.

On 9 items cost reductions can be realized to the extent of $65.10.

One item is questionable and it may be possible to realize $20.00 per thousand timers.

On 17 items it is the concensus of opinion that the suggestions are not feasible at this time.

Terminal & Contact Assembly
8905016 & 4138950 No

This suggestion is not acceptable on a cost basis. Recent quotes from a reputable manufacturer of raise-lay material as suggested for this application would show a cost of $98.50 per thousand timers instead of $56.80 as quoted by the Schenectady Value Analysis report. This material increase alone would result in a cost increase over the present method.

2.	Terminal 8905016 This suggestion was accepted by E.C. 24-3195 and has been used successfully in production.	Yes	$5.00/M
3.	Pinion Gear & Stud Assembly (1st Red) Assembly (Old) 4143375 Assembly (New) 8945132 This suggestion was accepted by E.C. 24-3446 and has been used successfully in production	Yes	10.80/M
4.	Pinion Gear & Stud (2nd Red) Assembly (Old) 4143375 Assembly (New) 8945130 This suggestion is acceptable on the same basis as the first reduction pinion. Further action on this part is held up pending the outcome of production experience on the first reduction pinion.	Yes	15.20/M
5.	Dials This suggestion is not acceptable for large inked areas such as those required on range timer dials. The styling of dials is controlled by the customer and could not be changed to fit the recommended process.	No	
6.	Contact Assembly V-4138926 This suggestion is not acceptable. This idea was previously considered but it did not comply with the temperature rise requirements.	No	
7.	Knobs K-8905094 and K-8905064 This suggestion was acceptable, however this part will not be furnished with the new timer.	No	
8.	Leads This suggestion is not acceptable as the uninsulated wire will not meet Underwriters Laboratories requirements.	No	

9. Armature Pivot
V-4138960 (Old)
K-8945114 (New) — Yes — $6.62/M

This suggestion is acceptable on the same basis as the first reduction pinion. Further action on this part is held up pending the outcome of production experience on sample first reduction parts for quality and a measure of this type of fabrication.

10. Terminal & Support Strip
K-4143229 — No

This suggestion is not acceptable at this time. Other work on solderless type connectors looks more promising.

11. Hour Hand Sleeve Assembly
K-4143233 (Old)
K-8945112 (New) — Yes — 1.20/M

This suggestion has been accepted and is in effect.

12. Washer
L-4136041-102 — Yes — 4.10/M

This suggestion is acceptable and in effect.

13. Minute Hand Pinion
K-4138910 — Yes — 9.88/M

This suggestion as originally made was for casting the minute hand gear and pinion assembly as one piece which is not acceptable due to clutch requirements. However, it is possible to make the pinion a die cast part for assembly with the minute hand gear and spring washer. Their is no cost advantage in die casting the gear over the present method. Further action on the pinion is held up pending the outcome of production experience on the first reduction pinion.

14. Gear
K-8905443 (Old)
K-8905132 (New) — No.

This suggestion is not acceptable on a cost basis. We can make a compound blanking die for approximately the same tool price which will enable us to make the part for less than a die cast gear. Additional cost investigation is being done to determine if we can liquidate the tools on the forcasted production.

15. Pinion
V-4138898 (Old)
K-8945103 (New) — Yes — $4.30/M

This suggestion is acceptable on the same basis as the first reduction pinion. Further action on this part is held pending outcome of production experience on the first reduction pinion.

16. Cam Shaft & Gear Assemblies — Quest. — 20.00/M

This suggestion appears to be acceptable for the cams shafts only. The casting of the complete assembly is not advisable because of timing requirements. Further action on this part is deferred pending the outcome of tests on the first reduction assembly.

17. Gear
K-8945007 (Old)
M-8903031 (New) — No.

This suggestion is not acceptable on a cost basis. The present gears are blanked complete in one operation which is lower cost than die casting.

18. Gear
V-4138894 (Old)
M-8903031 (New) — No

This suggestion is not acceptable for the same reason as the 8945007 gear.

19. Bearing
V-4138897 — No

This suggestion is not acceptable. Recent design changes have eliminated this part.

20. Dial & Gear Hub
V-4138958 (Old)
K-8945098 (New) — Yes — $8.00/M

This suggestion is acceptable on the same basis as the first reduction assembly. Further action on this part is held up pending the outcome of first reduction production experience.

21. Motor Post
V-4138951 — No

This suggestion although acceptable is not possible at this time. In order to take advantage of this suggestion we would have to increase the screw machine load on Somersworth which is not possible at this time.

22. Mounting Nuts
K-8945127 — No

This suggestion is not acceptable. Recent design changes have eliminated these parts.

23. Friction Springs
K-8905104
K-8905105 — No

This suggestion is not acceptable on a cost basis. We have received lower quotes from another vendor.

24. Washer
L-4136042-97 — No

This suggestion is not acceptable. Recent design changes have eliminated this part.

25. Back Plate
P-8903088

This suggestion is not acceptable. Recent design changes have eliminated the formed ear. It is planned to replace it by a Tinnerman speed nut or its equivalent.

26. Trigger Shaft
K-8905095 No.

This suggestion is not acceptable Recent design changes have eliminated the milling operation. The centerless grinding is necessary for timing accuracy.

27. Trigger
V-4138910 (Old)
M-8903333 (New) No

This suggestion although acceptable is a duplication of a change on the new design.

Estimated savings per thousand timers for this part

9 yes items for	65.10		
4 in effect for		21.10	
5 pending for			44.00
1 questionable item for			20.00

17 no items

It should be noted at this time that the five remaining yes items which are not in effect at this time are all zinc die cast parts. At the time of releasing the tools for the first reduction assembly it was the concensus of opinion that this part would be the most difficult to make. In addition it has the highest bearing requirements in the gear train. Based on these facts it was decided that if the first reduction were acceptable the five remaining items would also be acceptable. Every effort is being made to put the remaining items into effect as soon as possible.

SUMMARY:

The total savings per thousand timers are as follows:

	In Effect	Pending
1. Material & Purchase Analysis	60.89	23.86
2. Speed Clamps	24.82	1.20
3. Preplated Steel	59.20	
4. Value Analysis	21.10	64.00
Total	$166.01	$89.06

The annual savings based on an estimated production of 784,000 timers to be shipped in 1950 is as follows:

In Effect	$130,000.
Pending	70,000.
Total Possible	$200,000.

M. RODMAN,
WORKS PURCHASING AGENT
BY: A. E. Brostrom
MATERIAL ANALYST

AE Brostrom

December 29, 1950