

Part 4

**SEEPAGE RELIEF
IS NOTHING NEW**



- **The Appian Way was designed by Roman military engineers under Appius Claudius in 312 BC. It was 15.5 feet wide and was constructed using 4 layers, one of which was a layer of drain rock, sloped to either side of the right of way, to insure adequate UMR subdrainage.**

CONSTRUCTION OF A ROMAN ROAD

4. Paving slabs

The road was paved with hard-wearing stone slabs. The middle of the road was made higher than the sides so rain would drain off.

2. Foundations

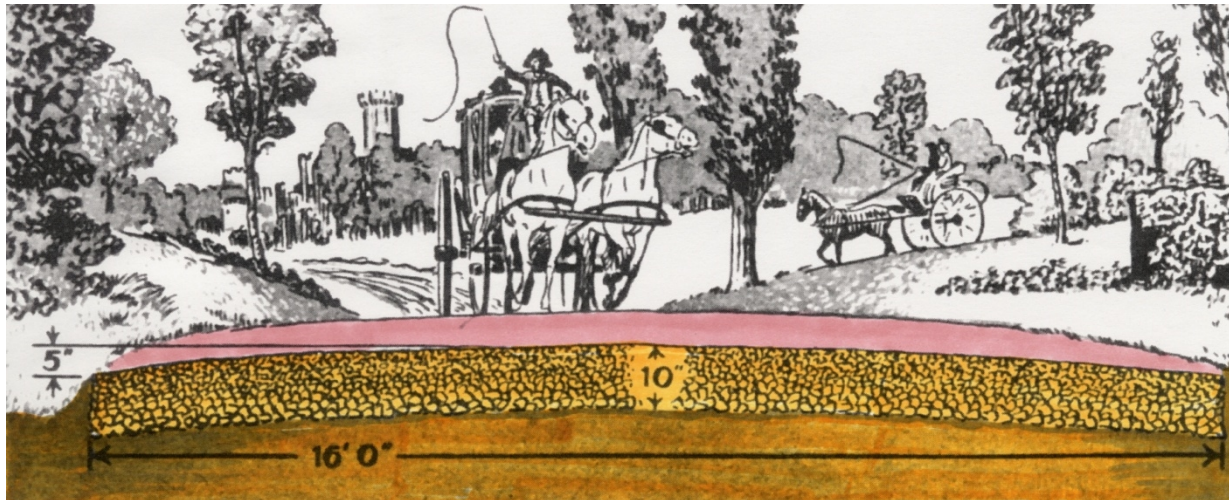
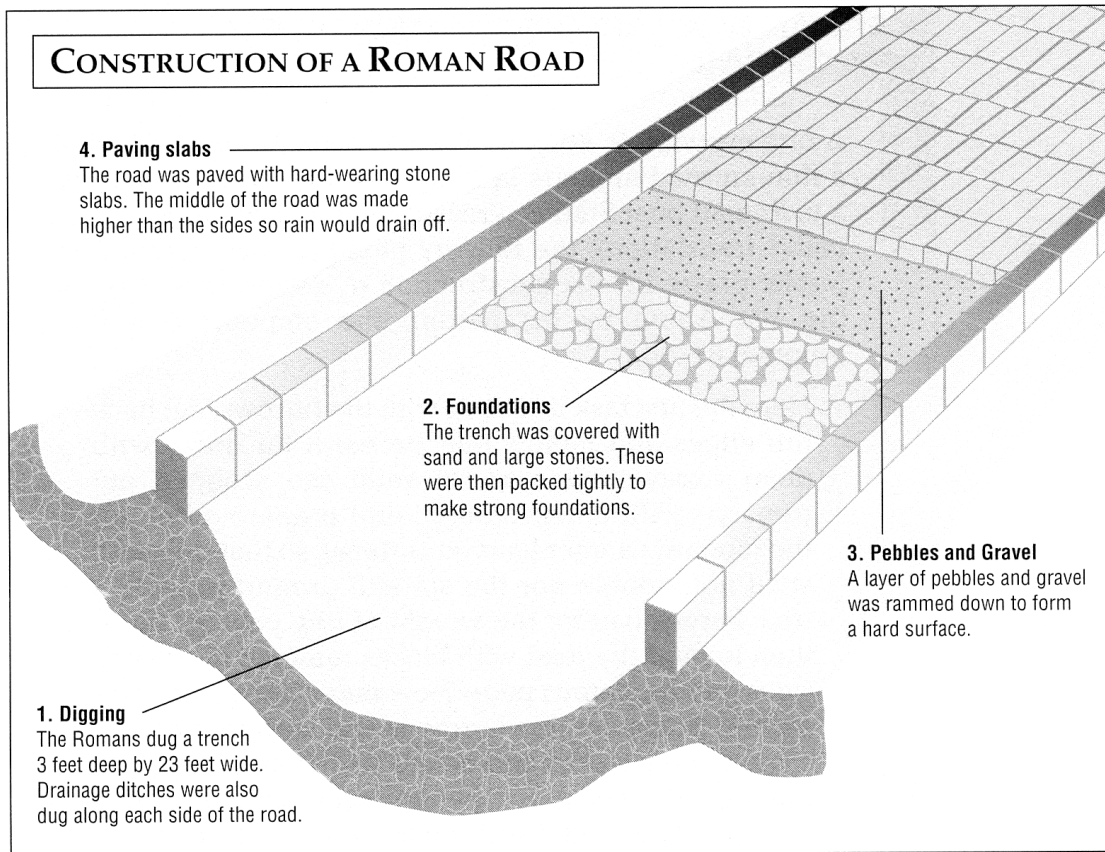
The trench was covered with sand and large stones. These were then packed tightly to make strong foundations.

3. Pebbles and Gravel

A layer of pebbles and gravel was rammed down to form a hard surface.

1. Digging

The Romans dug a trench 3 feet deep by 23 feet wide. Drainage ditches were also dug along each side of the road.





- **Laying base course of free-draining stone for a highway in Arkansas around 1910. The base course layer was usually humped to promote decanting of seepage to either shoulder**

FARM DRAINAGE.

THE
PRINCIPLES, PROCESSES, AND EFFECTS
OF
DRAINING LAND

WITH STONES, WOOD, PLOWS, AND OPEN DITCHES,
AND ESPECIALLY WITH TILES;

INCLUDING

TABLES OF RAIN-FALL,

EVAPORATION, FILTRATION, EXCAVATION, CAPACITY OF PIPES; COST AND NUMBER
TO THE ACRE, OF TILES, &C., &C.,

AND MORE THAN 100 ILLUSTRATIONS.

BY

HENRY F. FRENCH.

“READ, not to contradict and to confute, nor to believe and take for granted, but to weigh and consider.”—BACON.

“The first Farmer was the first man, and all nobility rests on the possession and use of land.”—EMERSON.

New York:

A. O. MOORE & CO.,
AGRICULTURAL BOOK PUBLISHERS, 140 FULTON STREET.
1859.

French Drains

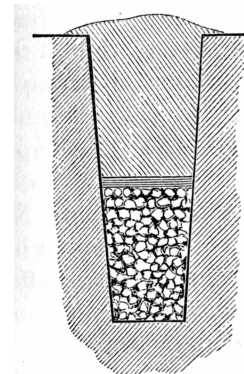


Fig. 20.

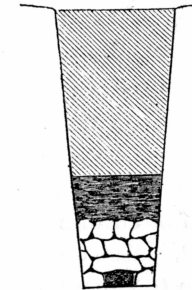


Fig. 21.

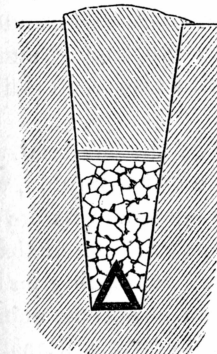


Fig. 22.

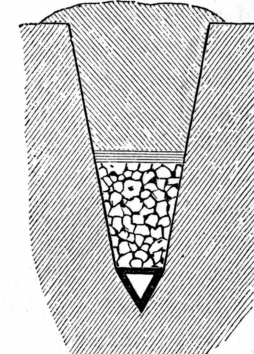
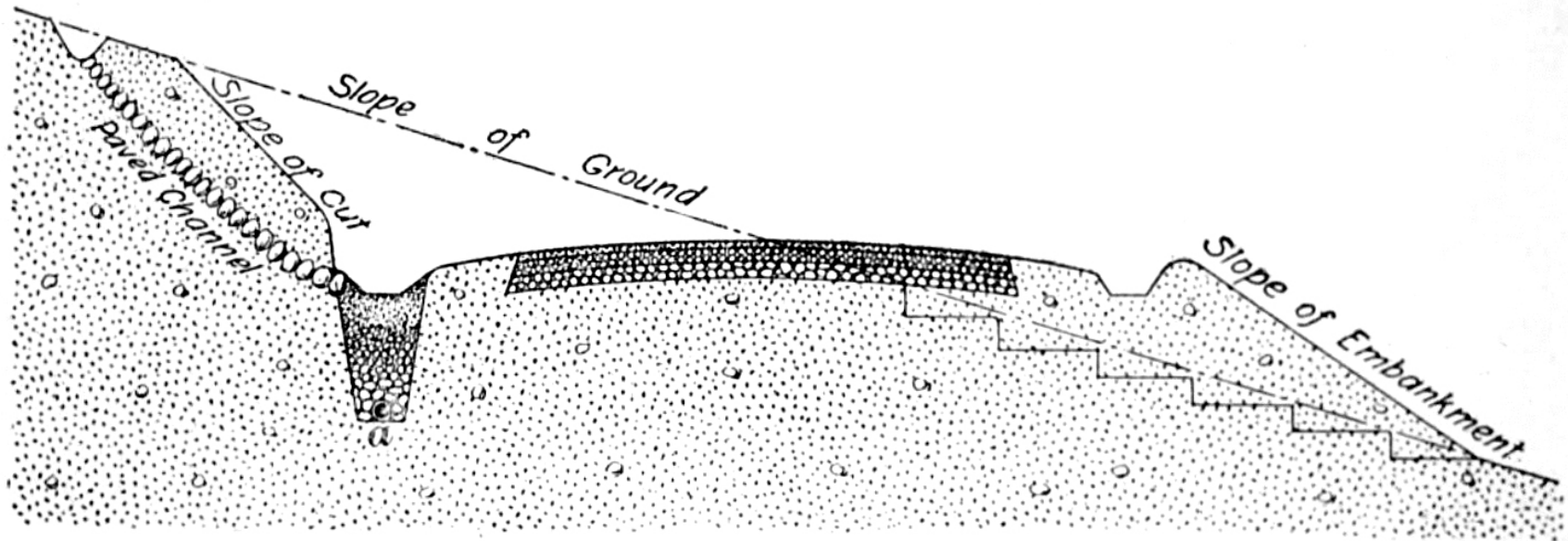


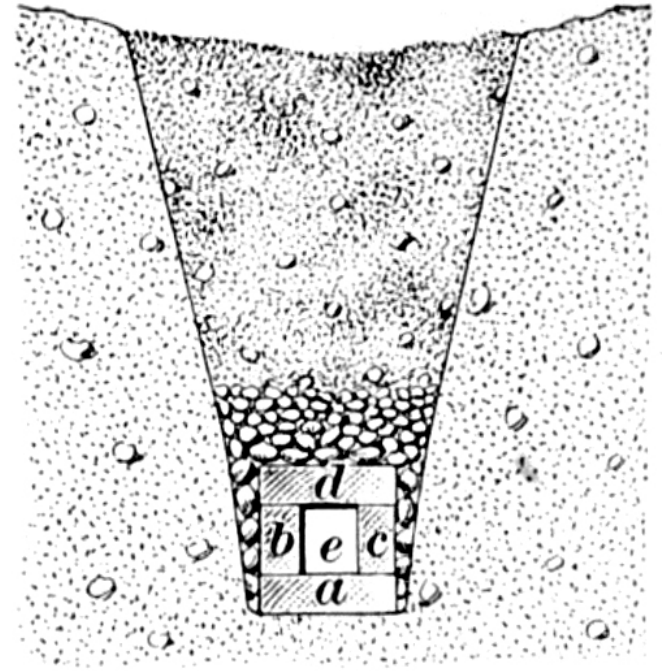
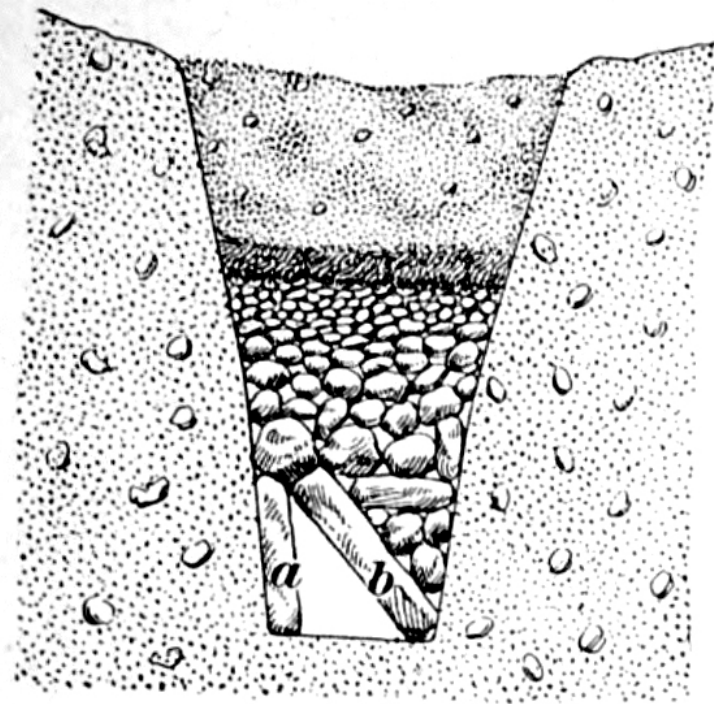
Fig. 23.

In 1859 Maine farmer **Henry F. French** published the classic text “Farm Drainage,” where he suggested subdrainage systems with inverted filters, shown at right

Typical Hillside Road Cross Section



- Designs for permanent roads varied little from Roman standards up until the 20th Century. This 1890 textbook design suggest employment of a free-draining aggregate base layer beneath the pavement and a trench subdrain along the uphill shoulder



- Design standards published prior to the 20th Century recognized the need for near-continuous subdrainage along roads. These 1890 sketches present sample designs for subdrains with inverted filters.

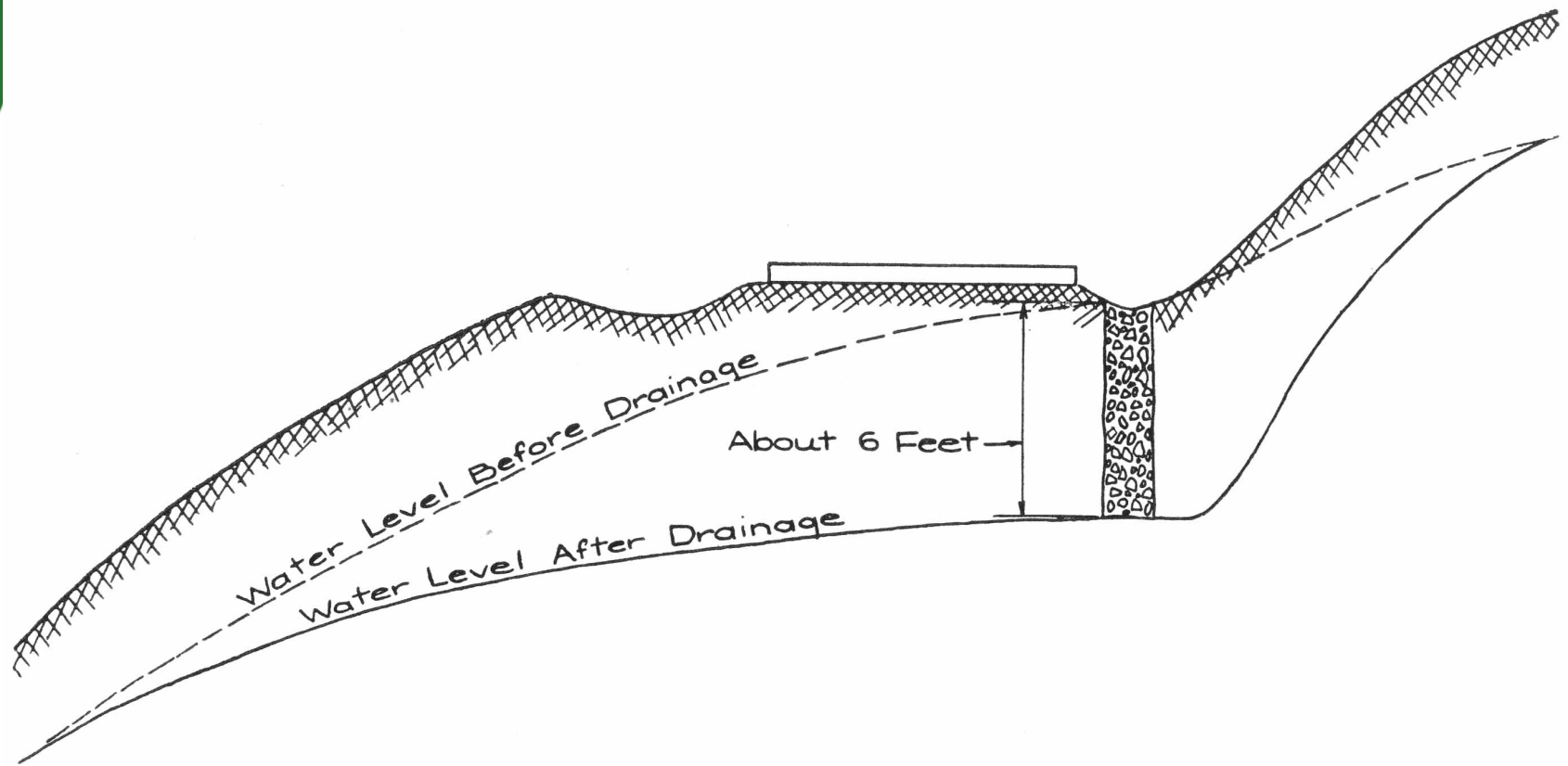


FIG. 14-25. Deep drains on upslope side of highway. (From J. O. Osterberg, *Civil Engineering*, Vol. 10, 1940)

- **In the 1940s soils engineers began realizing the value of subdrainage along highways, for both slope stability as well as enhanced bearing capacity**