

No. 739,969.

PATENTED SEPT. 29, 1903.

E. E. YOUNG.
TUNNEL SUPPORT.

APPLICATION FILED FEB. 25, 1901.

NO MODEL.

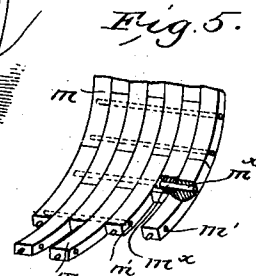
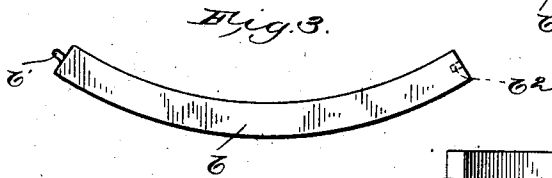
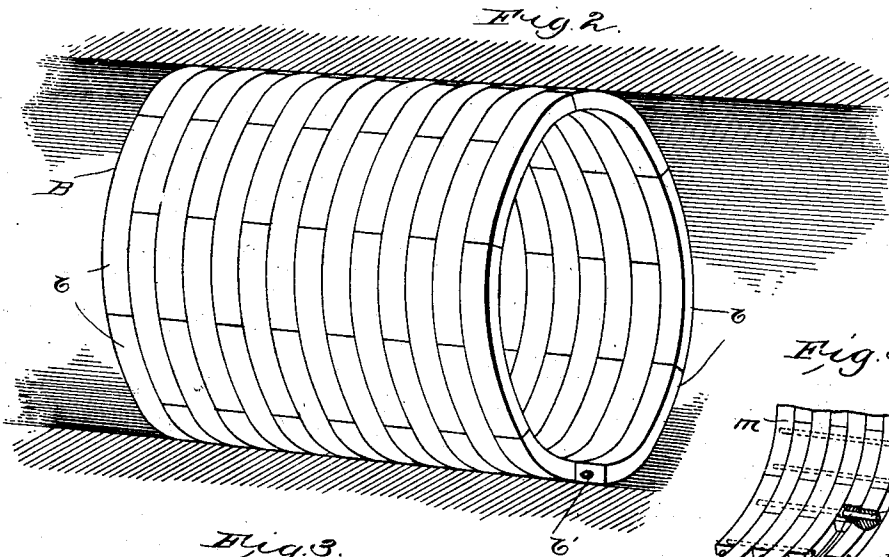
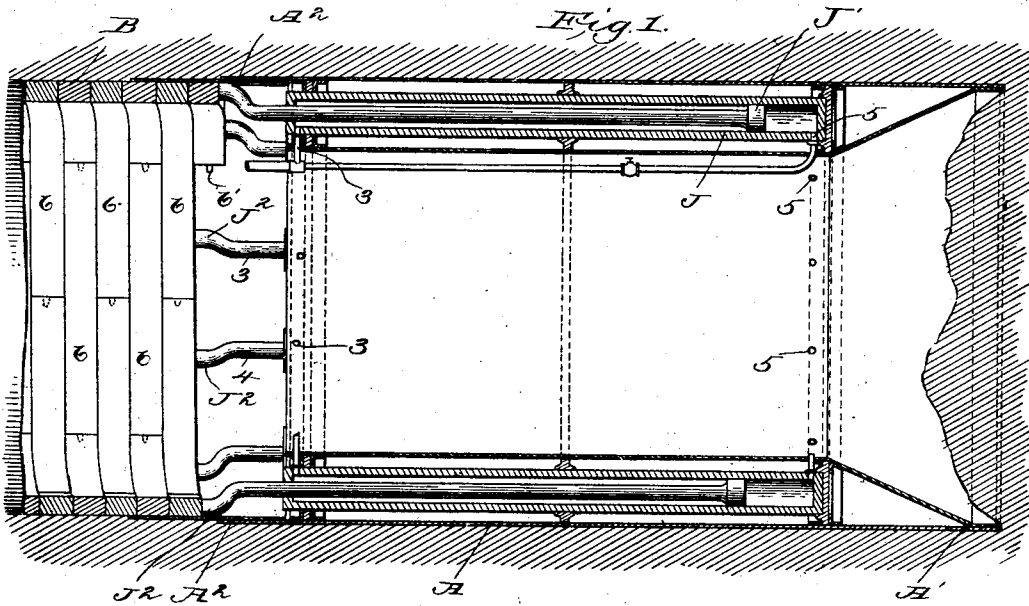
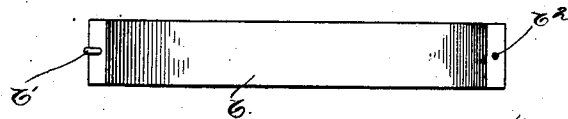


Fig. 4.



Witnesses:

W. C. Sumner

Fred. S. Grunke

Inventor:

Eddy Elbert Young,
by *Wesley H. Young*
attys.

UNITED STATES PATENT OFFICE.

EDDY ELBERT YOUNG, OF NEWTON, MASSACHUSETTS.

TUNNEL-SUPPORT.

SPECIFICATION forming part of Letters Patent No. 739,969, dated September 29, 1903.

Application filed February 25, 1901. Serial No. 48,661. (No model.)

To all whom it may concern:

Be it known that I, EDDY ELBERT YOUNG, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Tunnel-Supports, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

In tunnel construction it is necessary to build up a support as the work progresses to sustain the roof and sides while the permanent masonry, brickwork, or other permanent lining is being completed, the support usually being made of timbers laid longitudinally and held in place by bracing. When the permanent lining is put in, the bracing is removed little by little as the lining progresses, the support being expensive to build and consuming time and labor, as well as much material in its erection.

My present invention has for its object the production of a novel tunnel-support which may constitute the temporary or the permanent lining or facing, as desired, the support possessing great strength, while admitting of very rapid erection and materially economizing in time and labor as well as in cost of construction.

I have herein illustrated my invention in connection with a tunneling-shield of well-known construction in order to clearly demonstrate the structure and the applicability of my invention but my novel tunnel-support is not restricted to use in connection with such a shield, as my invention may be employed in connection with any usual mode of tunneling.

Figure 1 is a longitudinal sectional view of a portion of a tunnel, showing a shield, means for forcing it ahead, and a tunnel-support embodying my invention, the support being built up as the shield is advanced. Fig. 2 is a perspective view of a portion of the tunnel-shield, showing it in a tunnel. Fig. 3 is an enlarged side elevation of one of the segmental members of the support. Fig. 4 is a top or plan view thereof; and Fig. 5 is a detail in perspective to be described, showing one manner of providing longitudinal braces.

Referring to Fig. 1, the tunneling-shield, comprising a rigid tubular body portion A,

its open cutting-head A', which enters the material to be tunneled as the shield is moved forward, and the rear overhanging portion or tail A², are and may be of usual or well-known construction, the earth or other material E in the cutting-head being dug out and carried back through the shield, as usual.

The shield has mounted therein a series of hydraulic or other jacks, the cylinders J extending longitudinally of and being supported in the strong body A of the shield, the plungers J' having their outer ends offset, as at J², to bring their point of application as near as possible to the surface of the tunnel.

It will be understood that water or other fluid under pressure is admitted to the cylinders at each side of the plunger-heads by ports 3 5 and ordinarily the greater pressure on the inner sides of the heads will tend to force the cylinders and shield ahead, the plungers being anchored at their outer ends. This anchorage or back-stop has heretofore been provided in various ways, as by the longitudinal timbers of the lining, and when the plungers are fully extended they must be withdrawn to permit additional lengths of timber to be put in, and of course the advancement of the shield cannot be continued until the new lengths of timber are inserted. Even with other forms of lining the delay thus occasioned is very considerable, as the progress of the tunneling is retarded whenever the forward movement of the shield is stopped.

By my invention the advance of the shield is practically continuous or just as rapid as the material in front can be removed, and in accordance with my invention I build up a tubular support consisting of a continued spiral formed of segmental members of the required radius and placed end to end, the leading end of the spiral being extended as the shield progresses and forming a back-stop for the plungers of the jack.

Referring to Figs. 1 and 2, the support consists of a series of segments b, of a radius corresponding to the curvature of the tunnel, placed end to end to form a closed continued spiral B, the segments being made of wood, brick, cement, or other desired material having the requisite rigidity and strength. The spiral is built up within the tail of the shield,

one turn after another being constructed as the shield advances, the segments being so laid that they break joints in adjacent turns. Each turn of the spiral sustains the next turn as it is built up in the direction of the length of the support, and I prefer to interlock the abutting ends of the segments. One simple form of lock is herein shown, each segment having at one end a projection b' and a recess b^2 at the other end, so that the projection on one segment enters the recess in the adjacent end of the next. Such interlocking prevents lateral displacement of the adjacent segments and increases the general rigidity of the support, which, as far as completed, presents a tube within the tunnel-opening and which sustains the surrounding material. The segments may be laid up in cement or mortar as the support is built up and it may form only a lining-support, or it may constitute the permanent lining or facing, as desired. It will be manifest that all cross-bracing is obviated and that the construction of the support may be very rapidly accomplished. The jack-plungers rest on the leading end of the support on parts of two successive turns, as shown in Fig. 1, and when another segment is to be inserted one or more of the plungers are retracted—as, for instance, 3 and 4, Fig. 1—the segment inserted and the plungers again extended, the pressure on the shield exerted by the other plungers being undisturbed during the operation, so that the advancement of the shield is never retarded.

As the cylindrical support is self-sustaining, requiring no bracing, there is nothing to interfere with a free and uninterrupted passage through the tunnel.

If the support is used only as a temporary lining, it can be segregated from its rear end as the permanent lining or facing is built up. All truing up and careful jointing is obviated in the support constructed as herein set forth.

In tunneling in clay or other similar material where the roof and sides will hold without immediate support my invention can be practiced in constructing the permanent lining or structure which will be built up after the manner herein set forth, using brick, cement, or other segments, the first turn of the spiral being carefully set up, and thereafter the spiral will be continued as the tunnel progresses, following the excavation as closely as possible. Such procedure obviates the use of a shield as well as a support or temporary lining following up the shield.

In Fig. 5 a section of the tunnel-support is shown to illustrate a mode of providing additional strength longitudinally at desired distances about the perimeter of the support when working with a shield should the material of which the latter is composed be insufficient to stand the crushing tendency of the jack-plungers in forcing the shield forward.

The several segments m , Fig. 5, are provided with transverse openings or holes m' to receive, preferably, metallic plugs or rods m^x , which may be as long as the segments are wide or slightly longer to compensate for the width of the spiral-joints. The plugs in the segments comprising one turn of the spiral will register with or come opposite the plugs in the next adjacent turns, so that a series of sectional longitudinal braces are provided against the leading end of which the ends of the plunger bear, said braces taking up the pressure, the plugs fitting loosely in the holes in the segments. If desired, the plugs may be made longer or rod-like, for instance, and extended through the segments of a number of turns, the result attained being the same whether the braces are composed of long or short lengths.

My invention is not restricted to the precise construction and arrangement herein shown and described, as the same may be modified or varied without departing from the spirit and scope of my invention.

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

1. A built-up tunnel-support consisting of a continued spiral composed of a series of segmental members, said segments having transverse holes therein located to register with the holes in the segments of adjacent turns of the spiral, and longitudinal pressure-resisting braces inserted in the holes.

2. A tunnel-support consisting of a series of segments of the required radius abutted at their ends and forming a continuous spiral, and pressure-resisting plugs mounted in and extended transversely of said segments, the plugs in one turn of the spiral alining with those in the adjacent turns, to constitute longitudinal braces mounted in the support.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDDY ELBERT YOUNG.

Witnesses:

JOHN C. EDWARDS,
AUGUSTA E. DEAN.