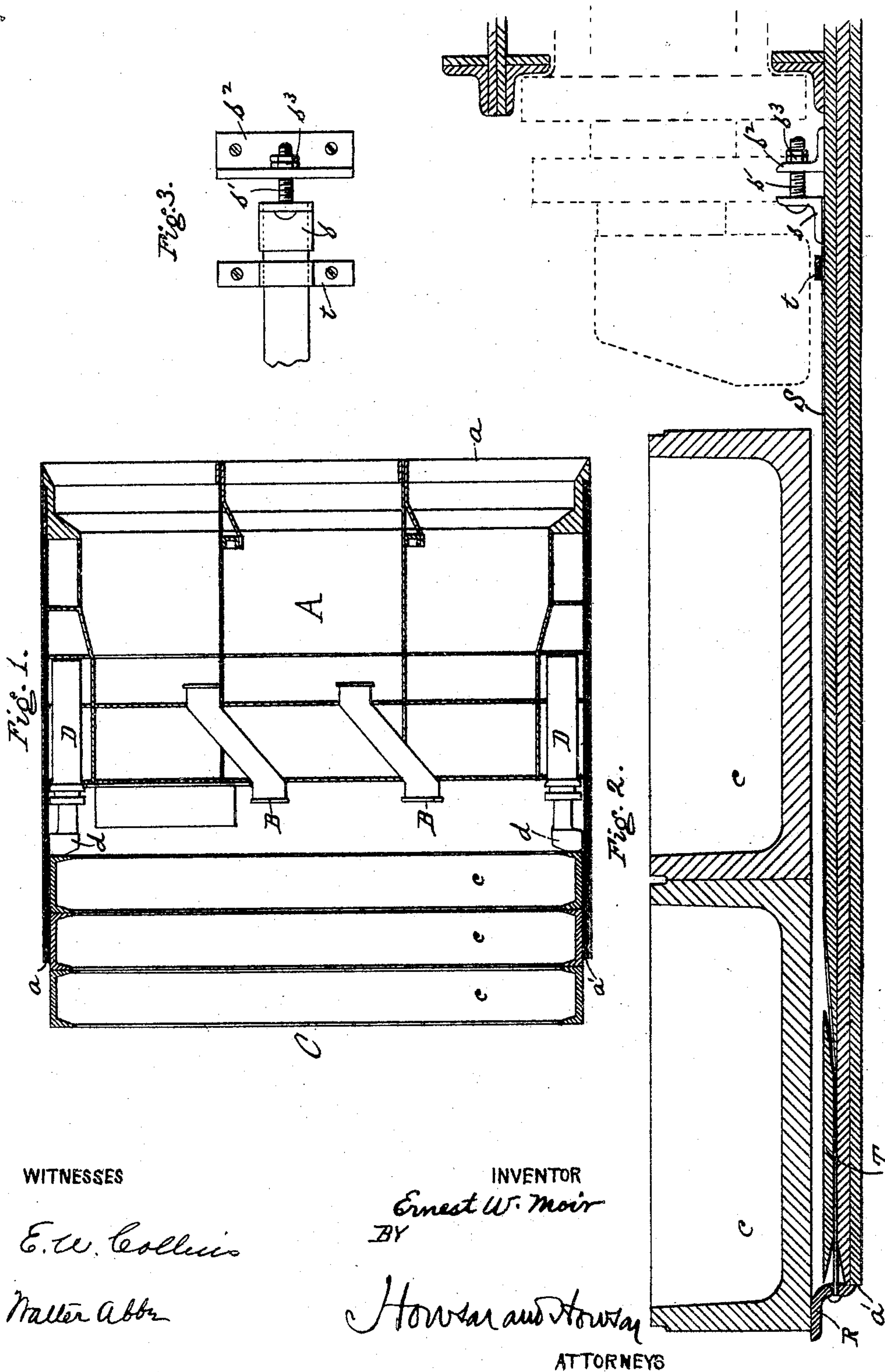


No. 794,632.

PATENTED JULY 11, 1905.

E. W. MOIR.  
TUNNELING SHIELD.  
APPLICATION FILED MAR. 18, 1905.



WITNESSES

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# UNITED STATES PATENT OFFICE.

ERNEST W. MOIR, OF LONDON, ENGLAND, ASSIGNOR TO S. PEARSON AND SON, INCORPORATED, OF LONG ISLAND CITY, NEW YORK, A CORPORATION OF NEW YORK.

## TUNNELING-SHIELD.

SPECIFICATION forming part of Letters Patent No. 794,632, dated July 11, 1905.

Application filed March 18, 1905. Serial No. 250,783.

*To all whom it may concern:*

Be it known that I, ERNEST W. MOIR, a subject of the King of Great Britain and Ireland, residing in London, England, have invented certain new and useful Improvements in Tunneling-Shields, of which the following is a specification.

My invention relates to apparatus for the construction of tunnels, especially such as are intended to be carried through water-bearing strata and in which an advancing shield is employed as the excavation is advanced and the tunnel-lining is put in back of the shield, the operations being carried on under an air-pressure greater than atmospheric pressure.

The object of my invention is to provide efficient means to prevent inrush of water or an escape of air between the iron tunnel-lining and the tail end of the shield.

In the accompanying drawings, Figure 1 is a diagram, on a small scale, indicating a tunnel end and shield. Fig. 2 is an enlarged longitudinal section through a part of the tail end of the shield and the forward segments of the tunnel-lining when provided with my improvement, and Fig. 3 is a plan view of the strap-drawing means.

Referring to Fig. 1, A represents the shield, which has the usual forward cutting edge *a* and air-locks B B. The tunnel-lining, which preferably is built up of curved segments, is represented at C, the tail end of the shield being outside of and surrounding the forward end of the tunnel-lining. Hydraulic jacks D D are mounted on the shield in such positions that their piston-heads *d* may be brought to bear against the advance side of the last-introduced ring of tunnel-segments to force the shield forward at the proper time, as is well understood in this art.

In using tunneling apparatus of the character described it is usual, especially in cutting through water-bearing strata, to employ compressed air in the working chambers, and it has always been a difficult problem to get a secure and tight joint between the tail end of the shield and the tunnel-lining, such a joint as will prevent, on the one hand, an inrush or flow of water into the space back of the air-

locks and, on the other hand, escape of the compressed air. To meet this difficulty, I have provided, as shown in Figs. 2 and 3, at the extreme tail end of the shield a ring R, preferably of angle-iron, which bears at the same time against the annular end *a'* of the shield and against the circumference of the tunnel-lining C. This ring R, which may be either a complete ring or may be built in segments, is held up to its position to make a tight joint by means of a series of longitudinal straps S, of steel or other suitable material, each strap secured at its outer end to the ring in any suitable way, while at its inner end it is secured to the shield with means for drawing it up to its seat, these means being within the space or chamber between the forward end of the lining C and the diaphragm of the shield and being located circumferentially between the several hydraulic jacks D. (Indicated by dotted lines in Fig. 2.) In the present instance I have shown these means for keeping the packing R to its seat as consisting of an angle-iron piece *s*, riveted to the inner end of the strap, and passing through a hole in this angle-piece is a headed screw-bolt *s'*, whose outer end passes through an angle-piece *s''*, secured to the shield by a nut and set-nut *s'''*, threaded on the bolt to tighten up the strap when desired. The steel strap may be guided at its inner end by a guide-piece *t*, while at its outer end it is guided by being passed through a channel under the ring T on the tail *a'* of the shield.

The packing-ring R at the tail of the shield is preferably of sufficient flexibility to keep a tight joint even when in the forward advance of the shield the axis of the latter happens to get out of coincidence with the axis of the tunnel-lining.

I claim as my invention—

1. In combination with a tunnel-lining and its advancing shield, a packing-ring to close the joint between the tail of the shield and the tunnel-lining and means to draw the packing-ring longitudinally of the shield and up to its seat.

2. In combination with a tunnel-lining and its advancing shield, a packing-ring to close

the joint between the tail of the shield and the lining, straps connected to the ring and extending into the space forward of the tunnel-lining, with means to draw the straps to keep  
5 the ring in its seat.

3. In combination with a tunnel-lining and advancing shield, a packing-ring of angle-iron to bear against the end of the shield and the circumference of the lining and means to draw  
10 said ring to its seat.

4. In combination with a tunnel-lining and advancing shield, a packing-ring, straps con-

nected to the ring to draw it to its seat to close the joint between the tunnel-lining and the end of the shield and screw means to act on 15 the inner ends of the straps in the chamber forward of the lining.

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

ERNEST W. MOIR.

Witnesses:

C. SEDGWICK,  
HUBERT HOWSON.