(No Model.)

# D. SHAW.

## DEVICE FOR CONSTRUCTING TUNNELS.

No. 301,927. Fig. 1 Patented July 15, 1884.

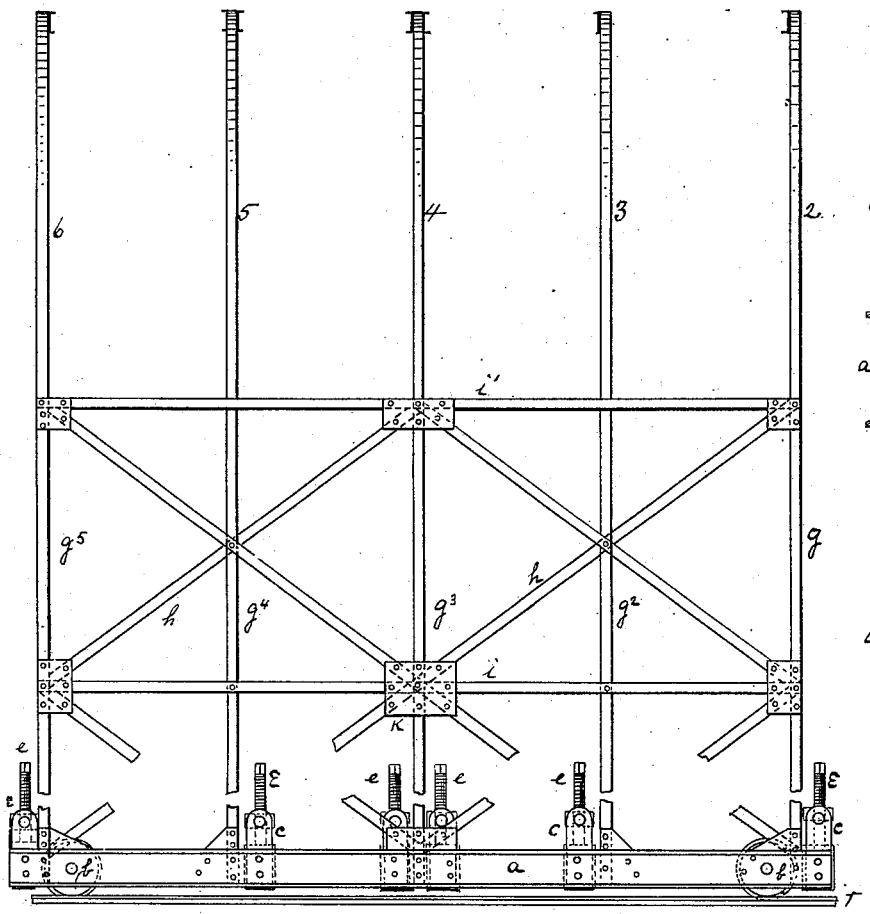
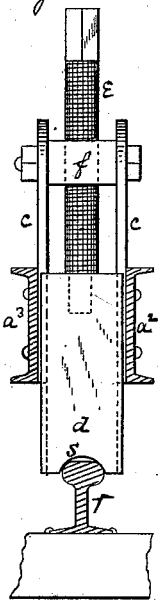



Fig. 2



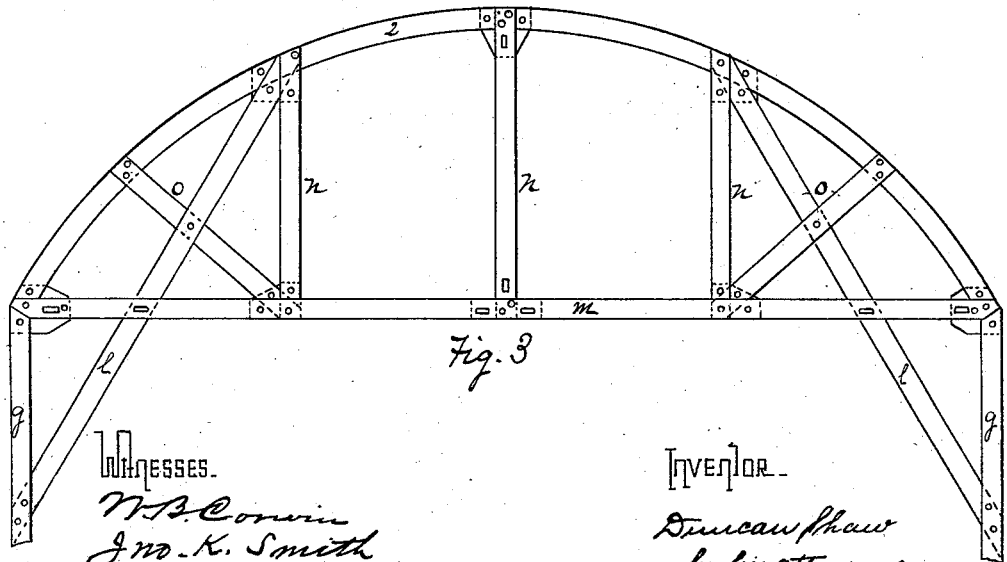




Fig. 3

Witnesses.
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# UNITED STATES PATENT OFFICE.

DUNCAN SHAW, OF COLUMBUS, OHIO.

## DEVICE FOR CONSTRUCTING TUNNELS.

SPECIFICATION forming part of Letters Patent No. 301,927, dated July 15, 1884.

Application filed January 7, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, DUNCAN SHAW, of Columbus, in the county of Franklin and State of Ohio, have invented a new and useful Improvement in Devices for Constructing Tunnels; and I do hereby declare the following to be a full, clear, and exact description thereof.

The object of my invention is to provide a movable center for construction of the arches of vaults, railway-tunnels, or other structures similar in shape and method of construction. I shall, however, describe my invention particularly as applicable to construction of the lining of railway-tunnels, and have so represented it in the drawings which accompany and form part of this specification, in which—

Figure 1 is a side elevation of my improved movable center, the frame of which is partly broken away. Fig. 2 is an end elevation of one of the trucks or carriages of the movable center, showing the lifting device attached thereto. Fig. 3 is an elevation of one of the arch-frames, showing the manner of bracing and supporting it.

I shall now describe my invention with reference to these drawings, like letters of reference indicating like parts wherever they occur.

In application to the construction of the arches of long vaults or tunnels where a movable center is desirable, I make the supports or base of my center of two side frames, *a*, placed parallel to each other at the desired distance apart, and each mounted on suitable wheels, *b b*, preferably flanged, so that they may be moved backward and forward upon a rail-track. I make each of these side frames, *a*, of two bars of angle-iron, $a^2$ $a^3$, riveted side by side, but so as to permit the wheels *b b* to be journaled between them. I also place at intervals along and between these bars $a^2$ $a^3$ suitable jack-frames, *c c*, which are rigidly attached to and extend upward vertically from the carriage-frames and contain a movable jack-block, *d*, to which is secured a jack-screw, *e*, the threads of which engage and work in a collar, *f*, on the frame *c c*.

Rising upward from the carriage-frames *a*, and bolted rigidly thereto, is the frame-work for support of the center. This consists of several vertical bars or braces, $g$ $g^2$ $g^3$ $g^4$ $g^5$, opposite to which and attached to the carriage on the other side are similar and corresponding uprights, $g$ $g^2$ $g^3$ $g^4$ $g^5$. The uprights on each side are strengthened and connected by diagonal braces *h h*, bolted to the frame of the carriage *a*, and at their intersections to the uprights *g* through suitable stiffening-plates, *k*. There are also horizontal braces *i i'*, connecting adjacent uprights, of which the braces *i'* are preferably bolted to the highest point of the uprights, so that by laying planks upon opposite braces, *i'*, a suitable platform may be formed for support of workmen engaged in the use of the center.

Bolted to the upper extremities of corresponding opposite uprights *g g*, and in the same plane therewith, are the arch-frames 2 3 4 5 6, which are made of form and size according to the size and shape of the structure to be built thereon. The arch-frames are supported and strengthened as shown in Fig. 3, in which a horizontal brace, *m*, constitutes the chord of the arch, and connects the extremities of the opposite uprights *g g*.

To the brace *m* and the crown and flanks of the arch-frames are bolted vertical and oblique braces *n o*, and for greater strength the arch-frames may be supported by braces *l*, extending thereto from the uprights *g*. The arch is covered by planking or other sheathing, which connects adjacent arches 2 3 4 5 6, and serves as a support for the arched structure intended to be built upon it. This covering is made in such manner as to afford a support to the roof of the arch or tunnel during its construction, and at the same time so as to allow the workmen easy access to the work to be done.

If the movable center be used for the construction of an external covering or arch, the arch-frame may be entirely covered, and the workmen may build on it from the back of the arch, while if the use is for lining the interior of a tunnel or similar structure with masonry, interstices are left between the sheathing, and the workmen build the arch while standing on the platform above described.

Thus constructed the operation of my device is as follows: The wheels *b* of the carriage-frames *a* are placed upon two rails, *r*, extending along the floor of the tunnel or other place where the arch or roof is to be built, and the center frame is moved along these rails to the desired position. The jack-blocks *d* are then lowered by means of the screw *e* until the

longitudinal grooves *s*, on the base of the jack-block *d*, rest upon the rails *r*, and the center frame is raised to the height desired. (See Fig. 1.) The masonry of the roof or other structure is then built upon the outside of the arch, and when completed the jack-block is raised, thus lowering the wheels *b*, and thereby dropping the whole frame down correspondingly away from the roof or tunnel upon the rails *r*, and the center frame is moved forward into a new position, when the operation is continued as just described. In this way arches or roofs of great length may be built with the use of but a single movable center, and great expense and labor in the construction of fixed trusses for the entire length of the structure is avoided. The function of the movable jack-block *d* is twofold and important. It renders the truss-frame adjustable to the desired height, and by raising the wheels *b* from the rails *r* gives great stability to the apparatus.

In the use of my movable center in the construction of the arches of tunnels, bridges, or in other railway-engineering operations, the rails *r* and the carriage-frames *a* being situate outside of the railway-tracks, railroad-cars or other vehicles not requiring tracks may pass under the center without interruption of any of its operations.

To secure greater adjustability and ease of transportation, I make the component parts of the center frame in sections and secure them together by bolts, (instead of rivets, as represented in the drawings,) so that the derrick may readily be taken apart, and by omitting corresponding sections of the frame it may be reduced to any desired size.

I have described my invention as applicable to the construction of long vaults and tunnels, but by certain modifications it may be adapted for use in the construction of the crowns of furnaces, glass-pots, or other articles similar in mode of construction. For this purpose, when the nature of the subject makes it impossible to use the rails *r* and wheels *b*—as when a roof is to be put on places having contracted entrances—I reduce the upright frame to the desired size and shape, as already explained, place it in the position required, and, having bolted on it arch-frames of the proper shape, proceed with the building, as above described. The center frame is then lowered by means of the block *d*, and separated by loosening the bolts, when the parts can be easily removed from the interior of the inclosure.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a movable center for constructing tunnels, &c., the combination, with a detachable center support, of the base composed of parallel bars of angle-iron, jack-frames secured to the parallel base-bars, and provided with jack-screws, and movable jack-blocks arranged between the parallel base-bars, substantially as and for the purposes specified.

2. In a movable center for constructing tunnels, &c., the combination, with the center, of a base composed of parallel angle-bars, wheels arranged between the base-bars and journaled thereon, jack-frames secured to the parallel base-bars, and provided with jack-screws, and jack-blocks arranged to slide between the parallel base-bars, substantially as and for the purposes specified.

3. In a movable center for constructing tunnels, &c., the combination, with the center and its supports, of the base composed of the parallel angle-bars $a^2$ $a^3$, the wheels *b*, arranged between and journaled on the parallel base-bars, the jack-blocks *d*, arranged between the parallel base-bars $a^2$ $a^3$, and notched on the under surfaces, as at *s*, and jack-screws secured to the parallel base-bars, substantially as and for the purposes specified.

In testimony whereof I have hereunto set my hand this 28th day of December, A. D. 1883.

DUNCAN SHAW.

Witnesses:
W. B. CORWIN,
JNO. K. SMITH.