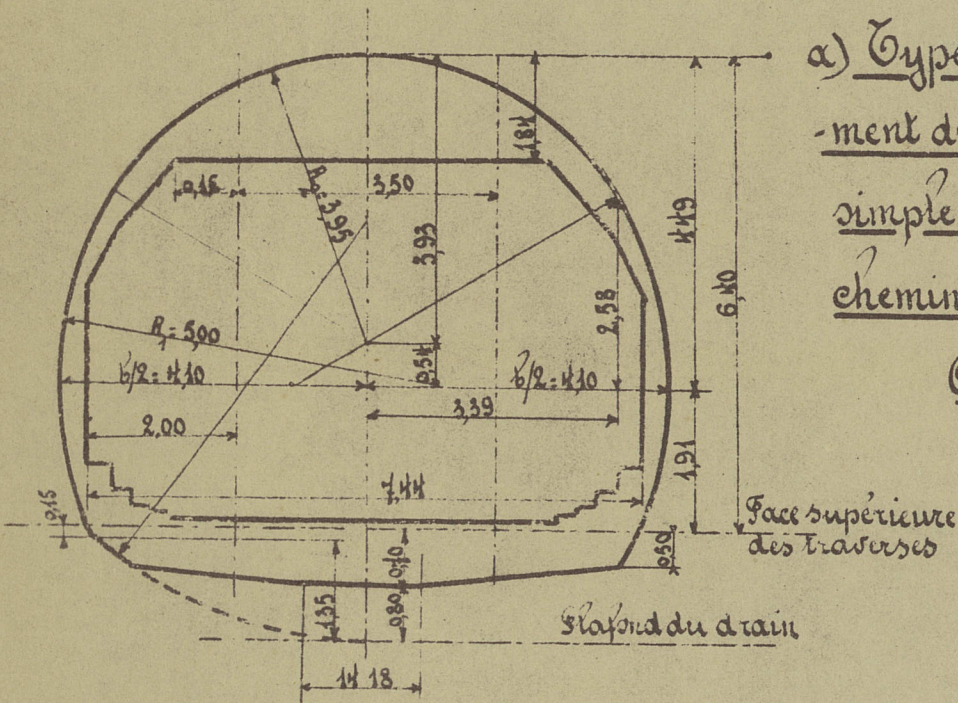
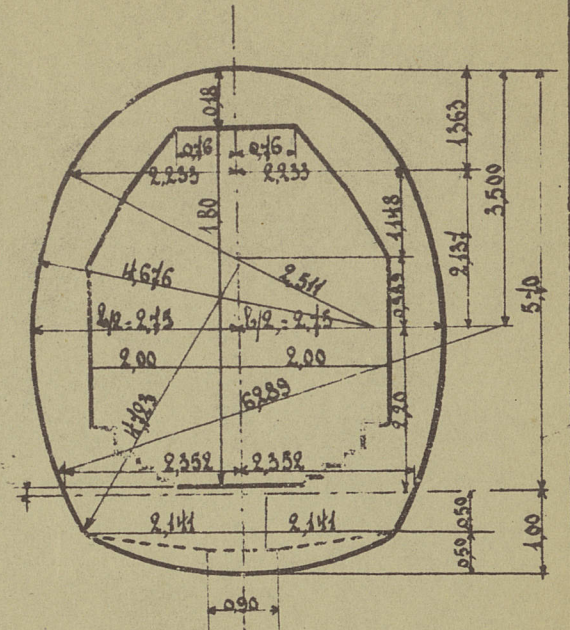
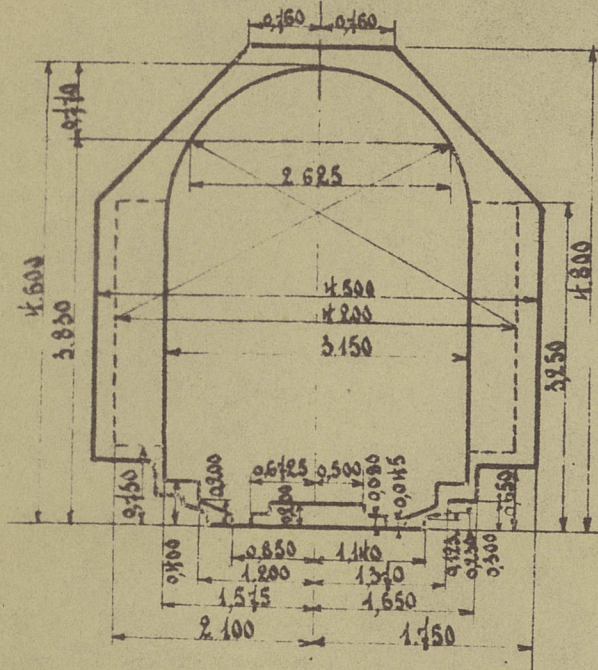
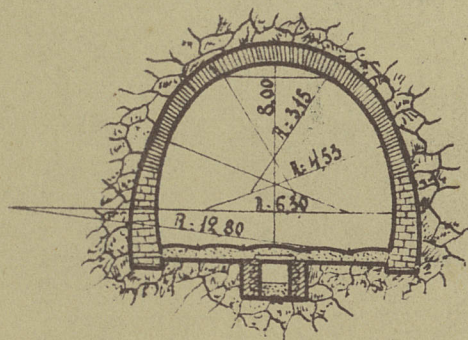


Gabarit des chemins de fer de l'Etat belge.

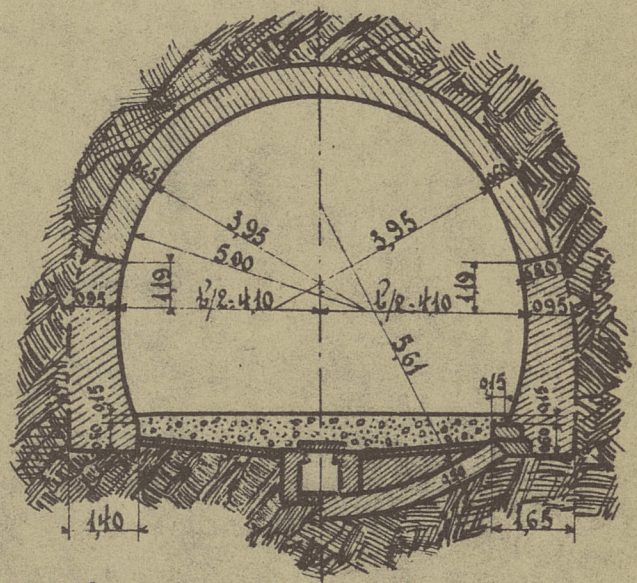
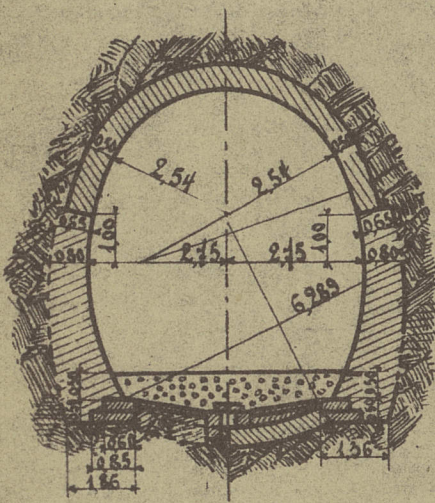
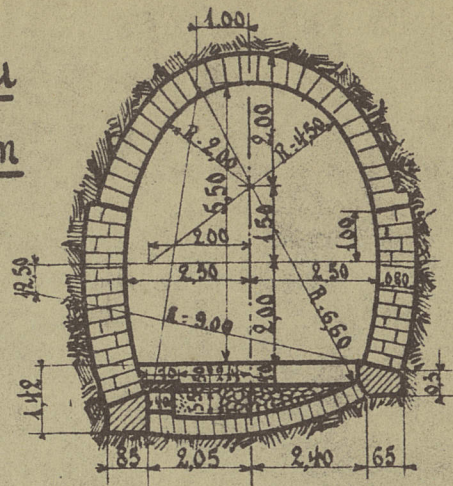
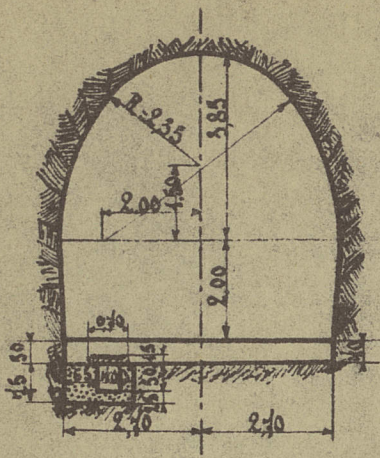


a) Types normaux en alignement droit des tunnels à simple et double voie des chemins de fer des Alpes Autrichiennes.



b) Profil courant du tunnel du Mont Cenis

Profils types du tunnel du Simplon revêtu ou non.



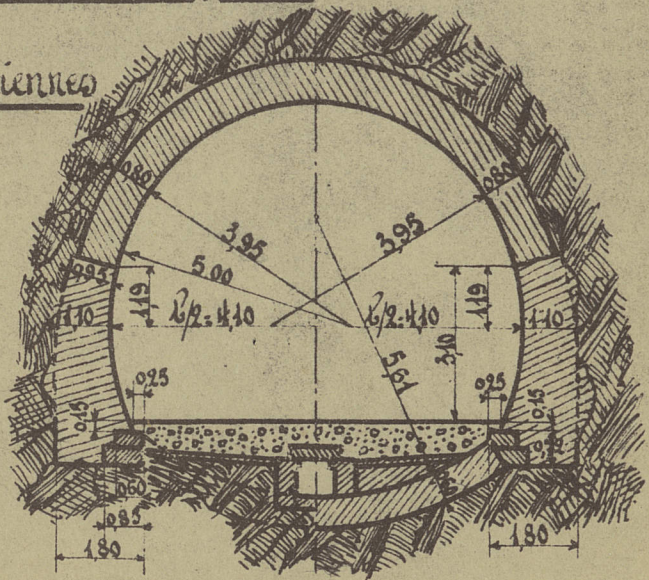
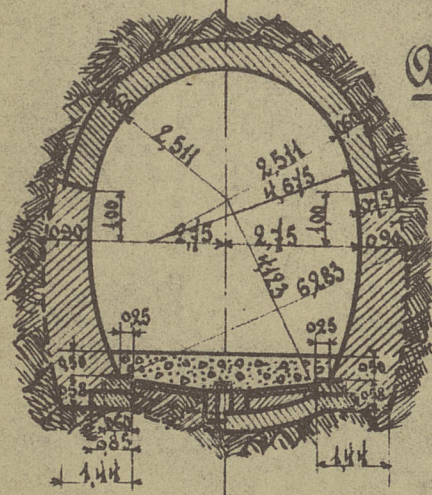
Sections

de revêtement normal

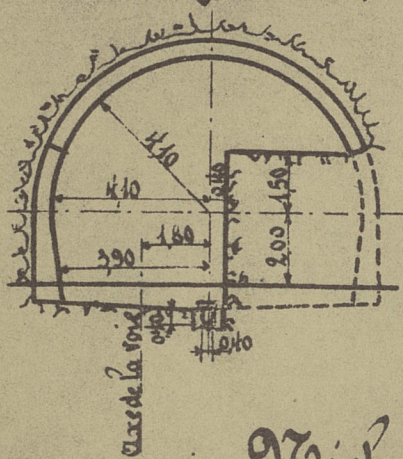
ou renforcés des tunnels à simple

ou double voie des chemins de fer des

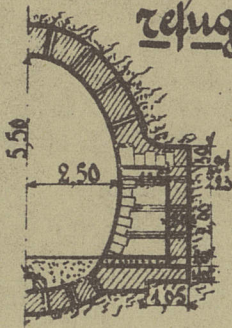
Alpes anciennes



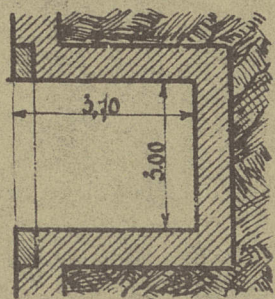
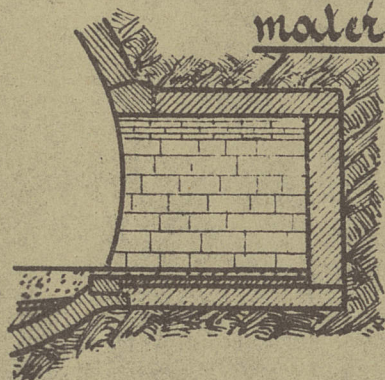
Élargissement ultérieur
d'un tunnel à double voie
(Goetschberg 1907-1911)



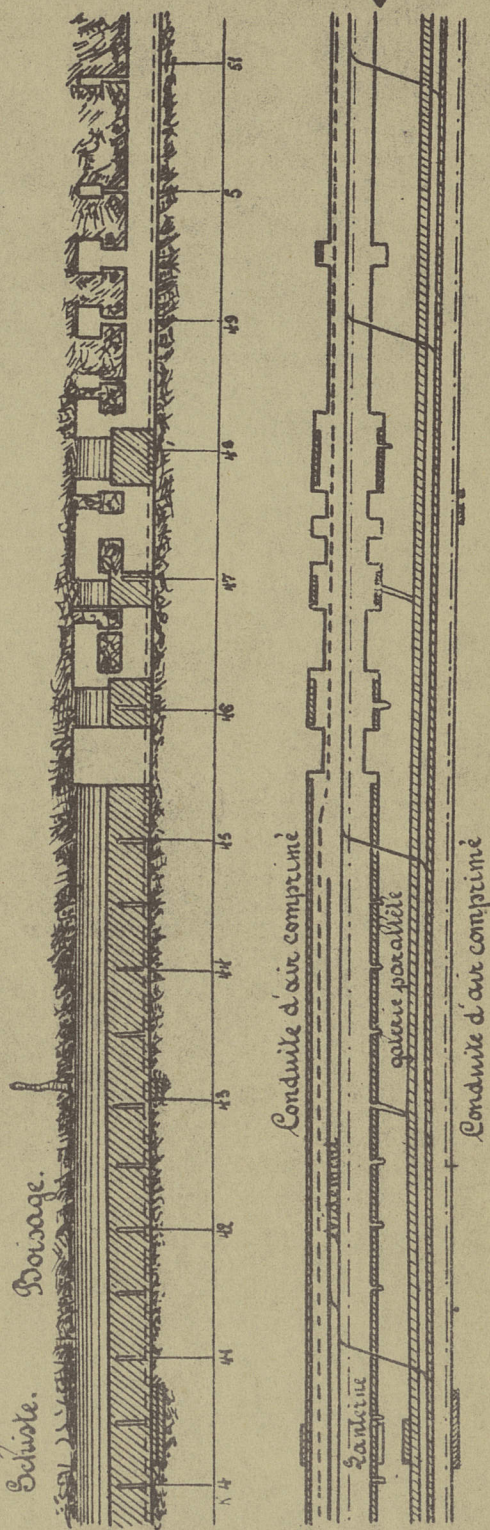
Coupe dans
une niche de
refuge



Niche de dépôt de
matériaux

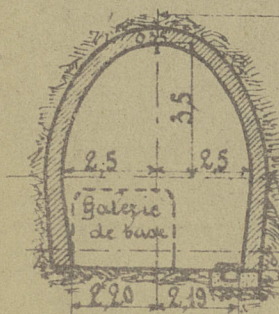


a) Plan et coupe longitudinale

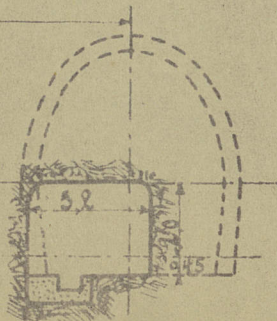


Disposition schématique des chantiers
du Simplon (Nord) 1858-1905

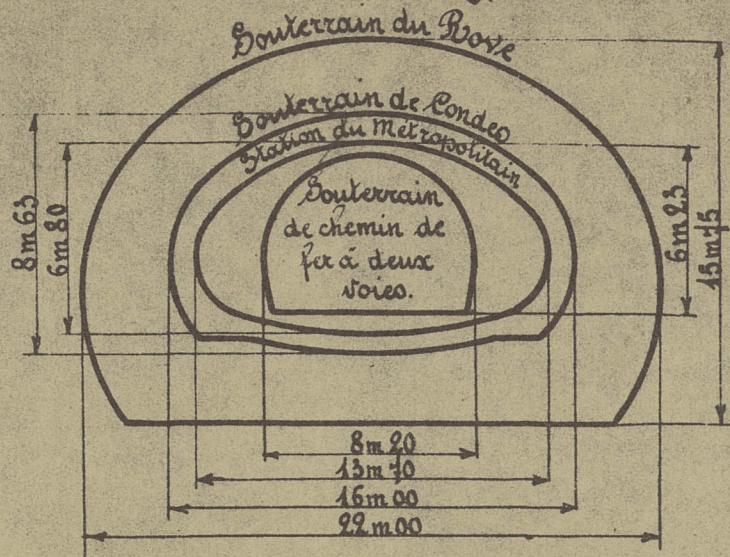
b) Coupe transversale



Galerie transversale
face inférieure des traverses

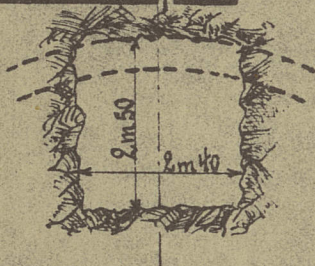


Profil comparé de divers types de tunnels



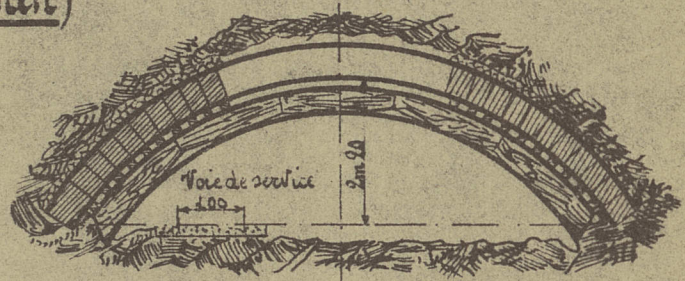
Tunnel du St Gothard (Méthode belge) 1872-1880

a) Galerie de faite

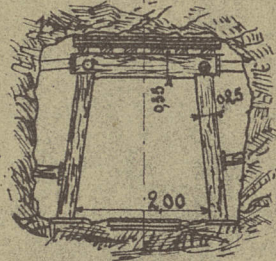
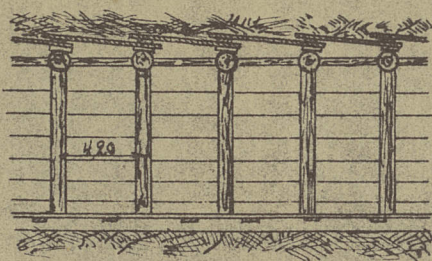


I Attaque Nord
(goeschenen)

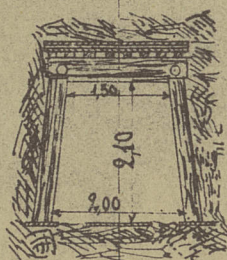
b) Construction de la voûte



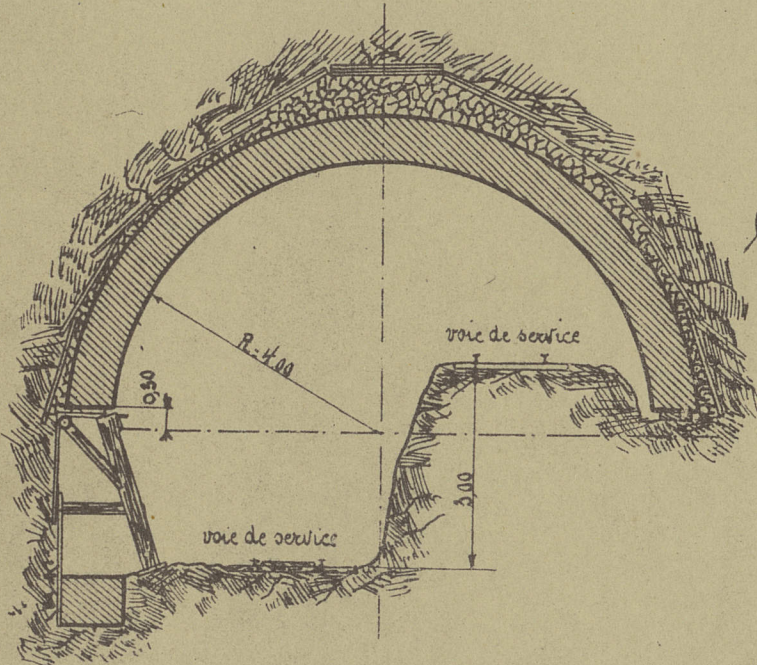
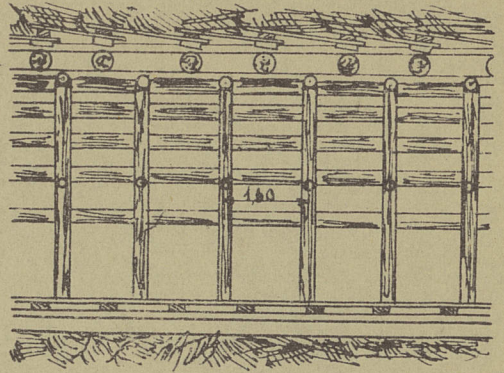
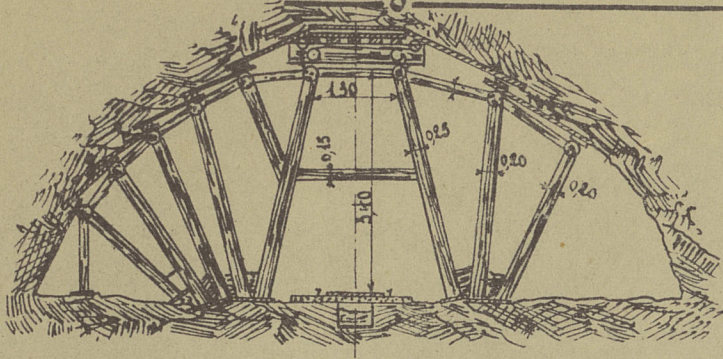
a) Galerie de faite



II Attaque Sud
(Airolo)



Élargissement de la calotte (boisage)



Construction des piedroits

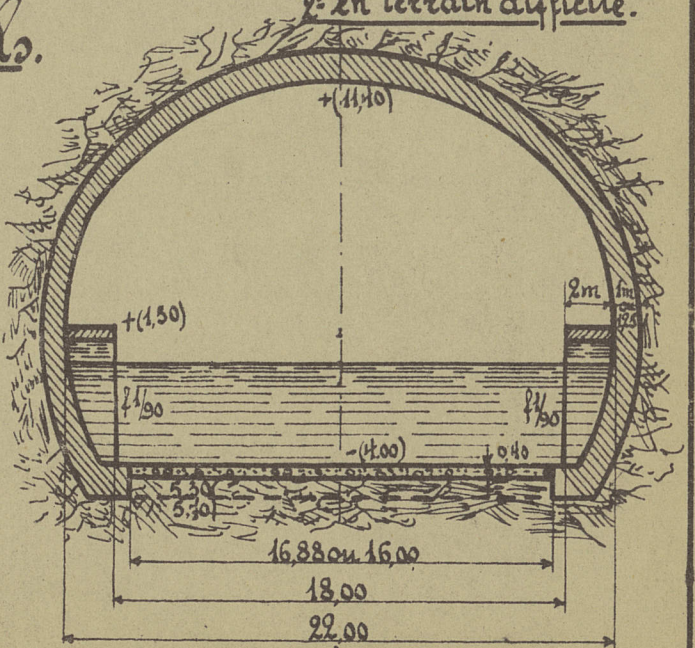
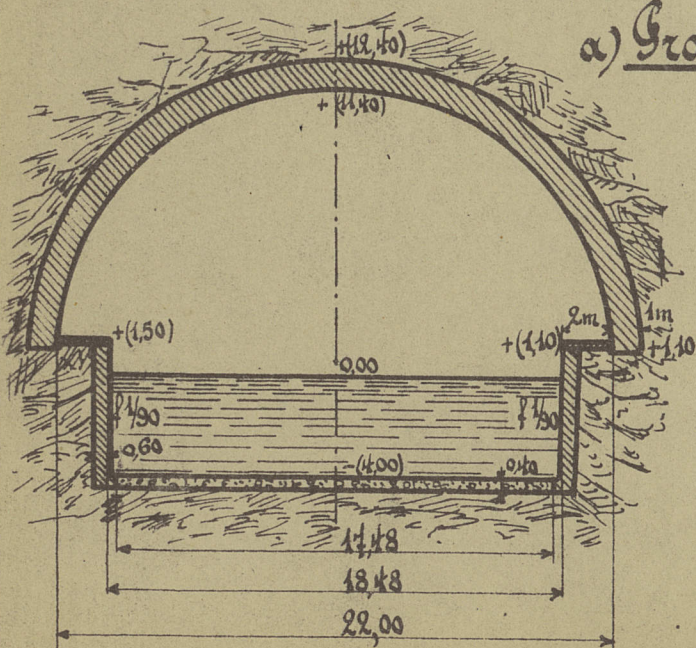
Tunnel du Voire (Canal de Marseille au Rhône)

1911-1922 Méthode belge.

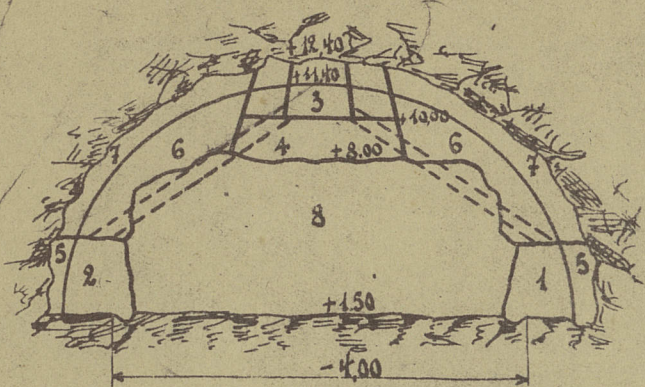
1^{er} en bon terrain

2^{er} en terrain difficile.

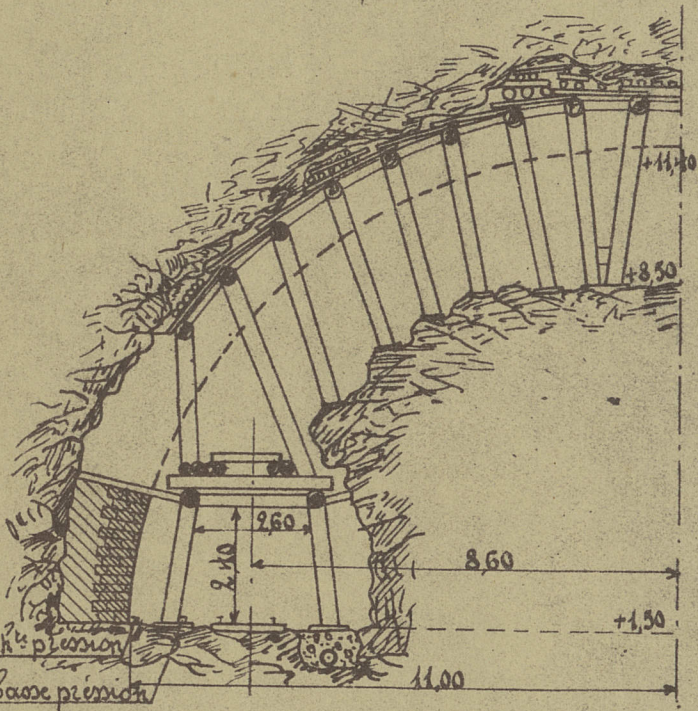
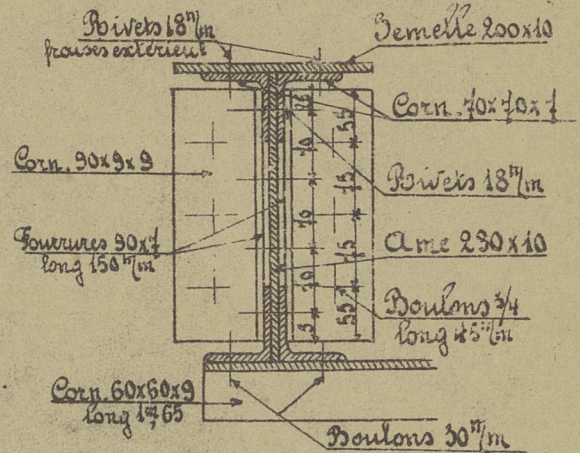
a) Profils.



b) Schéma du mode de percement



d) Profil du eintre métallique

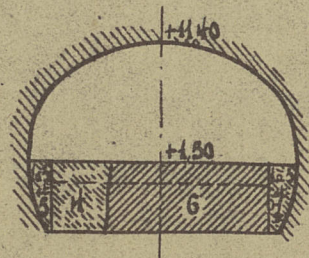


e) Boisage après l'abatage en couronne

e) Exécution des piedroits en sous-œuvre (cuvette Nord)



Élévation



Coupe transversale

Tunnel du Cinquantenaire à Bruxelles (1924-1926)

Méthode Fougère dérivée de la méthode allemande

Légende

25 à 52, numérotage riveaux de piedroit
 330 à 385, numérotage riveaux de voûte

- non défilé
- défilé
- béton

Fig. 2

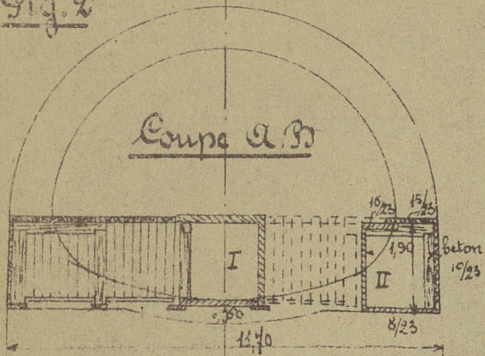
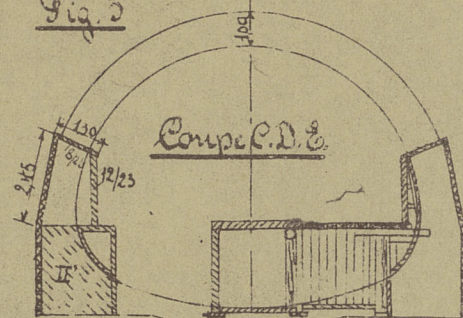


Fig. 3



Coupe F.G

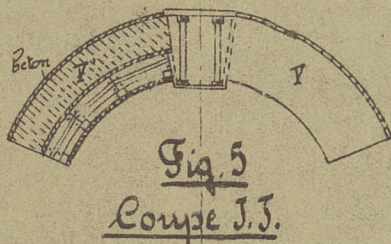
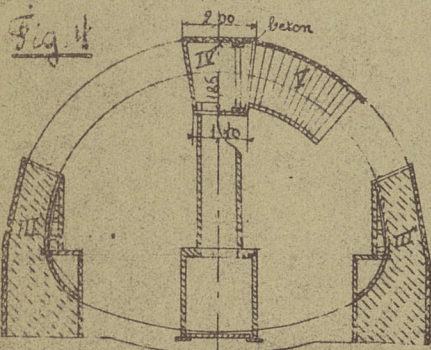


Fig. 5
Coupe J.J.

Coupe M.N.

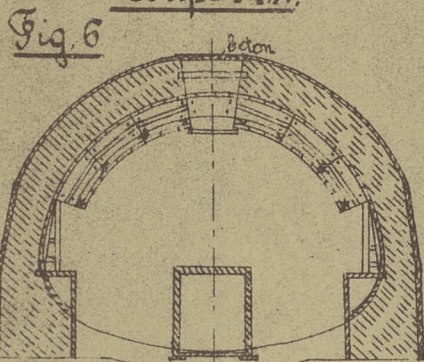
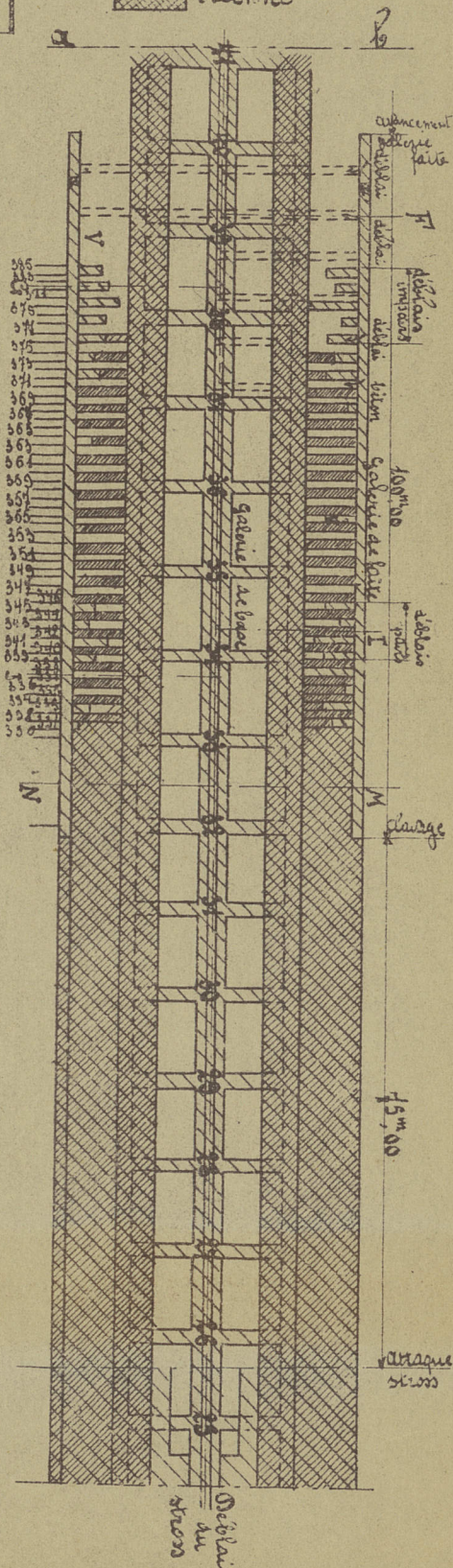
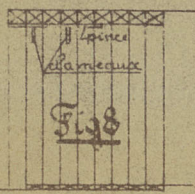


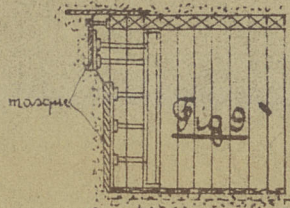
Fig. 6



Avancement bon terrain

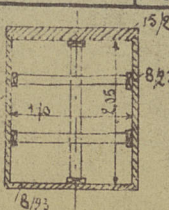


Avancement mauvais terrain



Plaque de piedroit

Fig. 13.



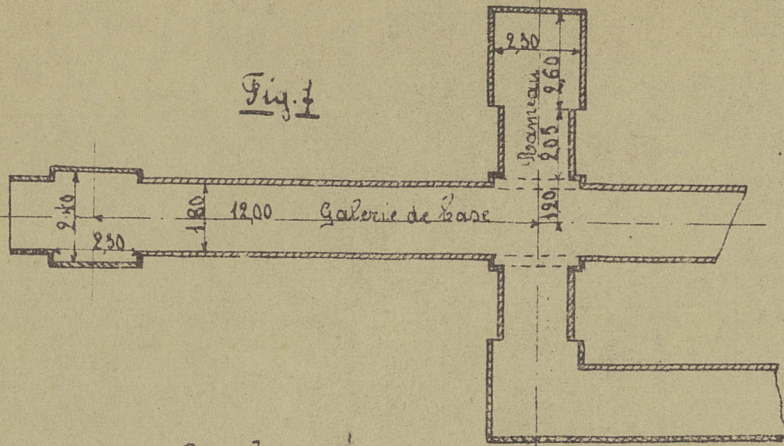
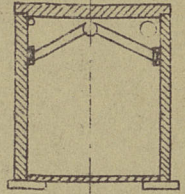
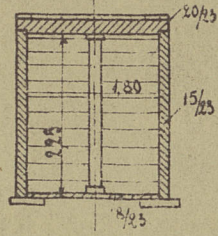


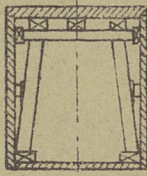
Fig. 7

Galerie de base
Fig. 10

Galerie de base
renforcement
Fig. 11

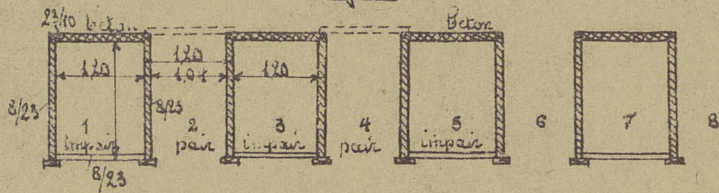


Renforcement
Fig. 14

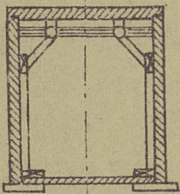


Coupe dans les rameaux de voûte

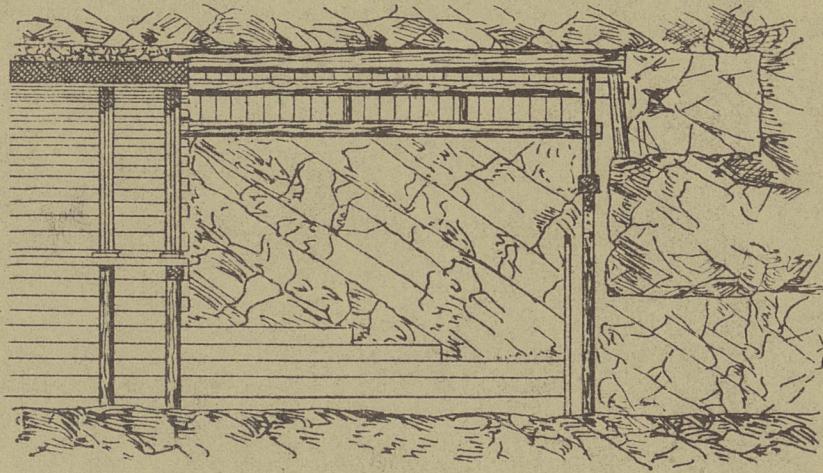
Fig. 15



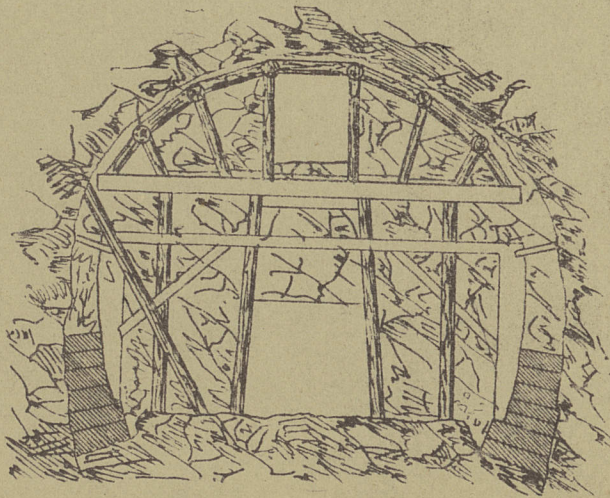
Galerie de base
renforcement
Fig. 12



Coupe longitudinale.



Coupe transversale



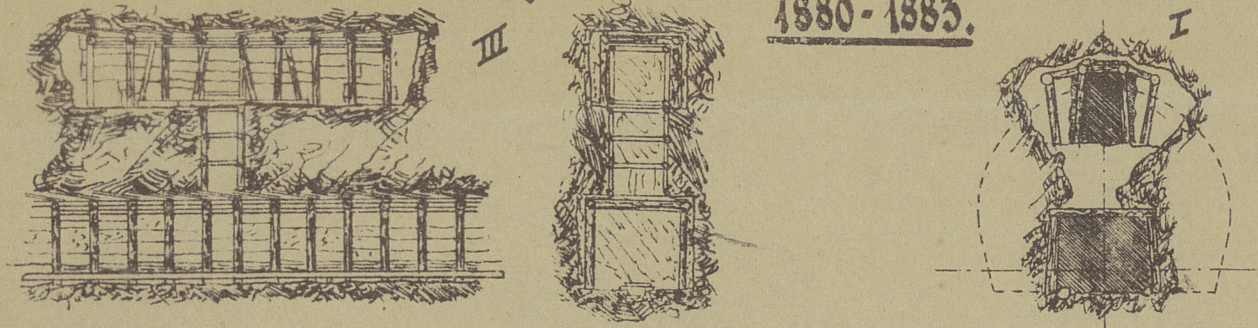
Tunnel de Hauenstein

(Suisse 1855-1858)

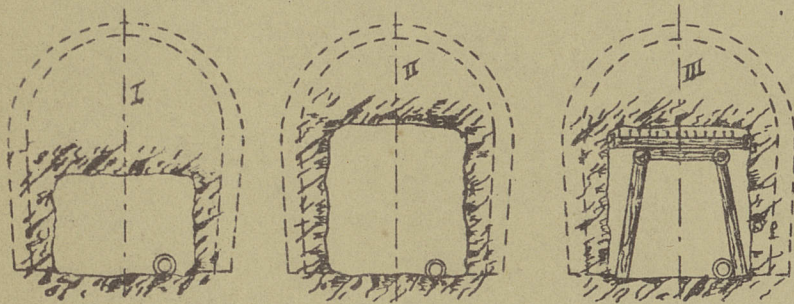
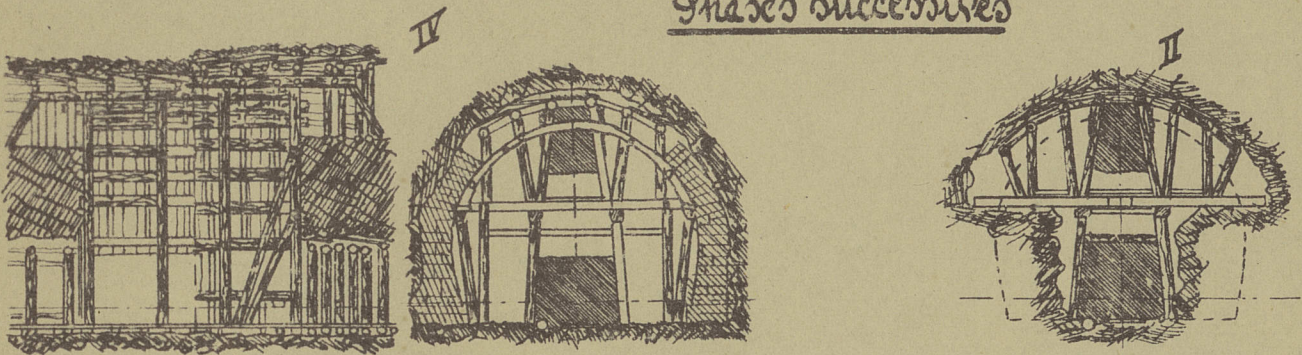
Méthode anglaise.

Tunnel de l'Arberg (Méthode autrichienne perfectionnée)

1880-1883.



Phases successives

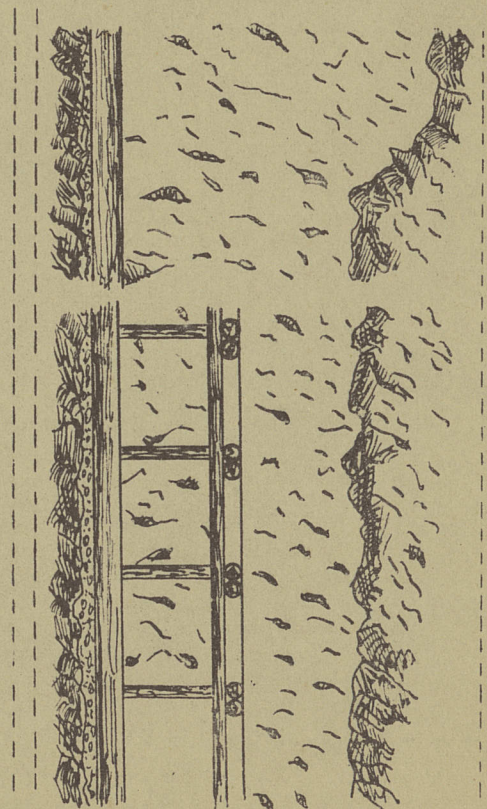
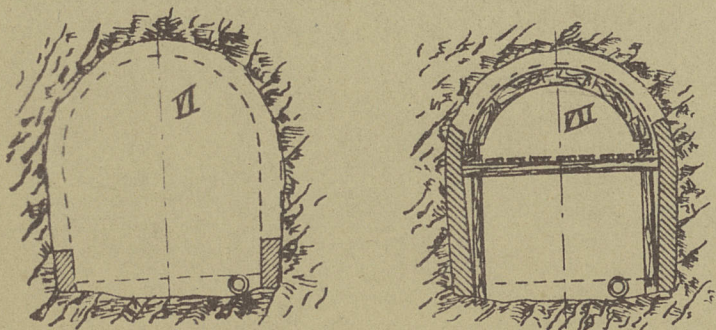


Tunnel de l'Albula
(Suisse)

Abatage en couronne sur
un plancher de travail



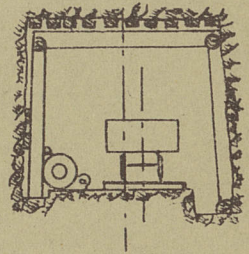
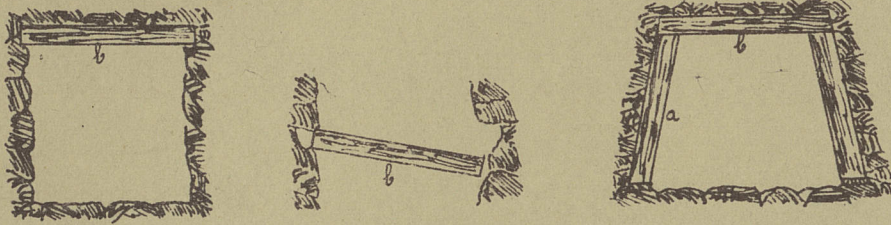
Phases
successives en
coupe transversale



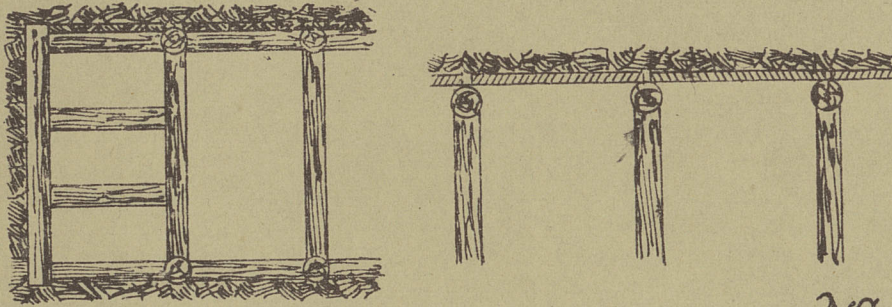
1) Incomplets sans coffrages (roches dures)



Boisages divers
de galeries

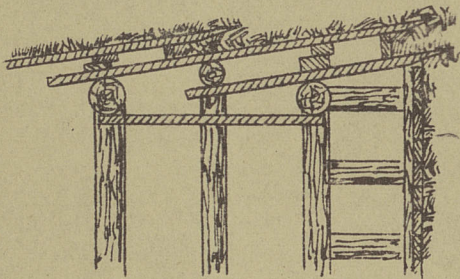


2) Avec coffrage en terrain dur

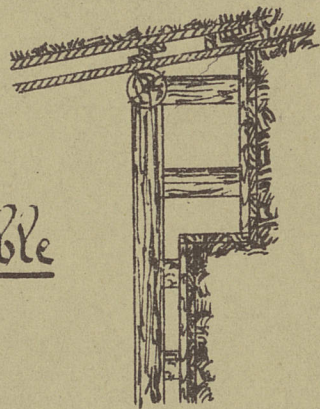


3) Avec blindage de front

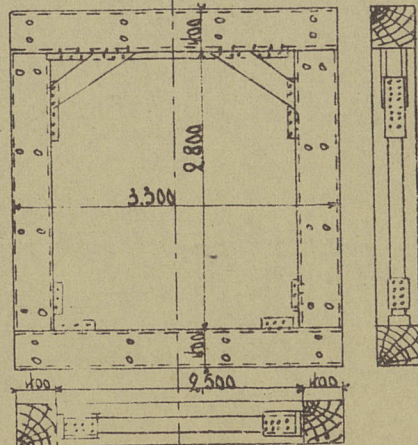
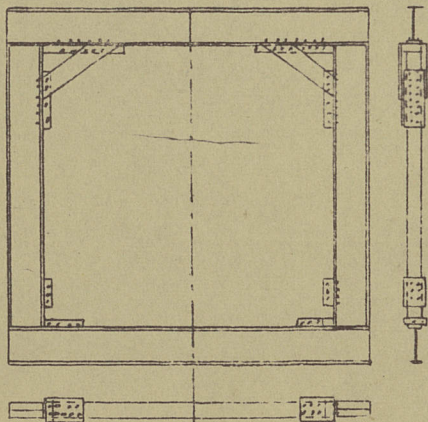
4) Avec chassis intermédiaires provisoires



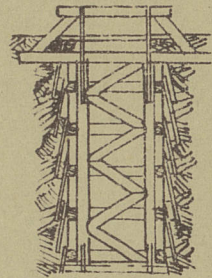
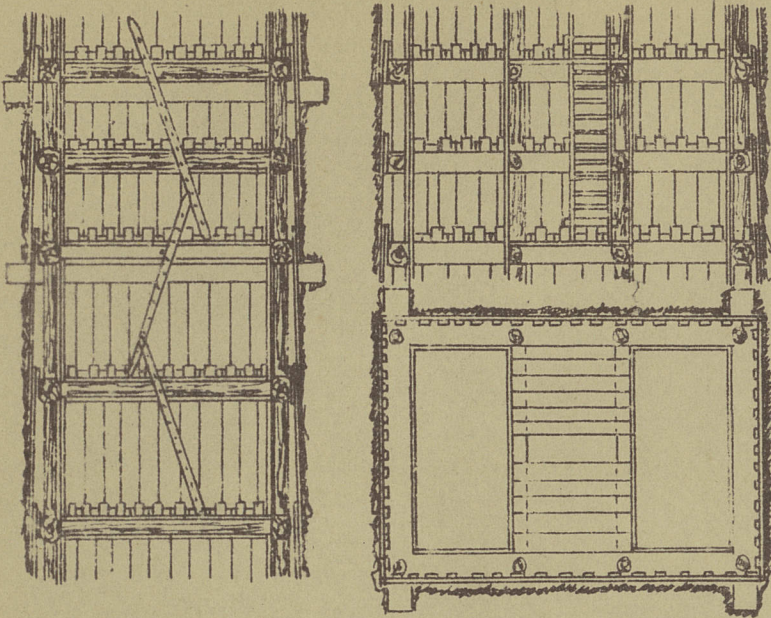
5) En terrain meuble



e) Chassis métalliques et mixtes (Simplon)

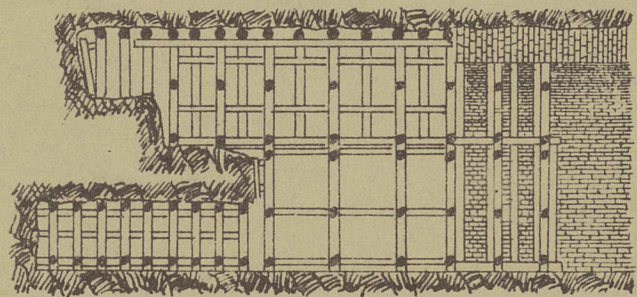
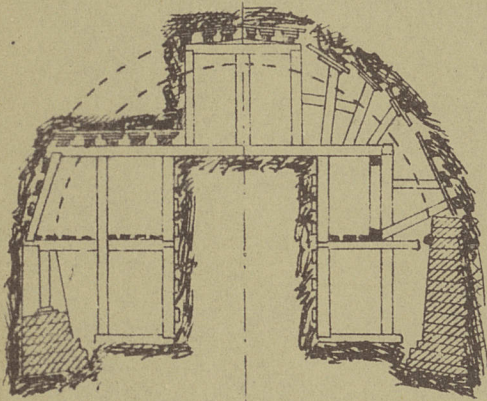


Sections et boisages de puits.

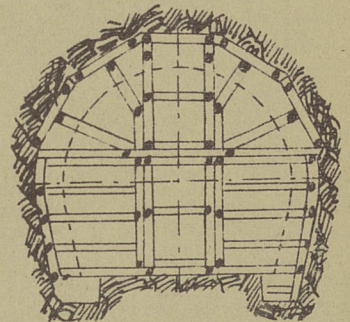
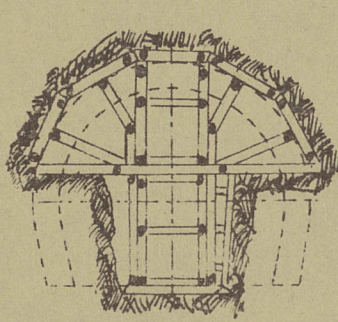


a) Méthode allemande

b) Méthode autrichienne ancienne

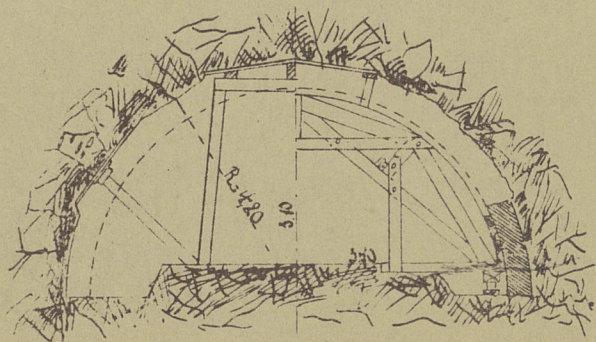
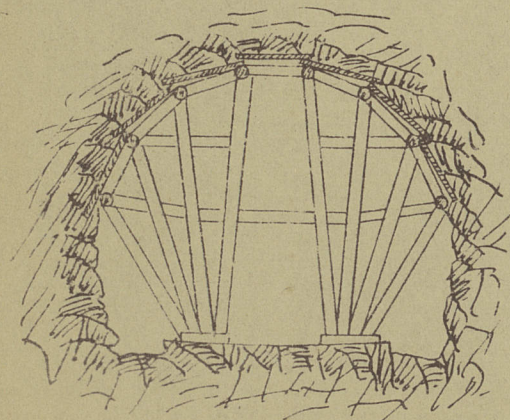


Boisages divers et cintres

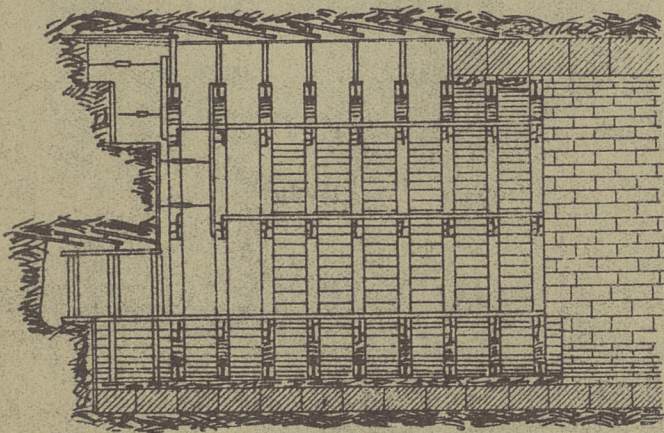
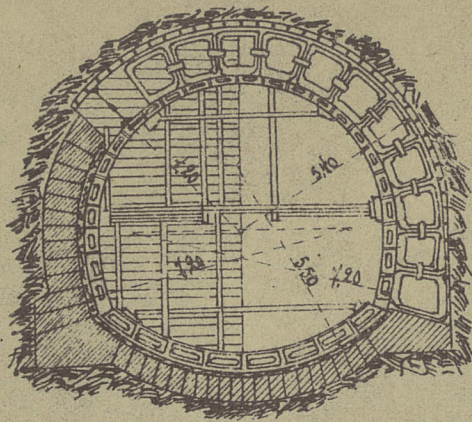


c) Chandelles et longrenes

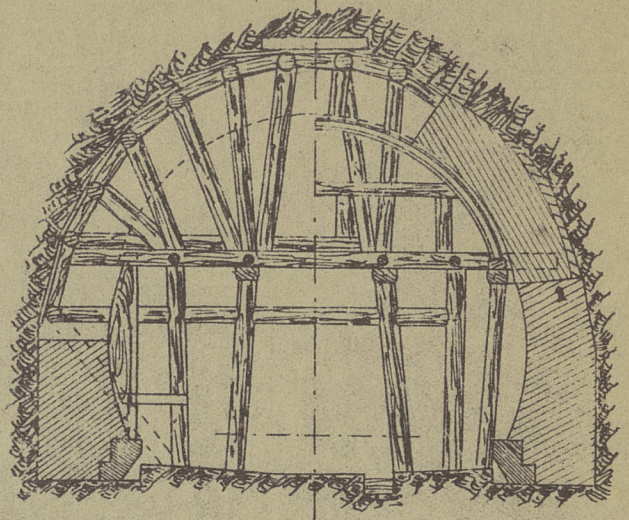
e) Disposition des cintres dans
la méthode belge.



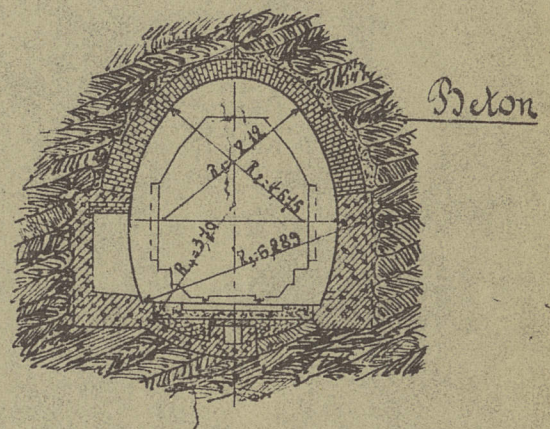
a) Chassis et cintres métalliques (Bozha)



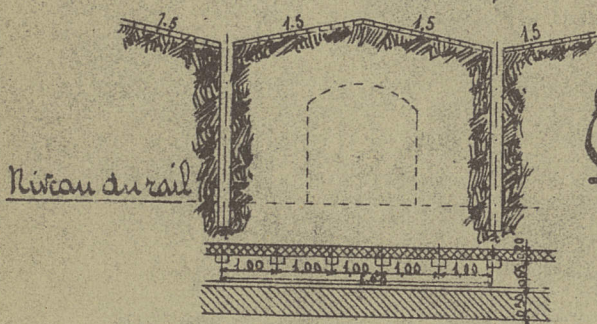
b) Cintre métallique



a) Dispositions générales des chapes et drains



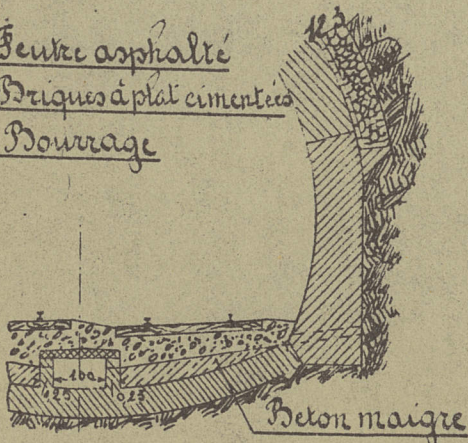
b) Détails des chapes et drains
Drains derrière les piedroits



Coupe du talot

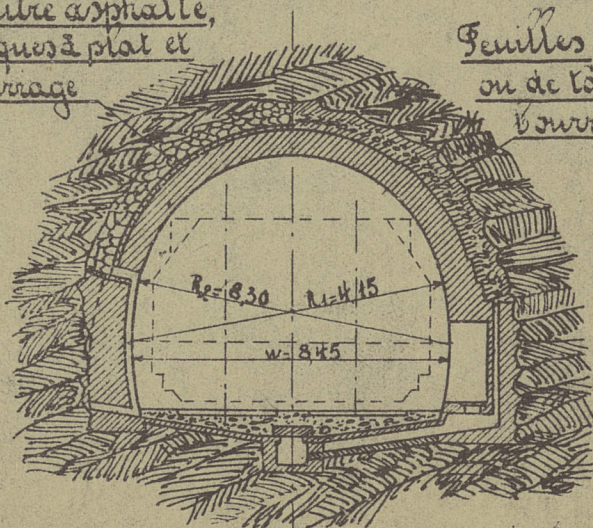
Branchement et drainage des tunnels

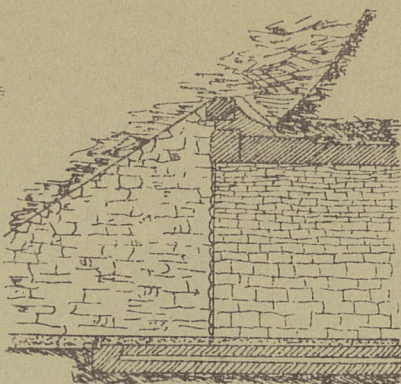
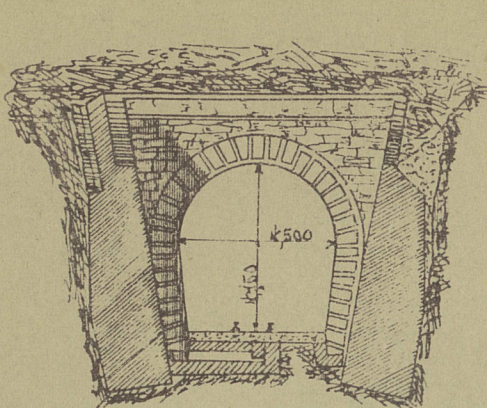
- 1. Feutre asphalté
- 2. Briques à plat cimentées
- 3. Bourrage



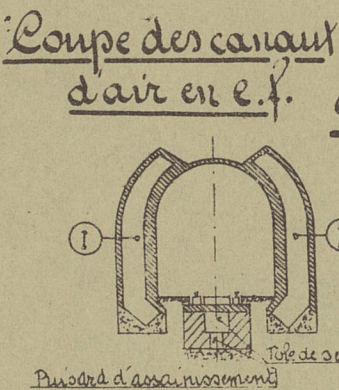
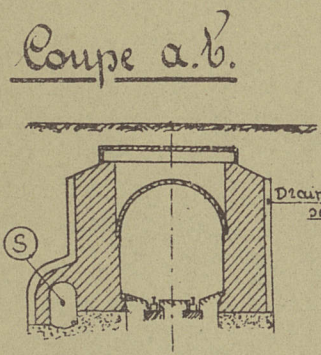
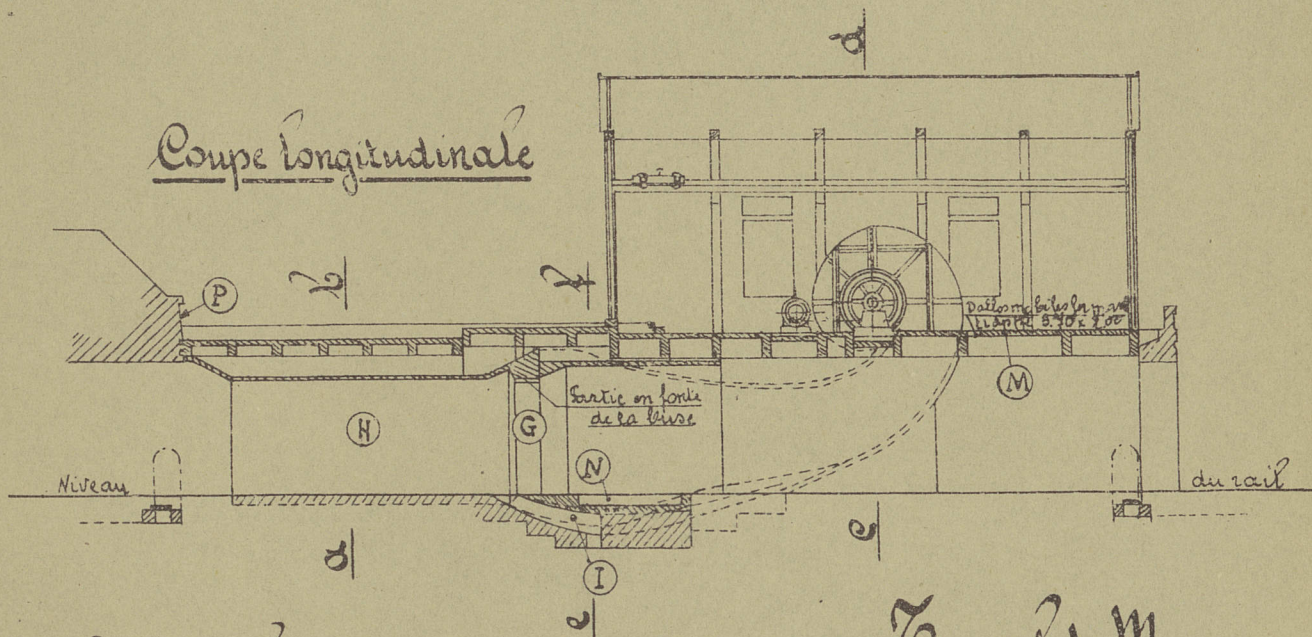
Feutre asphalté,
briques à plat et
bourrage

Feuilles de plomb
ou de tôle sous le
bourrage



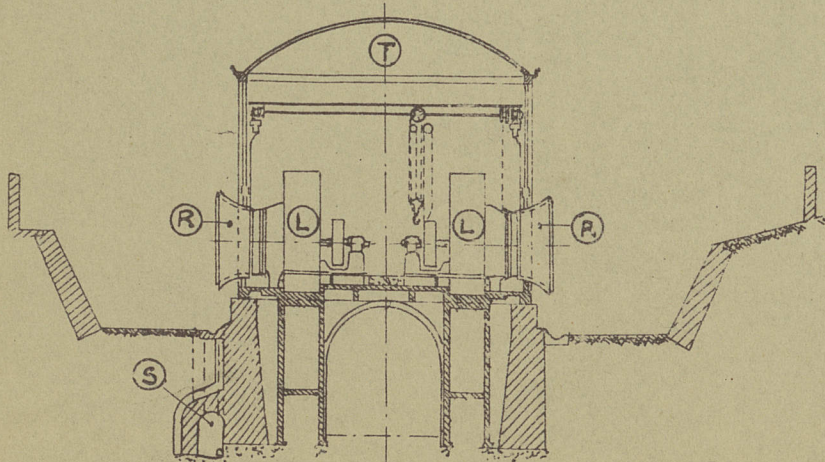


Dispositif de
tête à mur
en ailes



Tunnel de Mornay
Signe de Bourga Bellegarde
Station de ventilation
(Système Saccardo)

Coupe c.d.



Légende

G	Buse de soufflage
H	Diffuseur
I	Gaine d'amener d'air
L	Volutes des ventilateurs
M	Traverse
N	Sont métalliques
P	Anciennes portes du tunnel
Q	Portes de la ventilation
R	Portes de ventilation
S	Drainage
T	Out roulant 3 tonnes