

5. Anatomy of a running shoe

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“In the beginning, God created the Heaven and the Earth. . . .” Having done this great thing, God probably recognized that he had also created a number of problems, one of which was man, who hastily went about producing problems of his own. Ever since Genesis, men have been seeking solutions to their problems, sometimes resolving them through divine guidance or other means, sometimes simply continuing to err in ways that try the patients of other men, their feet, and undoubtedly their Creator.

In the evolution of men, some become chiefs and the less fortunate became Indians. According to Boccaccio, one of the Arab chiefs, Abdul Ali Hassan, returned from a foray to the Persian Gulf and dismounting from his camel stepped on a thorn. He blasphemed for about 10 minutes and then issued a proclamation that all the earth should be covered with leather. His chief bearer, Muhamid Ali, was no fool and figured it would be easier to cover a foot than the world, even though Hassan would need a size 14^{1/2}. Was the Arabian peninsula and the area known as the Fertile Crescent therefore the home of the first shoe?

Not so, according to Luther Cressman, an anthropologist of some renown and a hunter of early *Homo sapiens* memorabilia. Cressman has presented evidence to the Oregon Museum of Natural History in Portland that man was shod as early as 10,000 years ago while living at a place now called Fort Rock in the high desert country of Oregon. One of the pre-Columbians left his shoes there, and about 10,000 years later Cressman came across them. No one has discovered an earlier shoe.

The descendants of pre-Columbian man, the Modoc Indians, made a simple shoe that we still call a moccasin. The vamp and tongue were one piece. The sole, heel, counter, and shank were another piece. The latch (lace or fastener) was threaded from counter to tongue. The entire shoe was made of leather and wonderfully simple (Fig. 5-1).

The original last was probably a foot-shaped river stone or a whittled chunk of hardwood. The modern last did not appear until the time of the Civil War. One last was used to make both a right and a left shoe.

To build a shoe one starts with the *last*. The last is a mold that looks somewhat

like a foot and in the United States is graded according to men's sizes 5 to 13 (although it is possible to find or have lasts made in sizes 1 to 18). The average width for men's lasts is D, but they are made from widths AA (narrow) to EEE (wide). Lasts for women are generally 1½ sizes smaller than for men: a women's size 7, for instance, is about the same length as a men's size 5½. The average width for women is A, but widths run from AAA to EE. Infants' shoes run from sizes 1 to 13; children's shoes are made in a larger series of sizes 1 to 13. To further confuse the world, the European sizing system is metric, sizes 20 to 50, and the British system uses the same numbers as the American but each number designates about a full size larger.

Until a couple of years ago most shoes produced for joggers were made in a D width, but as the demand became greater and manufacturers more financially able, there were more variations to choose from, particularly for women. Unfortunately, the shoes began to look more like fashion shoes and less like feet.

The first step after choosing the last is to tack an *innersole* to the last. The innersole is cut from a pattern that almost exactly fits the bottom of the last.

The *upper* is the part of the shoe that is slipped over the top of the last and tacked at the toe, the heel around the Achilles tendon, and sometimes medially and laterally around the metatarsal heads (Fig. 5-2). In the standard running shoe the visible parts of the upper include the *vamp*, the part from the toe to midarch; the *quarter* from the vamp to the back of the heel; and *foxing*, which covers the seam at the center back of the heel. There is also the *vamp plug* (in moccasin-style shoes) or the *tongue*, which covers the upper part of the foot from the toes almost to the ankle. In laced shoes there are *eyelets* for the *latch* or laces. Eyelets have a *facing* that usually conceals reinforcing material to firm and prevent tearing out of the part of the quarter that contains the eyelets.

At the back or heel part of the upper is stitching that must be both strong and flexible. The stitching is strengthened and concealed either by a *backstay* or by the previously mentioned foxing, which has little use except to hide the stitching and trim the shoe.

An invisible but very important part of a shoe is the *heel counter*. It is concealed by the quarter, backstay, and foxing. It should give the heel stability, but if it is too stiff, it can cause bruises, blisters, or calluses. If too flexible or fragile, it is of no practical value. The real test of an acceptable heel counter will be passed when it satisfies multitudes of runners. Despite the scientific evaluations and advertising claims that have been made, no heel counter has yet passed this test.

The front part or vamp of a shoe may conceal a *toe box* made of the material used to strengthen and firm the vamp or made simply of the same material as the upper, as in moccasins. The toe box must provide adequate room for the mechanical function of the toes in running. Most manufacturers have given lip service to this requirement but actually have little or no knowledge of what happens from the metatarsal heads forward during running.

Several of the most common adaptations for uppers are (1) *standard*, which

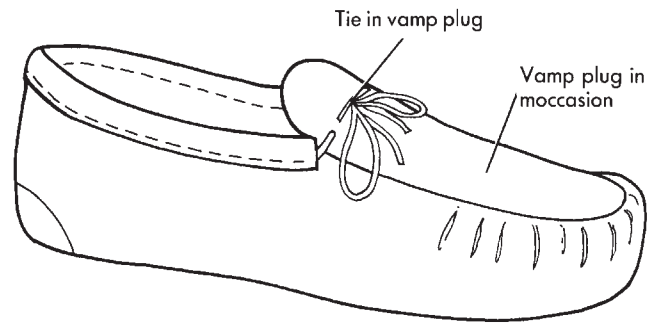


Fig. 5-1. Moccasin. Quarter, vamp, and sole are one piece. Backstay is rawhide.

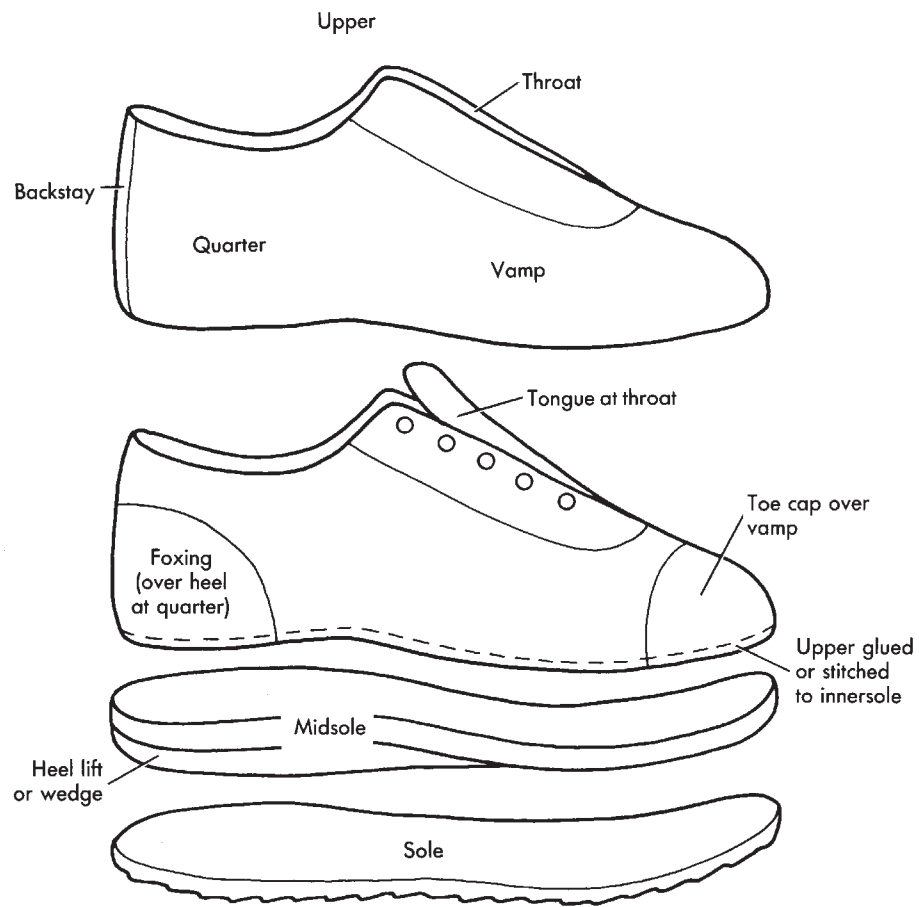


Fig. 5-2

includes vamp and quarters; (2) *moccasin*, which incorporates vamp and tongue; and (3) *slip lasted*, a California-designed upper that slips onto the last like a slipper.

The *midsole* and *heel wedge* for most running shoes are cemented together and then cut or “clicked” by a special machine to the appropriate size for cementing to the upper while it is tacked on to the last.

Finally, there is the *outsole*. The outsole usually is designed for traction (as in the waffle sole) and should be made of a long-wearing, nonskid compound. When this outsole is cemented to the midsole, the shoe is ready for its finishing treatment, which should include an appropriate amount of heat to allow the synthetic materials in the shoe to “memorize” the size the shoe is meant to be.