W. H. HANNAFORD.

Boot and Shoe.

No. 220,475. Patented Oct. 14, 1879.

Fig 1

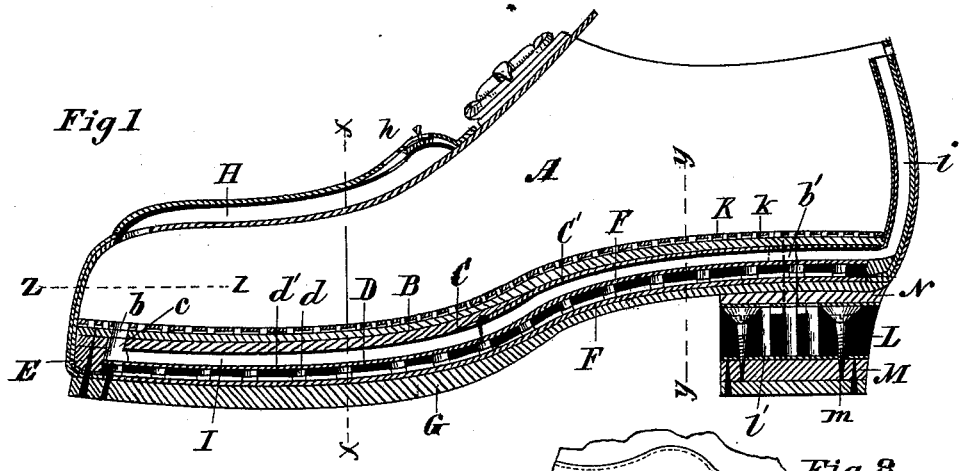


Fig 3

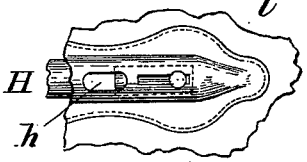
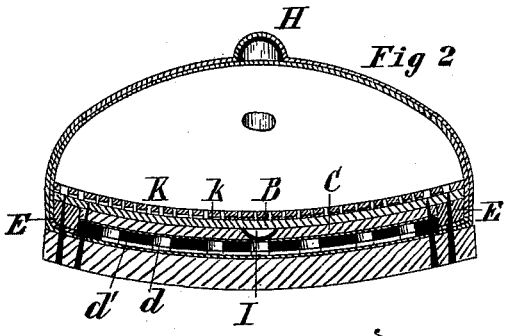


Fig 2



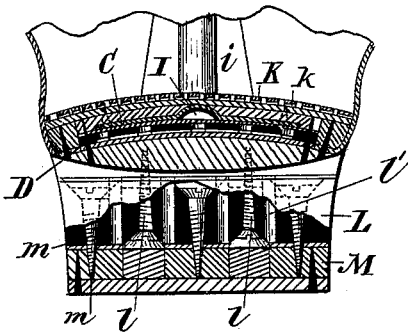
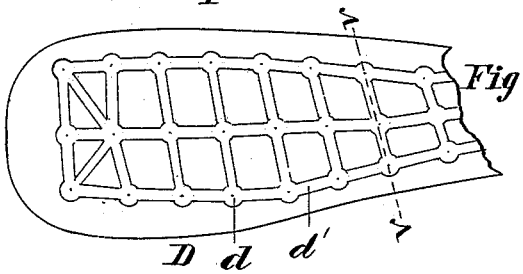


Fig 5



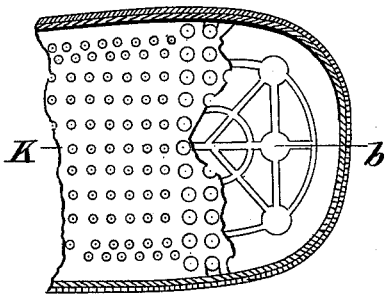


Fig 4

Fig 6

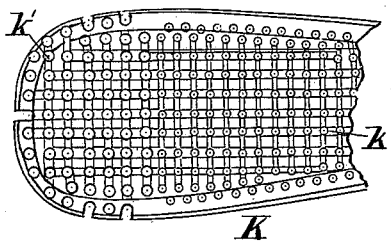
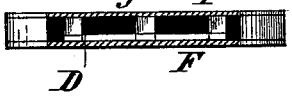


Fig 7



Witnesses

W. C. Corlies

Jno. C. MacGregor,

Inventor

William H. Hannaford

By Coburn & Thacher

Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM H. HANNAFORD, OF LAKE, ILLINOIS.

IMPROVEMENT IN BOOTS AND SHOES.

Specification forming part of Letters Patent No. **220,475**, dated October 14, 1879; application filed June 27, 1879.

To all whom it may concern:

Be it known that I, WILLIAM H. HANNAFORD, of the town of Lake, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Boots and Shoes, which is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a longitudinal section of a shoe embodying my improvements; Fig. 2, a transverse section of the same, taken on the line *x x*, Fig. 1; Fig. 3, a similar section, taken on the line *y y*, Fig. 1, with the front of the heel partly broken away. Fig. 4 is a plan section of the toe of the shoe, taken on the line *z z*, Fig. 1, the insole being broken away; Fig. 5, a broken plan of the middle or elastic sole; Fig. 6, a bottom plan of the perforated insole; Fig. 7, a transverse section of the elastic middle sole and upper and lower rubber sheets on an enlarged scale, taken on the line *v v*, Fig. 5; and Fig. 8, a detail plan of the outer end of the toe-ventilating passage, on an enlarged scale.

My improvements are especially intended to be applied to shoes or boots designed for walking; and the object of my invention is to provide means for the complete ventilation of the boot or shoe by constant change of the air within, this change being effected by the action of the foot in walking.

It is well known that in walking with boots or shoes of ordinary construction the feet soon become heated and uncomfortable, which is due almost entirely to want of proper ventilation, the air remaining within the shoe about the foot with little or no change.

I propose to obviate this difficulty, and make the shoe cool and comfortable, by effecting a constant change of air within the shoe.

To effect this object I introduce between the inner and outer soles a middle sole of rubber or other suitable elastic material, which is perforated to form air-receptacles, which are connected by channels leading to the toe of the shoe, where there are apertures opening into the interior of the latter, thereby forming a communication between the interior of the shoe and the air-spaces in the bottom; and in connection with this device I provide air tubes or passages leading from the interior of the shoe to the outer air, thereby forming a communication with the interior air-receptacles, by means of which, alternately, the warm air is forced outward and fresh air admitted to the foot in the act of walking.

The invention consists in various special devices and combinations of devices whereby the above-named result is secured.

In the drawings, A represents a shoe, the insole B of which may be of usual form and construction, except that at the toe it is provided with two or more apertures, *b*, and at the heel with similar apertures, *b'*. I usually place a thin sole of cork, C, underneath the sole B, extending it back under the forward portion of the shoe to the arch, where it meets an ordinary steel shank, C'.

This device is not absolutely necessary, however, and may be dispensed with if desired. When used it should have apertures *c*, corresponding to those in the sole B at the toe of the shoe.

Underneath the cork sole is a rubber sole, D, somewhat narrower than the bottom proper of the shoe, and arranged between welts E, which run around to fill the space outside of the sole.

The rubber sole is provided with perforations *d*, which are sufficiently large to constitute air-receptacles, and may be arranged in rows, as shown in Fig. 5 of the drawings. In a shoe of ordinary size these holes should be from an eighth to a quarter of an inch in diameter.

On the under side of the sole D are grooves or channels *d'*, which connect the perforations *d*, and make a continuous communication between them to the toe of the shoe, as shown in Fig. 5 of the drawings. These channels lead to the apertures *b*, opening into the interior of the shoe, and thereby establishing communication between the air-receptacles in the thick elastic middle sole and the interior of the shoe.

Immediately above and below the elastic sole D thin strips F, of canvas, rubber, or some other suitable material, are placed to relieve the friction between the middle sole and

the overlying and underlying soles. These strips may be dispensed with, though I prefer to introduce them, as they improve the action of the shoe.

The bottom sole, G, is of ordinary construction, and applied in the usual way below the rubber sole.

From this description it is apparent that an elastic chambered and channeled section is provided in the bottom of the shoe, to which air is admitted through openings in the toe.

Now in the act of walking the pressure of the foot upon the shoe bottom, which, at the same time is bent, will compress this elastic section, and thereby force the air therein out through the apertures into the interior of the shoe.

To provide for the ready escape of this air, which will be more or less heated, I make an air passage or tube, H, in the upper of the shoe. This passage may be formed by inserting a small flexible tube above the vamp, as shown in Fig. 1 of the drawings. It opens into the interior of the shoe at the toe, and at the other end communicates with the fresh outside air, and may be provided at the outer end with a suitable valve, *h*, by means of which this communication may be shut off at any time, if desired.

In walking the pressure of the foot will first force the warm air out of the shoe-bottom into the interior of the shoe, and thence through the tube H into the open air, and then, when the foot is lifted and the pressure on the bottom relieved, a partial vacuum will be created in the elastic sole, which will induce an inflow of fresh cool air from the outside through the tube H into the interior of the shoe around the foot. A constant change of air about the foot is thus effected, and consequently the foot is kept cool and comfortable in walking.

As another means of taking the warm air from the interior of the shoe, I provide a metallic pipe, I, which is arranged in the bottom of the shoe, above the elastic sole, and extends the whole length thereof, and opens into the interior of the shoe at the toe thereof, while at the heel it communicates with a tube or passage, *i*, which extends upward at the heel of the shoe to the top thereof, where it opens into the outer air. These two air-passages H and I may be employed together in the shoe, or either may be used without the other.

I also provide a removable insole, K, which is perforated, as shown in Fig. 4 of the drawings, and is provided with channels or grooves *k* in its under side, whereby the perforations are connected, as shown in Fig. 6 of the drawings. At the toe of this sole there are a series of enlarged perforations, *k'*, and in the action of walking the air will alternately be expelled from underneath this sole and again admitted thereto, passing mainly through the large apertures through the toe of the sole. It will be understood that this action is similar to that above described with the elastic middle sole, though in a less degree. This removable sole may be used alone or in connection with one or more of the devices described above.

In constructing the heel of the shoe, a lift, L, of rubber or other elastic material, is attached to the lower lift or bottom, M, by means of screws *m*, and the two united are then fastened to the heel N, above, by means of screws *l*, which pass through perforations in the bottom lift, so as to sink the heads of the latter screws; and, if desired, the openings may be filled by small plugs of leather, or another thin lift may be put on to cover the whole.

In the lift L there are also perforations *l'*, which extend up through the heel and communicate with the apertures *b'* opening into the inside of the shoe, at the heel thereof, thus providing an additional means for changing the air about the heel of the walker.

This improved shoe-bottom is not only a means of ventilation, but is also light and conducive to an elastic step. The improvement, while designed especially for walking-shoes, may, of course, be applied to boots and shoes of all descriptions. The shoe does not necessarily contain all of the devices described above, though they all may be used together, if desired. The exact construction and arrangement of the different parts may be changed to suit peculiar circumstances and fancies, provided the main features of my improvement are retained, whereby a force and exhaust is alternately produced by the action of the foot in walking to change the air continually in the interior of the shoe.

I am aware that it is old to place a bellows between the outer and inner soles of a boot or shoe, which, acted on by the foot, causes a current of air to pass through the inside of the boot or shoe; also, that it is not new to form air-spaces between the soles by the use of fluted or corrugated leather; also, that rubber boots have been provided with vertical air-tubes at front and rear, having their external openings near the top of the leg, with a duplicate insole and passages connected with the tubes; and, further, that a flexible water-proof elastic sole has been made with projections, the spaces between forming air-passages, from which holes lead up through the sole, and I claim none of such constructions; but,

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The elastic middle sole, D, provided with air-chambers, in combination with the insole B, having apertures *b b'*, and the air-duct H, situated above the vamp, whereby air is alternately forced into and expelled from the interior of the shoe, substantially as and for the purposes set forth.

2. In a boot or shoe, the elastic middle sole, D, provided with apertures *d* and bottom channels, *d'*, in combination with the insole,

and a single flexible air-duct, provided with a valve, H, and communicating both with the interior of the shoe and with the outside air, substantially as described and shown.

3. In a boot or shoe, the elastic heel-lift L, provided with apertures *l'*, communicating with the interior of the shoe by apertures *b'* at the heel thereof, substantially as described.

4. The boot or shoe described, having a middle elastic sole, D, with channels and perforations formed therein, an insole having perforations *b b'*, a supplementary inner sole, K, perforated and channeled, and air-ducts H I *i*, all constructed and arranged substantially as described and shown.

WILLIAM H. HANNAFORD.

Witnesses:
JNO. C. MACGREGOR,
W. C. CORLIES.