



Figure 15
Standard Work Place for "Ribboning" Handkerchiefs. Note the "Spring Chair" developed by Frank B. Gilbreth. The legs rest on springs in the extensions to eliminate floor vibration and any consequent discomfort or fatigue.

dition and issued to the machines as required in advance for each job, we would nevertheless find that owing to the poor proportions of the head they would frequently break or damage the slots on the table.

On this account it is the practice as one of the preliminary steps in installing the Taylor System in a machine shop to plane out the slots in all machines to take the strong standard bolt developed by Mr. Barth.

Still another excellent and simple illustration of machine standardization in a machine shop is in the tool posts of small and medium size engine lathes. Until quite recently and still in many instances, the tool post with its concave or cupped washer and sliding shoe furnished with the ma-

chine was intended to be used with a tool simply cut off from the bar of steel, the end trimmed roughly to shape and ground. Now the Taylor standard tool, as will be seen by referring back to Figure 7, (p. 500; October number) has a nose turned up considerably above the top surface of the bar, facilitating grinding and affording an increased number of grindings before the tool must be dressed, with, as a consequence, less waste of tool steel. In all cases where necessary the tool post and in some cases the side rest are altered to permit the use of standard tools; usually this results in reducing the number of sizes of tool steel that have to be used. A more direct gain is obtained, however, by doing away with the cupped washer and sliding shoe and substituting therefor a flat washer with flat packing pieces to be placed under the tool.

To make this clear it is necessary that I explain that the cutting edge of a tool used on cylindrical work be set approximately on, or slightly above, the horizontal radial axis of the work and that the front of the tool clear slightly a tangential line drawn from the point at which the edge of the tool touches the work. The front of a Taylor Standard tool is ground to an angle of six degrees from a perpendicular to the base, just enough so that the front of the tool will bear on the work only on the cutting edge; consequently it should be set with the cutting edge just on the horizontal axis of the work—"on the center," as a machinist would say. If a tool is ground with a greater angle of clearance—as is almost inevitable with a tool ground by hand on an emery wheel of relatively small diameter (and it is not unusual to see such tools ground with from fifteen to twenty degrees clearance)—one of two things must be done. Either it must be set with the cutting edge above the center or horizontal axis of the job so that the circumferential arc of the work will neutralize the excessive clearance, or it must be tilted, the base being on an angle to the horizontal, which accomplishes the same effect. The cupped washer and sliding shoe accomplishes both at once, tilting the tool and raising the edge. It is in fact quite an ingenious device. However, there is one very serious objection to it; the proper setting of the tool is a matter of judgment and of cut and try, calling for more skill and better judgment than is possessed by many workmen and very liable to be



Figure 16
Truck Station.

a source of delay, or at least uncertainty in the time of an important element.

All of this uncertainty is eliminated by the flat washer and packing pieces replacing the cupped washer and sliding shoe, and by the provision of a measuring device which quickly indicates the number and thickness of packing pieces that must be placed under the tool, to compensate for variation in height from base to cutting edge due to grinding, and to bring the cutting edge in contact with the work at the right point. This is another standard for which we are chiefly indebted to Mr. Barth.

Under the unstandardized conditions described it is impossible to make a definite allowance for this elementary operation which on the average must be per-

formed several times during each job. Under the standardized conditions it not only may be depended upon to take the same time each time it is done, but it may be done in less time. A description of this device, of which there are several forms all essentially the same, is, I think, worth while, as it may suggest something similar in other directions. The measuring device with hooks, holding packing pieces, shown by Figure 9 (p. 501, October number), is mounted on the tool stand supplied for the lathe. The tool is picked up from the stand and placed on its base with the cutting edge against the scale. The graduation indicates by direct reading the packing pieces or pieces required, which are picked off their hooks and placed with the tool in the tool post. If the cutting edge comes to the top graduation—marked O—as might be