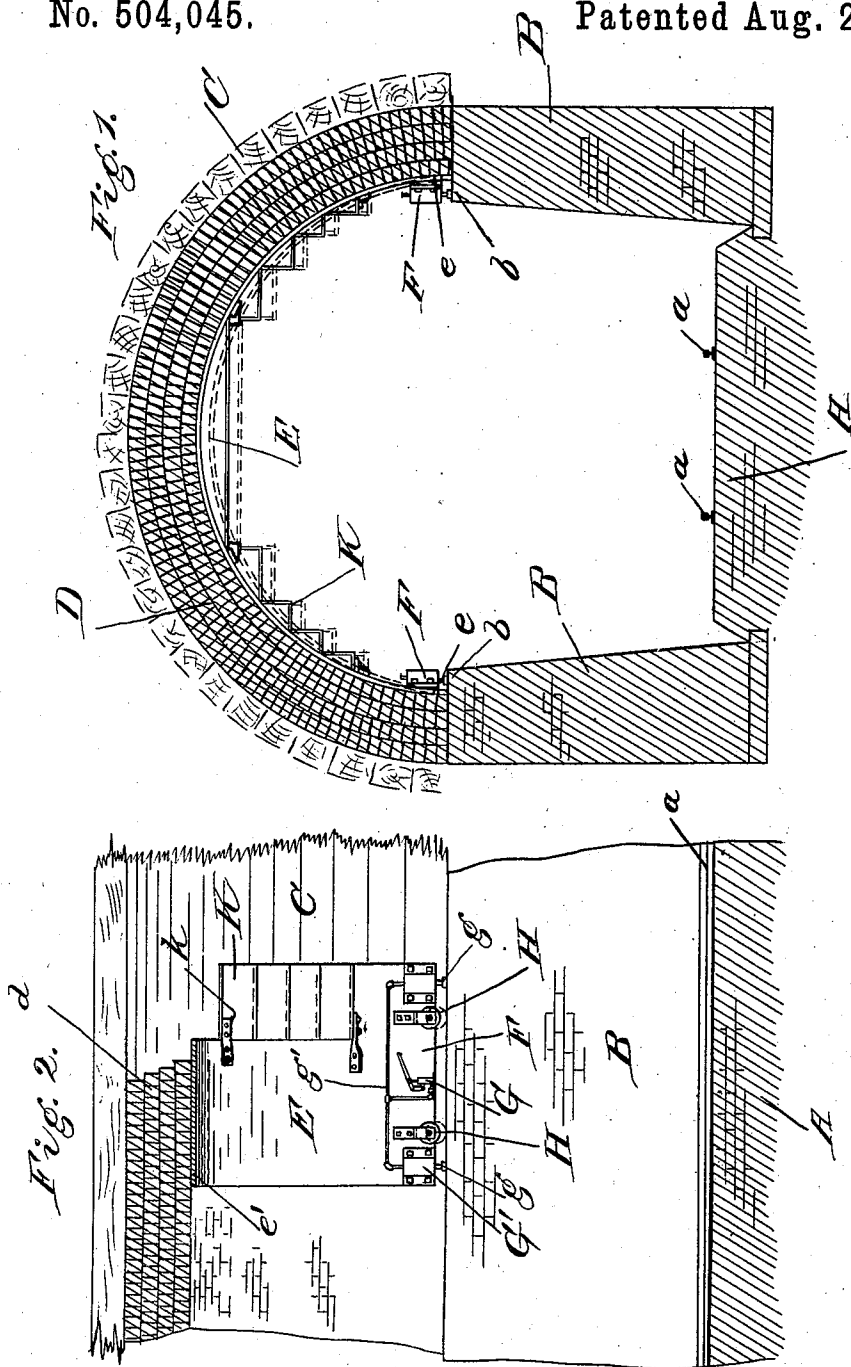


(No Model.)

S. I. MORRIS.
APPARATUS FOR RELINING TUNNELS.

No. 504,045.

Patented Aug. 29, 1893.



WITNESSES:

Chas. C. Burnap
Jos. W. Mill

INVENTOR

Simeon I. Morris.

BY Walter H. Chamberlain
ATTY

UNITED STATES PATENT OFFICE.

SIMEON I. MORRIS, OF ST. PAUL, MINNESOTA, ASSIGNOR OF ONE-HALF TO
JASON W. WAIT, OF SAME PLACE.

APPARATUS FOR RELINING TUNNELS.

SPECIFICATION forming part of Letters Patent No. 504,045, dated August 29, 1893.

Application filed February 9, 1893. Serial No. 461,560. (No model.)

To all whom it may concern:

Be it known that I, SIMEON I. MORRIS, a citizen of the United States, residing at St. Paul, county of Ramsey, State of Minnesota, have
5 invented a certain new and useful Improvement in Apparatus for Relining Tunnels; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object the provision of an apparatus whereby the relining of
15 railway tunnels may be facilitated to such an extent that the right of way for trains will be kept practically clear. Heretofore in this class of work where a tunnel is to be relined the arch center, or in other words, the frame which supports the arch masonry while it is being built has been carried on and supported by what is popularly termed, the work train. In other words, a suitable frame work has been mounted upon one or more cars, and the
25 latter have been run through on the track provided for the passage of trains. By this frame work the workmen have been supported and the masonry has been built upon until the arch was completed. But the fact
30 that the work train has been obliged to stand upon the track and could only be moved when the arch on which they were working had been completed, has caused serious delay in the running of the trains through the tunnel since it became necessary, before a train
35 could pass through the tunnel, to move the work train out of the tunnel, and thus leave a clear way. This has obviously been a great source of annoyance, inconvenience, and expense to the railroad.

My invention contemplates the provision of apparatus whereby a frame work supported clear of the track is employed to support the workmen, and to support the masonry until the arch is completed.

The invention consists in a combination of devices and appliances hereinafter described and claimed.

In the drawings Figure 1 is a cross section
50 of a tunnel showing my apparatus therein,

and Fig. 2 is a longitudinal section of the same.

In carrying out the invention A represents the road bed of the railway track and *a* the rails thereof.

B—B are the walls of the tunnel made up of masonry and extending up substantially one half the height of the tunnel, although of course the relative height of the walls is a matter of selection.

C represents the arch frame of timber, and represents also what may be termed the old lining of the tunnel. That is to say, this invention is particularly applicable to tunnels that have been originally lined with wood,
65 and it is afterward desired to line them with masonry (preferably brick work, as that is usually employed). E is what is technically termed the "center." It is a frame on which the masonry of the arch from the base to the
70 keystone is supported until the keystone has been placed in position. In my apparatus it is formed of steel preferably semi-circular in shape to conform to the desired shape of the arch, and extends the entire length of the
75 arch. At each lower end *e* of the "center" is attached what may be termed, for convenience of expression, a carriage, F. On this carriage is located any suitable jacking apparatus.

I have illustrated apparatus which may be used either as a hydraulic or a pneumatic jack. In this apparatus G represents a suitable pump, G' suitable jacks provided with piston rods *g*, and the pipe *g'* connecting the
85 pump and jacks whereby the latter may be operated by the former. On the carriage or center are also mounted the wheels H, the lower edge of said wheels being above the lower ends of the jack piston rods when in
90 their depressed positions. Now, as will be seen by reference to Fig. 2, by means of the pump G the jack piston rods may be forced outward and coming to a bearing on the ledge *b* of the wall, the entire apparatus including
95 the center E will be forced upward.

I will now describe the operation. The walls B are first built throughout the entire length of the tunnel or at least far enough in advance of the work on the arch to allow the
100

walls to be used as support. The material for the arch is then brought in and piled in the ditches at the side of the track or upon the walls B. The center E and its accompanying carriages is then placed upon the wall. The ends of the center being supported from the edge of each wall by pulleys or wheels *h*. By means of the jacks G' the center is then forced up to the position where it can support the arch while it is being built. When the arch above the center has been completed the center is lowered by releasing the jacks until the wheels H come to a bearing on the ledge *b*, when the entire apparatus is moved along until only about a foot, more or less, of the edge *e'* of the center remains under the edge *d* of the arch. By means of the jacks the center is then forced up against the arch and the building of the latter continued, and so on until the tunnel is completely relined. In this way the work of relining the tunnel is continued uninterruptedly until completed, and at the same time the track way is left clear (except at such times as the work train is delivering material) for the passage of the trains.

Where there is sufficient room I provide a suitable platform in the shape of steps K which are attachable to and detachable from the center E by means of the strap irons *k*, these steps or platform being substantially fifteen inches more or less in depth, and being located in advance of the completed arch, which is eighteen inches more or less in thickness, gives the workmen a space of thirty-three inches more or less in which to work when supported by the platform. While these steps are preferable, they are not absolutely essential, and can be dispensed with if necessary.

It is obvious that many of the details of my apparatus might be altered without departing from the spirit of the invention. For instance—screw jacks might be employed to raise and lower the apparatus. And I would have it understood that I contemplate by my invention any of the various modifications that might be made without departing from

the true spirit of the same. So also while I have mentioned particularly a railway tunnel, yet the apparatus is obviously applicable to the lining of any tunnel.

What I claim is—

1. The combination with the walls of a railway tunnel, of an apparatus for accomplishing the lining of the arched portion of the same consisting of an imperforate sheet metal center supported at each end from the side walls, and mechanism connected with said center for raising and lowering it toward and from the lined arch, substantially as described.

2. The combination with the side walls of a railway tunnel of a metallic center for building the arch lining consisting of a single strip of sheet metal extending from wall to wall and provided on each end with lifting apparatus to move it toward or from the arch lining, substantially as described.

3. The combination with the walls of a railway tunnel of a metallic center for building the arch lining consisting of a substantially imperforate metal center extending from wall to wall provided on each end with wheels whereby the center may be moved easily longitudinally of the tunnel, and provided also on each end with lifting apparatus to raise the center toward or from the arch lining, substantially as described.

4. The combination with the imperforate sheet metal center of an auxiliary platform in the form of steps connected to said center and adapted to support the workmen, substantially as described.

5. The combination with the imperforate sheet metal center of a platform arranged in a form of steps, said platform attachable to and detachable from the main portion of the center, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

SIMEON I. MORRIS.

Witnesses:

W. H. CHAMBERLIN,
FLORENCE KING.