Measures for Preventing Accidents from Wood-Planing Machines

Translated by Eric Patton and Ruth Hein

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The Institute respectfully submits the following remarks on the activities outlined in last year's report regarding the introduction of cylindrical safety shafts and regarding equipping square shafts with metal flaps in wood-planing machines.

The introduction of the cylindrical safety shafts in wood-planing machines is finally progressing well, as is attested in the edict circulated by the k. k. Office of the Governor to the k.k. district authorities regarding the introduction of the safety shafts; the same opinion is expressed by the k. k. trade inspectors, who are pressing us with increasing urgency to use these shafts. Finally, there is the fact that a considerable number of employers are already working with such shafts and have spoken very favorably, not only about the important safety feature of the cylindrical shafts—which was never in question—but also about their practical usefulness. There is thus a well-founded hope that in the near future the cylindrical shafts will have won such widespread acceptance that any business that does not use them will have to be classified as indicative of above-average risk.

We can only wish that the technical journals would devote greater attention to the cylindrical shafts, for judging by the current situation, it appears that the only thing now needed to make the cylindrical shafts quickly and universally accepted equipment is a final detailed discussion that would reach all circles involved. The reason for this is primarily that the cylindrical shafts occupy a very special position in the area of safety equipment, since apart from their protective effect—which is, in fact, absolute—they combine a number of other advantages, being basically cheaper than the square shafts and functioning both more cheaply and more efficiently. Thus their adoption does not call on employers' sociopolitical judgment but is clearly advisable as a practical matter.

I. The cylindrical safety shaft provides perfect protection.

Our illustrations show the difference between the square and the cylindrical shafts from the perspective of safety. The blades of the square shaft (*figure 1*) are screwed directly to the shaft, and their exposed cutting edges spin at 3800–4000 revolutions per minute.

The danger that arises for the worker from the large gap between the blades on the shaft and the surface of the table are obvious. These shafts would therefore have to be used either out of ignorance of the danger, which may become even greater as a result, or in full awareness of constant and unavoidable danger. An extremely cautious worker might well take care that as he works guiding the piece of wood over the planing blade, no part of his fingers protrudes beyond the wood, but the primary danger makes a mockery of all caution. The hand of even the most careful worker would inevitably slide into the blade slot in case of a slip, or when the piece of wood to be planed is pitched backward—a mishap that is not infrequent—as he presses it down on the table with one hand and guides it toward the blade with the other. This act of raising and pitching back of the wood can never be either predicted or prevented, since it happens whenever the wood is misshapen or gnarled, whenever the blades do not spin quickly enough or slide out of alignment, or whenever the pressure from the worker's hand on the wood is unevenly distributed. And whenever such an accident occurs, several finger joints or even entire fingers are severed (*figure 2*).

Not only have all cautionary measures seemed to fail in the face of such risks, so also has every safety device. They either proved to be fully inadequate or they decreased the danger in one respect (by automatically covering the blade slot with a safety plate or decreasing the width of the blade slot) while increasing it in another respect by not giving the shavings enough room to fall, so that the blade slot became clogged and injuries to the fingers occurred frequently when the worker tried to clear the slot of shavings.

As a comparison to this square shaft, a cylindrical safety shaft from the engineering works of Bohumil Voleský, Prague-Lieben, is illustrated in *figures 3* and *4*; *figures 5* and *6* show an original cylindrical safety shaft for wood-planing machines using the Schrader system, a product of the engineering works of Emil Mau und Co. in Dresden.

The blades of these shafts are completely protected between the flap (Voleský Co. shaft) or between a wedge (Schrader patent) and the solid frame of the shaft. They are fastened securely, unaffected by any strain, and the blades can never snap out, any more than they will be flung out or bent. Should the shaft break, the possibility of the screws' flying out is also minimized because the screws are cylindrical and are sunk deeply into the flaps; moreover, in the case of the Schrader patent, the screws are exposed to much less strain than those in the square shafts, since in the latter the screws are made to hold the actual blades, while in the cylindrical shaft the only function of the screws is to press the flaps against the wedge—a task that is all the easier because

these flaps lie flush only at their outermost ends, being separated for the rest from the frame of the shaft by a space not visible in the illustration.

The fact that the Schrader patented shaft is undercut—this cannot be seen clearly in the illustration either—and very gradually flattens out as it comes closer to the blades keeps the shafts from becoming greasy while making it easy to insert the wood into the shaft and ensuring adequate space for the shavings to fall.

The described devices eliminate the probability of workers catching their fingers in the slot of the square shaft, and even if fingers are caught in the slot, the resulting injuries are slight, consisting merely of lacerations that need not even interrupt work (*figure 7*).

The general effectiveness of cylindrical shafts in regard to safety has flooded the market with a large variety of such products, and most of these perform as indicated, but a few also present some problems along with their protective benefits (shavings easily clog the slots, the blades are not fastened tightly enough, and the like); workers do not willingly use these products, and thus they compromise the effective safety shafts. At any rate, whenever employers were dissatisfied with the functioning of the cylindrical shafts, it has always been a matter of such defective products, and the real effectiveness of the cylindrical shafts remains undisputed. Some people have claimed that reconditioned square shafts are an adequate alternative to the newer cylindrical shafts. We can agree with this opinion only to the extent that the drawbacks we have listed do not apply—that is, the slots do not become clogged, the blades are fastened tightly enough, the wood glides easily across the shaft, the four rows of screws do not themselves pose a risk of their own, and so forth (*figure 8*, a shaft reconditioned by the Voleský company.)

Recently a new alternative to cylindrical shafts was recommended for use in wood-planing machines. This is an arrangement that encloses the square shaft in a steel hull, thus decreasing the dangerous gap between the surface of the table and the blade in the same way as do the cylindrical shafts, but it also allows the steel hull to cover the nuts of the screws holding the blades, preventing these from flying off in case the equipment should break. Granted that such a shaft does allow the use of the old blades of the square shaft and the same blade sharpening machine.

II. The cylindrical safety shaft is basically cheaper than the square shaft.

Only artificially tempered blades, at least 8mm thick, can be used in square shafts, whose exposed blades must stand up to far greater demands, while

blades 1 ½ mm thick of naturally hardened steel are sufficient for the cylindrical shafts. In addition, it is not necessary to add any other safety devices, an expenditure that cannot be avoided in the case of the old square shafts.

III. The operating costs of the cylindrical safety shafts are less than the costs required by the square shafts.

First and foremost, sharpening these thin blades is, of course, much easier and quicker than the effort required for the heavier blades of the square shafts. Further, the blades on the cylindrical shafts have a much larger wear-resistant surface. While the surface of the square-shaft blades is only 15–16mm, the blades of the cylindrical shafts measure 28mm, or almost twice as much. Since the blades on the cylindrical shafts encounter far less air resistance than do those of the square shafts, they expend less energy. Therefore they also run much more quietly, and there can be avoidance of the shrieks emanating from the old square shafts—shrieks that literally announced their dangerousness.

IV. The cylindrical shafts are also more efficient.

Since the blades in the cylindrical shafts—those of the Schrader patent, for example—place the entire active pressure of the blades directly on the solid frame of the shaft, a significantly cleaner planing of the wood is achieved, and the blades will not produce such large shavings as those of the square shaft.

The cylindrical shaft can plane both thin and thick shavings, as well as both hard and soft woods. Furthermore, shavings and splinters can be scraped off roughly hewn pieces without any risk; this practice was a frequent source of danger with the old square shafts.

Quick work is guaranteed by the rapid revolution of blades on the cylindrical shafts and above all, by the possibility of incising grooves without removing the planing blades. (Granted, the old square shafts also allowed for this operation, and not all cylindrical shafts have this provision.) In addition, the cylindrical shafts speed up the work process by allowing workers to proceed without anxiety because of the complete absence of risk.

fig.1
Abb.1

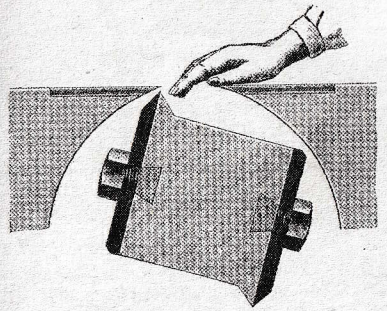

fig.4
Abb.4

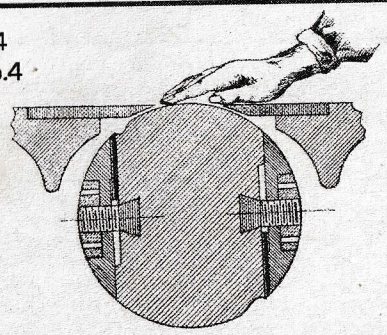

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Abb.6

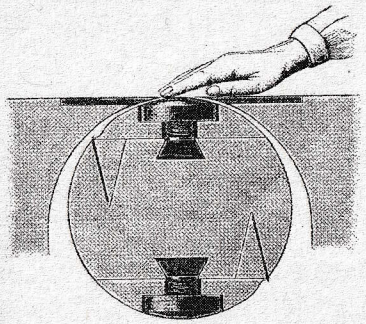


fig.8
Abb.8

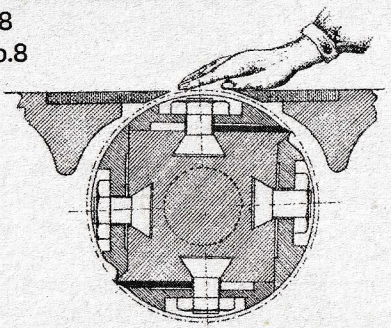


fig.3
Abb.3

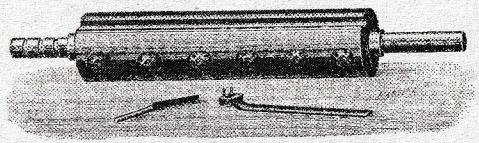
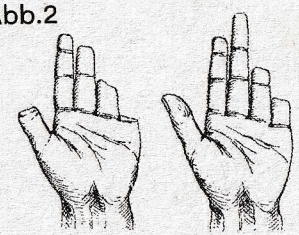


fig.2
Abb.2



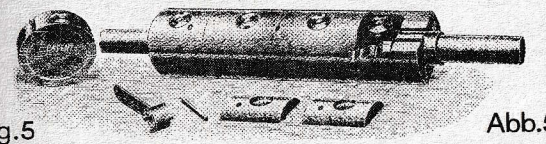


fig.5
Abb.5

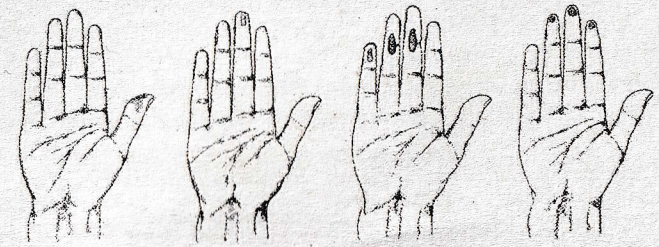


fig.7
Abb.7