(No Model.)

G. H. LYON.

EXPANSIBLE FRAME.

No. 402,755. Patented May 7, 1889.

Fig 1

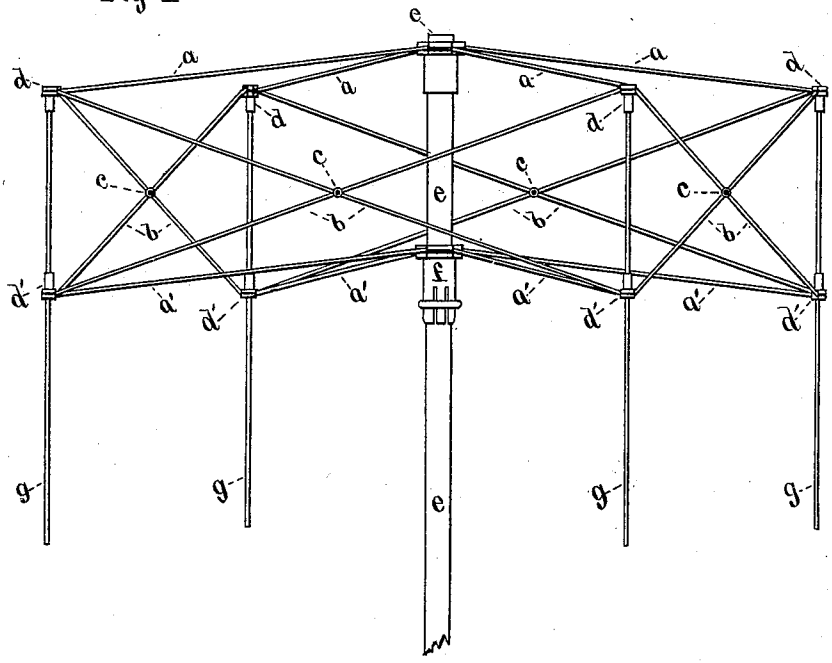


Fig 2

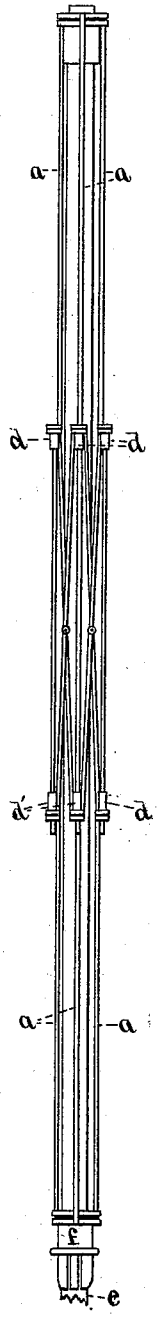


Fig 3

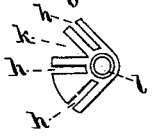


Fig 5

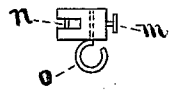


Fig 4

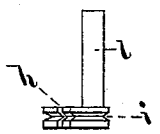
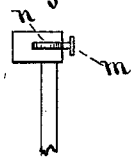


Fig 6



Witnesses;

Ben R Hagar

Paul P. Lyon

Inventor;

G H Lyon

N. PETERS. Photo-Lithographer. Washington, D. C.

UNITED STATES PATENT OFFICE.

GEORGE H. LYON, OF BRADFORD, PENNSYLVANIA.

EXPANSIBLE FRAME.

SPECIFICATION forming part of Letters Patent No. 402,755, dated May 7, 1889.

Application filed March 12, 1885. Serial No. 158,650. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. LYON, a citizen of the United States, residing at Bradford, in the county of McKean and State of Pennsylvania, have invented a new and useful Improvement in Expansible Frames, of which the following is a specification.

The object of this invention is to provide a frame-work which will expand by volume of space bounded, or to combine frames or machines which have lateral movement in their several intersecting planes to work mutually together.

It consists of cross-bars hinged together in pairs at their point of crossing each other, and the arms of which are joined to arms of adjacent cross-bars situated in intersecting planes by being hinged about their respective centers of intersection on a wire or other body constituting chords or projections for axes. A corner-block at such point affords a body about which to construct axes and to which to attach auxiliary parts.

Reference is made to the accompanying drawings, which form part of this specification.

Similar letters refer to similar parts throughout the drawings.

Figure 1 is a side projection of an expansible frame open, operated by two sets of arms radiating from a central shaft, one set of which has a sliding movement upon the shaft. Fig. 2 is the frame closed. Figs. 3 and 4 are side and top views, respectively, of corner-blocks. Figs. 5 and 6 are side and top views, respectively, of other forms of corner-blocks.

The cross-bars *b* are hinged together in pairs at their point, *c*, of crossing each other. The several pairs are combined by engaging the intersecting arms on axes about their respective centers of intersection at corner-blocks *d* and *d'*. One set of braces, *a*, hinged about a fixed point on the shaft *e*, radiate to corner-blocks *d*, and are hinged to them. Another set of braces, *a'*, hinged about a runner or slide, *f*, upon the shaft *e*, radiate to corner-blocks *d'*, and are hinged thereto. The sliding movement of runner *f* upon the shaft will open or close the frame, as desired. It may be clamped at any degree of expansion. Rods *a* and *a'* may radiate to *c* instead, and be hinged to the respective axes there. Rods *g* are hinged to cross-bars *b* at corner-blocks *d*, and move freely like a piston through a hollow stem in corner-block *d'*. The frame may be operated by means of such rod *g* and its fixed and sliding collars thereon, hinged in combination with the respective reciprocating arms of cross-bars independently of any outside or central staff and collars, and when made a three-sided polyhedron or combination thereof independently also of added braces.

Forms of corner-blocks are more fully shown in Figs. 3, 4, 5, and 6.

h are slots in which to receive cross-bars or other connecting parts.

i are grooves in which the respective wires or chords constituting axes upon which to hinge intersecting parts may lie.

k is a slot in which to tie knot of wire.

l is a hollow stem, in which rod *g* may slide.

Difference in the angle of slots or faces of corner-blocks will adapt them to corresponding difference in angles of intersecting parts. With suitable corner-blocks frames of any desired number of faces may be combined.

Figs. 5 and 6 represent the rods *g*, with head constituting corner-block having a short projection, *m*, and link *n* and loop *o*, various forms to engage intersecting parts.

A simple loop or ring may be turned on *g* at *d* at the proper angle to engage intersecting parts on the chords of curve so formed.

I claim—

A combination of pairs of cross-bars hinged together at their points of crossing each other, and said pairs severally situated in intersecting planes forming the sides of a polyhedron, combined at the edges of intersection by hinging the meeting arms upon a body constituting chords or projections for axes, and operated to work together expansibly by hinging one or more of said arms in combination with a rod or beam, and the reciprocating arm or arms, in combination with a sleeve or runner sliding upon said rod or beam.

GEO. H. LYON.

Witnesses:
J. C. MCMULLEN,
E. B. CHAPPELL.

Correction in Letters Patent No. 402,755.

It is hereby certified that in Letters Patent No. 402,755, granted May 7, 1889, upon the application of George H. Lyon, of Bradford, Pennsylvania, for an improvement in "Expansible Frames," an error appears in the printed specification requiring the following correction, to wit: After line 85 the following paragraph should be inserted: *The advantages of such expansible frames may be realized in use for transparency frames, portable tents, swifts, in machinery, as for a bellows, or wherein simultaneous action is desired in different directions. Any of the corner blocks are convenient points at which to attach connecting parts. Bars or pistons may project from them. Pairs of crossbars similar to the first may be attached at the corner blocks in either edge of the polyhedron formed, adding apartments to either side, or extending the system of framework indefinitely. By use of long and short arms or by making more or less the number of sides to an apartment, the direction of movements may be modified to apply in a multitude of ways;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 25th day of June, A. D. 1889.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

ROBERT J. FISHER,
Acting Commissioner of Patents.