



Figure 18

Drawing showing symbols and notes, indicating kind of finish, degree of accuracy, special tools to be used, etc.—nothing left to chance.

**Standardized Materials**

Similar standard work places were designed for each of the operations. Figure 15 shows one for "ribboning," i.e. tying the handkerchiefs on a card in attractive form before boxing. Figure 16 shows a truck station in which "jobs ahead" of the "ribboners" are stored and Figure 17 gives a general view of one department with a truck station in the foreground. The orderly arrangement with its ample and unobstructed aisles is in marked contrast to what existed before.

Standard materials which may be depended upon to react the same to treatment every time are essential to scientific management. Under the old style management fluctuations in output, due to variations in quality of material, are obscured. Under scientific management they are constantly forcing themselves upon the management's attention and demanding action.

THE TABOR MFG. CO. Drawing No. 9536.  
PHILADELPHIA, PA.  
Per. Raz 5/1 1911. Examined by 19

(Superseding Draw. No. 2300 & 2301). Order No. \_\_\_\_\_

**Key to Symbols on Drawings**

When a Letter is used with a Dimension it indicates one of the Following Finishes.

X Indicates: The Dimension that one of the greatest Importance is sure they are correct to Size & Lead, indicated by their Letters.

A \*\* Limit of  $\frac{1}{16}$ " +/-  
B \*\* Polish  
C \*\* Counter-bore  
D \*\* Drill  
DA \*\* after Assembly  
DP \*\* Driving Fit (See Table DP for Allowance).  
DIAM \*\* Diameter  
E \*\* Limit of 0.001" +/-  
F \*\* Smooth Machine Finish  
FP \*\* File Finish.  
FK \*\* Shrinking Fit (See Table FK for Allowance)  
FS Sliding \*\* " \*\* FS \*\* "  
G Grind to Gauge (See Table for Turning Allowance).  
JIG Machining to be Done with Jig.  
K Spot Countersink on Pattern  
L Work to be Laid out.  
LT Limit +/- Thus Lt 0.003 or Lt 0.01, etc.  
LT+ \*\* to Size or Over. Thus Lt+ 0.003 or Lt+ 0.01, etc  
LT- \*\* " " Under. Thus Lt- 0.003 or Lt- 0.01, etc  
M \*\* of 0.0001" +/-  
P Forcing Fit (See Table P for Allowance).  
PT Pipe Tap.  
R Ream with Standard Reamer.  
RA \*\* after Assembly.  
RP Running Fit (See Table Rk for Allowance).  
RP Rough Plane, with Limit of  $\frac{1}{16}$ " +/-  
RT \*\* Turn. \*\* " +/-  
T Hole to be Tapped, U.S. Standard Thread.  
TS \*\* " " Special, & so Marked on Drawing—Ts Acme 3/P. I.  
TR Hole to be Transferred from Piece. Mark Drawing 1/TW from Cap.

**Allowances for Fits.**

Note: As no Hard & Fast Rules can be laid down for Allowances. The following Tables should be used as a Guide. Subject to variations due to Different kinds of Metal, Finish, Length of Bearing, etc

Fk = Shrinking Fits

DIAM.	1/4 TO	1/2 TO	3/4 TO	1 TO	2 TO	3 TO	4 TO	6 TO	8 TO	10 TO	15 TO	20 TO
Min.	0.0005	0.0005	0.0007	0.001	0.002	0.003	0.004	0.006	0.008	0.01	0.015	0.02
Max.	0.0007	0.0008	0.0009	0.0011	0.0015	0.0020	0.0025	0.0040	0.0050	0.0075	0.0100	0.0150

DP = Driving Fits. (Light Drive for Lead or Hammer)

DIAM.	1/4 TO	1/2 TO	3/4 TO	1 TO	2 TO	3 TO	4 TO	6 TO	8 TO	10 TO	15 TO	20 TO
Min.	0.0005	0.0005	0.0008	0.0010	0.0015	0.0020	0.0025	0.0040	0.0050	0.0075	0.0100	0.0150
Max.	0.0008	0.0009	0.0011	0.0013	0.0018	0.0025	0.0030	0.0050	0.0060	0.0090	0.0120	0.0180

P = Forcing Fits (Heavy Drive for Sledge or Press)

DIAM.	1/4 TO	1/2 TO	3/4 TO	1 TO	2 TO	3 TO	4 TO	6 TO	8 TO	10 TO	15 TO	20 TO
Min.	0.0005	0.0005	0.0007	0.001	0.0015	0.0020	0.0025	0.0040	0.0050	0.0075	0.0100	0.0150
Max.	0.0008	0.0009	0.0011	0.0013	0.0018	0.0025	0.0030	0.0050	0.0060	0.0090	0.0120	0.0180

R = Running Fits

DIAM.	1/4 TO	1/2 TO	3/4 TO	1 TO	2 TO	3 TO	4 TO	6 TO	8 TO	10 TO	15 TO	20 TO
Min.	0.001	0.001	0.001	0.0015	0.002	0.003	0.004	0.006	0.008	0.01	0.015	0.02
Max.	0.002	0.002	0.002	0.0025	0.0035	0.005	0.006	0.01	0.012	0.015	0.02	0.025

FS = Sliding Fits. (Not used for Valves or Vibrators)

DIAM.	1/4 TO	1/2 TO	3/4 TO	1 TO	2 TO	3 TO	4 TO	6 TO	8 TO	10 TO	15 TO	20 TO
Min.	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Max.	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010

G = Turning Allowance for Grinding

DIAM.	1/4 TO	1/2 TO	3/4 TO	1 TO	2 TO	3 TO	4 TO	6 TO	8 TO	REMARKS.
Allow.	0.015	0.015	0.015	0.02	0.03	0.03	0.04	0.05	0.05	
**				0.025	0.025					FOR C.H. PIECES

Figure 19

Key to Symbols on Drawings of Figure 18.

But little in the way of illustration should be needed to show the importance of standardized materials. In the case of winding small coils for electric magnets, related under the heading of standardization of tools, our studies showed that an average of one-fifth of the operator's time was consumed repairing breaks in the wire due to defects. While it had been known to the operators that there was great loss here, it was not realized by the management until the facts were brought out by the time studies.

Each break necessitated the operator stopping her machine, retrieving the broken end of the wire on the spool, threading it through several guide pulleys, braz-

ing the two ends together and insulating the joint. It was seen that to correct this trouble at its source would require months if not years of work, involving changes in the method of insulating the wire, in the equipment used for insulating and even in securing the co-operation of the manufacturer of the raw materials, by all of which it was ultimately reduced materially. As the number of breaks that might occur during a job could not be predicted, the expedient was adopted of setting the time for the job with no allowance for breaks included. If the time set for a job were to include the repairing of breaks, in order to insure fairness to the operator we should have had to allow time for the greatest number of breaks that might