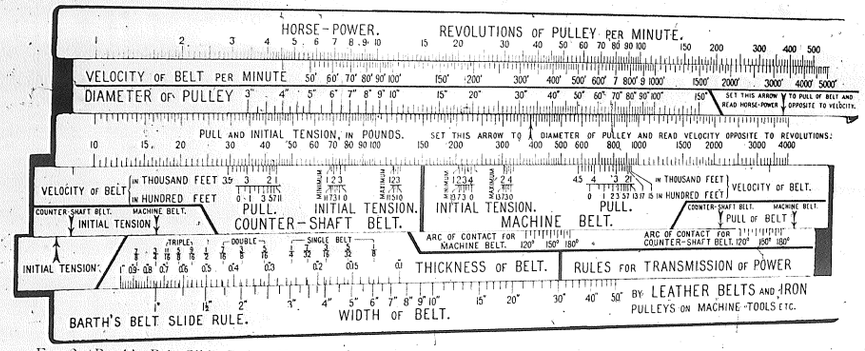


FIG. 2. Barth's Belt Slide Rule. Used for computations in establishing and maintaining standard belt conditions.

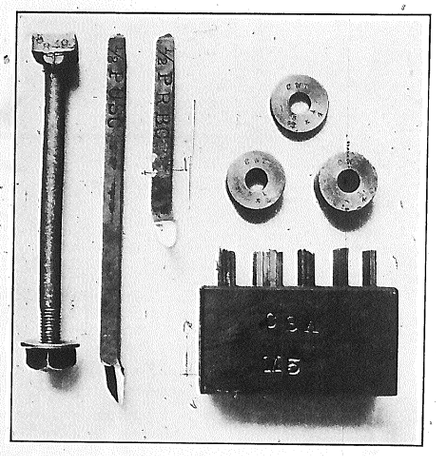


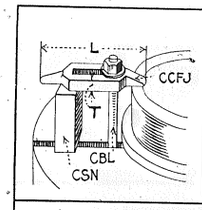
FIG. 4. Standard Tools. Clamping bolt, side tool, round nose roughing tool, washers for belt, set of "shims," or packing pieces, and small wedges.

II STANDARD TOOLS

In describing the results achieved through the application of scientific management in its simplest form to work of an elementary character—that of handling raw materials—such as iron ore, coal, coke, sand and ashes in the yards of the Bethlehem Steel Co., Mr. Taylor gave an illustration of the establishment of a standard that can be understood and appreciated by anyone. He found that the same size and kind of shovel was being used for all of these materials. Almost any ten-year-old child knows that coal is heavier than ashes. It is obvious (since Taylor called our attention to the fact) that a shovel that will be suitable to hold the most economical weight of one material will not be so economical when used for another material of a different weight and character. Taylor's experiments demonstrated that twenty-one pounds is the most economical weight to be handled as a shovelful, and consequently had shovels built for each of the various materials to handle that weight. Of what avail would time study or differential piece work have been in this work without the standard shovel?

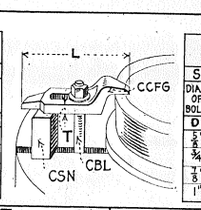
A few years ago I was gratified to see the advertisement of a manufacturer of shovels who announced that he would supply a standard twenty-one pound capacity shovel for any material. I doubt, however, whether it brought him much business; to most managers such a tool is too humble to attract their attention—a shovel is a shovel.

But little above the humble shovel is the bolt, clamp and block used by the machinist in fastening work on the platen of his machine, be it planer, milling machine, boring mill, drill press or lathe. In the ordinary machine shop the management does not consider these tools worthy of its attention, each workman is *supposed* to have in some way acquired and to have on hand at his machine an assortment and supply adequate to his needs. It is taken for granted that they are in good condition; that "is up to the workman." As a matter of fact these suppositions are largely fond delusions.



CCFJ — SIZE OF CLAMP

D	L	T	LBS	OZ
5/8"	9 3/4"	1 1/4"	4	8
3/4"	10 1/2"	1 7/16"	6	5
7/8"	10 3/4"	1 5/8"	8	12
1"	11 1/2"	1 7/8"	11	16



CCFG — SIZE OF CLAMP

DIAM OF BOLT	LENGTH OF CLAMP	THICKNESS OF CLAMP	WEIGHT OF CLAMP	
D	L	T	LBS	OZ
5/8"	9 1/2"	1 1/4"	5	10
3/4"	10 1/2"	1 7/16"	8	6
7/8"	10 3/4"	1 5/8"	11	7
1"	11 1/2"	1 7/8"	15	

CCFG CCFJ

SIZES GIVEN IN THE TABLE USED WITH CBL AND CSN

DIAMETER OF BOLT	5/8 AND 3/4				7/8 AND 1					
LENGTH OF BOLT	6	12	14	18	6	12	18	24	30	36
TIME FOR CLAMPING IN MINUTES	0.68	0.71	0.72	0.79	0.76	0.80	0.90	1.00	1.12	1.25
LIFT CLAM, BOLT AND BLOCK TO TABLE (CLAMP AND BOLT REMAINING IN HAND)	0.07	0.07	0.08	0.09	0.09	0.10	0.11	0.13	0.14	0.17
PUT BOLT IN SLOT	0.04	0.04	0.04	0.05	0.04	0.04	0.05	0.05	0.06	0.07
UNSCREW NUT FROM BOLT WITH FINGERS	0.13	0.13	0.13	0.14	0.14	0.14	0.16	0.17	0.19	0.22
PUT CLAMP OVER BOLT AND ON WORK	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.07	0.08
PUT BLOCK UNDER CLAMP	0.04	0.05	0.05	0.05	0.04	0.05	0.05	0.07	0.08	0.10
PUT WASHER ON BOLT	0.06	0.07	0.07	0.07	0.06	0.06	0.07	0.07	0.08	0.08
SCREW NUT ON BOLT WITH FINGERS	0.13	0.13	0.13	0.14	0.14	0.14	0.16	0.17	0.19	0.22
TIGHTEN NUT LIGHTLY WITH WRENCH	0.08	0.07	0.08	0.10	0.11	0.12	0.13	0.15	0.17	0.19
DRAW NUT DOWN TIGHT WITH WRENCH	0.08	0.10	0.09	0.10	0.09	0.10	0.11	0.13	0.14	0.12
TIME FOR REMOVING IN MINUTES	0.19	0.20	0.20	0.23	0.27	0.28	0.32	0.35	0.40	0.47
LOOSEN NUT WITH WRENCH	0.11	0.12	0.12	0.13	0.17	0.17	0.19	0.20	0.22	0.25
REMOVE BOLT FROM SLOT, AND ALL TO FLOOR	0.08	0.08	0.08	0.10	0.10	0.11	0.13	0.15	0.18	0.22
TIME FOR CLAMPING IN MINUTES	0.36	0.40	0.40	0.45	0.40	0.46	0.51	0.62	0.70	0.85
LIFT CLAMP, BOLT AND BLOCK TO TABLE (CLAMP AND BOLT REMAINING IN HAND)	0.06	0.07	0.07	0.07	0.06	0.07	0.08	0.10	0.11	0.14
PUT BOLT IN SLOT AND CLAMP ON WORK	0.05	0.05	0.05	0.06	0.05	0.05	0.06	0.07	0.09	0.11
PUT BLOCK UNDER CLAMP	0.04	0.05	0.05	0.05	0.04	0.05	0.05	0.07	0.08	0.10
SCREW NUT DOWN WITH FINGERS	0.06	0.06	0.06	0.07	0.06	0.07	0.08	0.10	0.11	0.14
TIGHTEN NUT LIGHTLY WITH WRENCH	0.07	0.08	0.08	0.10	0.11	0.12	0.13	0.15	0.17	0.19
DRAW NUT DOWN TIGHT WITH WRENCH	0.08	0.09	0.09	0.10	0.09	0.10	0.11	0.13	0.14	0.17
TIME FOR REMOVING IN MINUTES	0.45	0.45	0.46	0.52	0.51	0.51	0.58	0.62	0.68	0.78
LOOSEN NUT WITH WRENCH	0.10	0.10	0.11	0.13	0.17	0.17	0.19	0.20	0.22	0.25
UNSCREW NUT FROM BOLT WITH FINGERS	0.12	0.12	0.12	0.13	0.11	0.11	0.13	0.14	0.16	0.19
TAKE OFF WASHER AND CLAMP	0.04	0.04	0.04	0.05	0.04	0.04	0.05	0.05	0.06	0.07
REMOVE BOLT FROM SLOT	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.05	0.05
PUT WASHER AND NUT ON BOLT	0.11	0.11	0.11	0.12	0.11	0.11	0.12	0.13	0.14	0.15
PUT CLAMP, BOLT AND BLOCK IN TOTE BOX	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.07

TAYLOR SYSTEM ELEMENTARY UNIT TIME

CLAMPING
BOLT AND CLAMP NOT ASSEMBLED
THE TIME GIVEN IN THIS SECTION TO BE USED FOR CLAMPING THE FIRST PIECE ONLY IN LOT

REMOVING
BOLT AND CLAMP NOT SEPARATED
THE TIME GIVEN IN THIS SECTION TO BE USED FOR REMOVING CLAMP FOR ALL PIECES EXCEPTING THE LAST PIECE

CLAMPING
BOLT AND CLAMP ASSEMBLED
THE TIME GIVEN IN THIS SECTION TO BE USED FOR CLAMPING ALL PIECES IN LOT AFTER THE FIRST PIECE

REMOVING
BOLT AND CLAMP SEPARATED
THE TIME GIVEN IN THIS SECTION TO BE USED FOR REMOVING CLAMP FROM THE LAST PIECE ONLY IN LOT

FIG. 3. Elementary Time Study Data Sheets, showing time for putting on and taking off standard bolts, clamps and blocks.

The time that it will take to clamp a job on a machine depends upon:

(1) Whether the bolt, clamp and block to go under the heel of the clamp are readily at hand when wanted; whether they have to be dug out of a heterogenous mass of such tools kept by the workman in the bed of the machine, in a box or locker; whether they have to be "borrowed" from another workman—with or without his consent; whether the workman has to go to the blacksmith shop to get a piece welded on, a bolt to make it long enough, or to the carpenter shop to get a block of the right length cut off, etc., etc.

(2) Whether the head of the bolt available fits the T slot in the machine or has to be ground or filed to let it in; whether the length is just right or it is from one inch to three inches too long, necessitating either finding and putting on washers or old nuts to fill up the gap, or screwing the nut down an inch or two further than should be necessary on a bolt of the *right* length.

(3) Whether the nut fits properly on the bolt so that it may be quickly and easily screwed on or off with the fingers, or whether it is so tight that it must be slowly and laboriously screwed all the way on and all the way off with a wrench.