



HOW TO BUILD A HOUSE OF MODERN ADOBE

PERU



MINISTERIO DE VIVIENDA Y CONSTRUCCION
OFICINA DE INVESTIGACION Y NORMALIZACION

DRAWING #1

This is a picture of the maestro de obra and one of his helpers.

Q. What is the maestro doing?

A. He is painting a caña.

Q. What is he painting it with?

A. With aceite quemado.

Q. What is the ayudante doing?

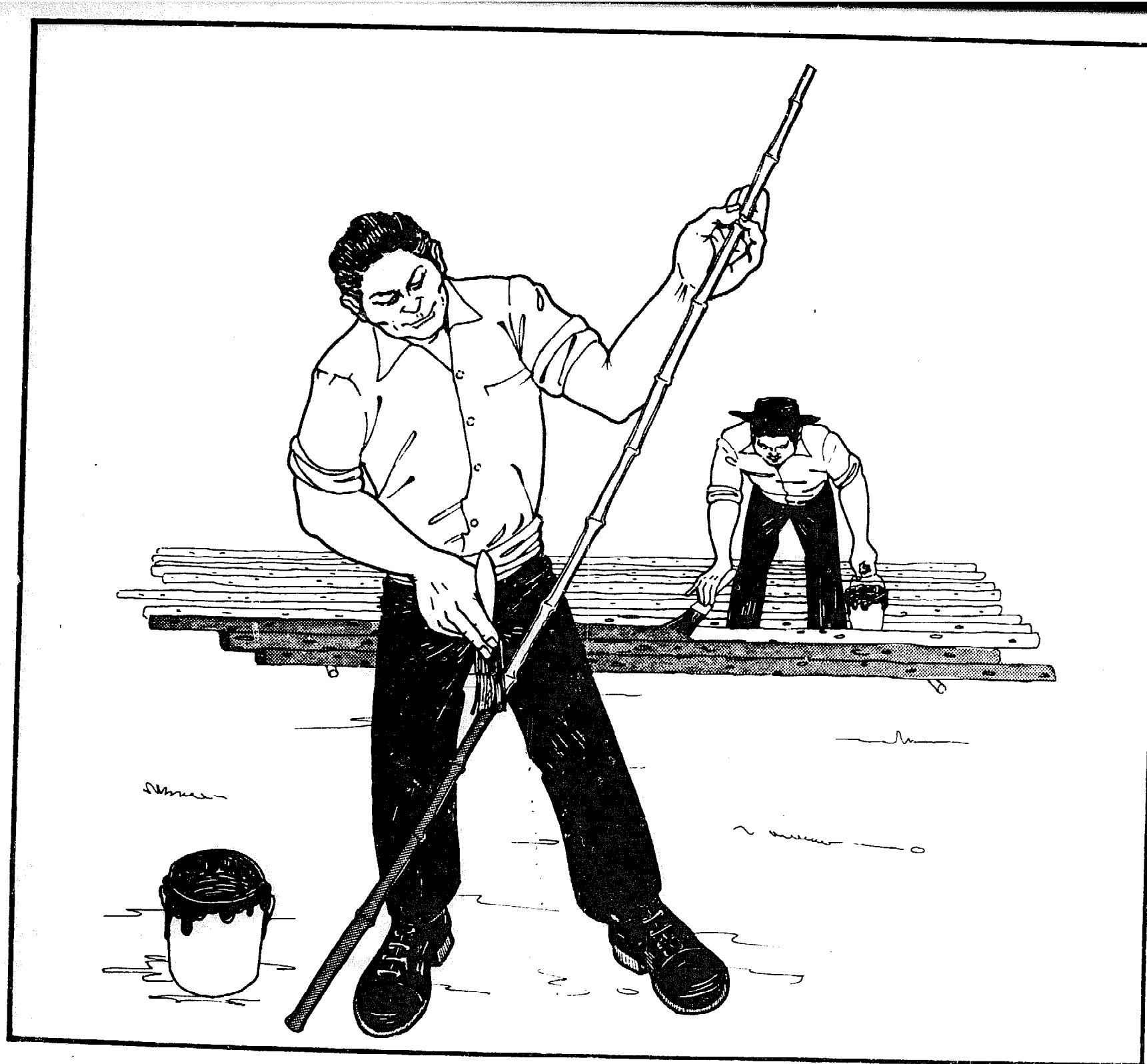
A. He is painting wood.

Q. What is he painting it with?

A. Aceite quemado also.

Q. With what other materials can they paint caña and wood?

A. With creosota or penta.

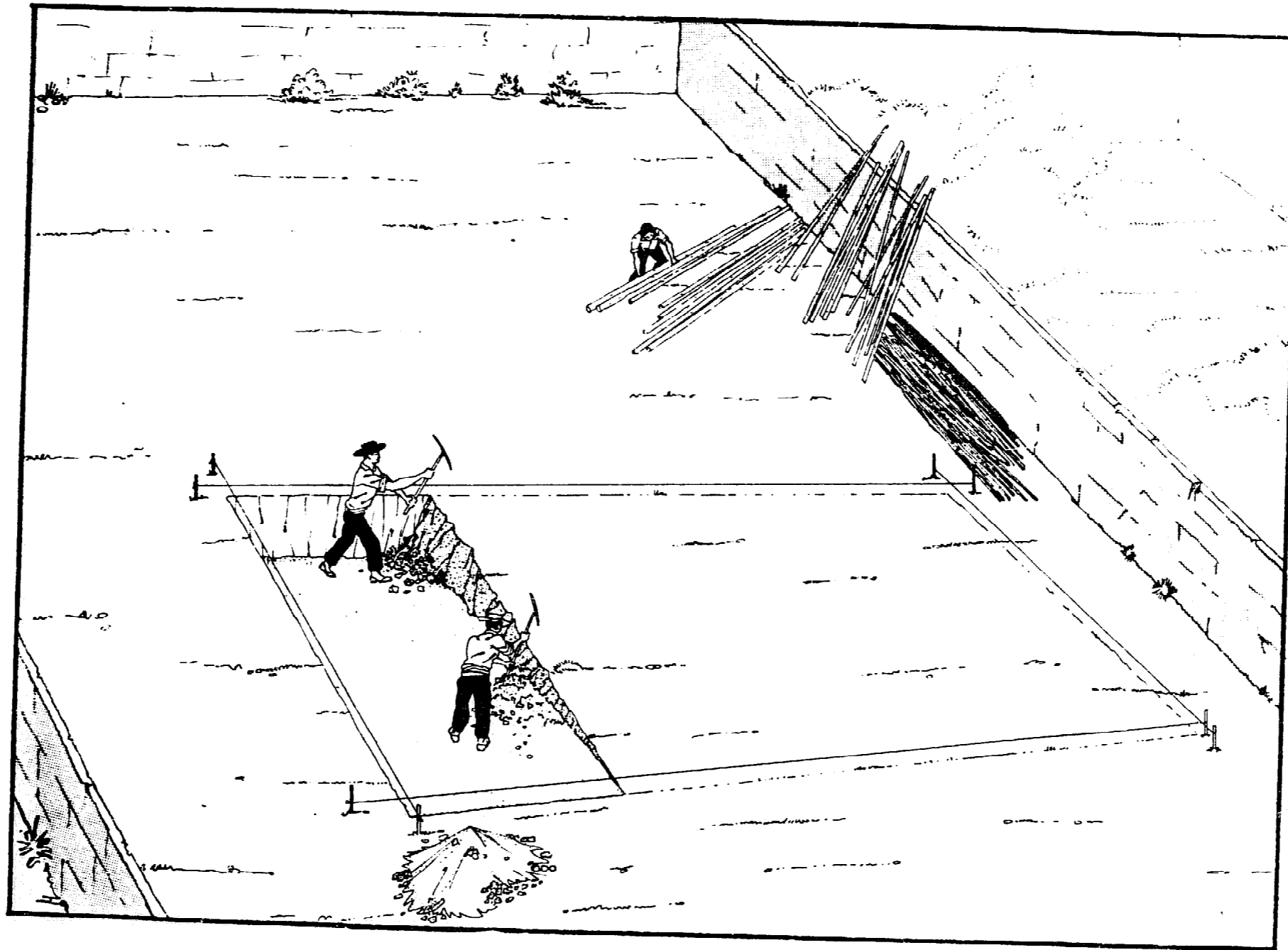


DRAWING #2

This is a picture of two of the maestro's helpers.

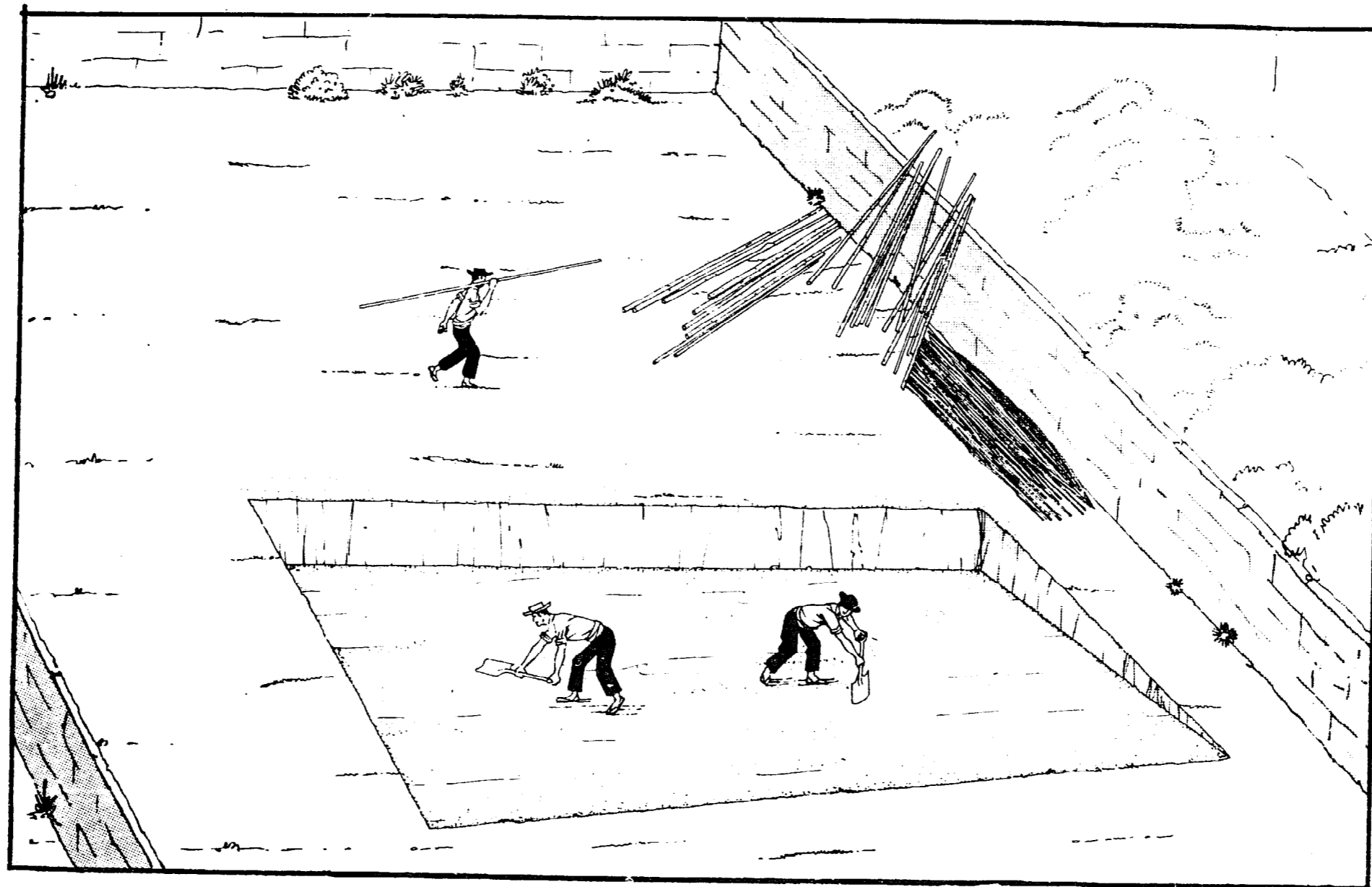
Q. What are they doing?

A. They are digging a platform so the house can be built on a level site.



DRAWING #3

These are the maestro's same two helpers. They have dug the platform and are leveling the land.



DRAWING #4

The maestro and his helpers are laying out the lines where the house will be built.

Q. What is the maestro doing?

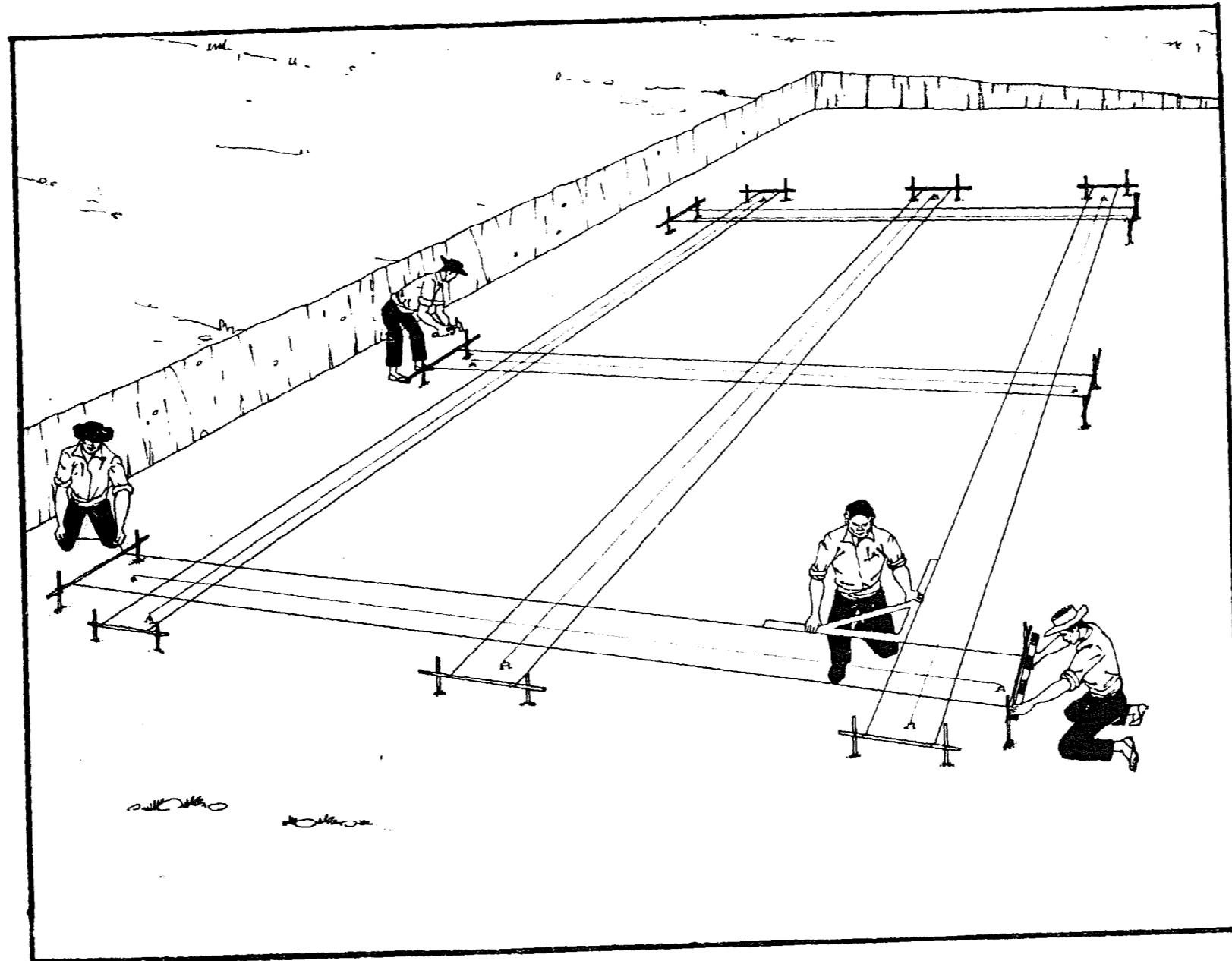
A. He is using a square to check and make sure the lines are at a 90° angle.

Q. Why is this important?

A. Because if the corners of a house are not square, they will be weak, especially in earthquakes.

Q. Does everyone know how to demarcate a house using this process?

Note to Instructor: If any of the students do not understand, you should demonstrate how to do it. The process is explained in the booklet, Improving Building Skills.



DRAWING #5

In this picture, the men are digging the holes (zanjas) for the foundation (cimiento).

Q. What is the helper doing?

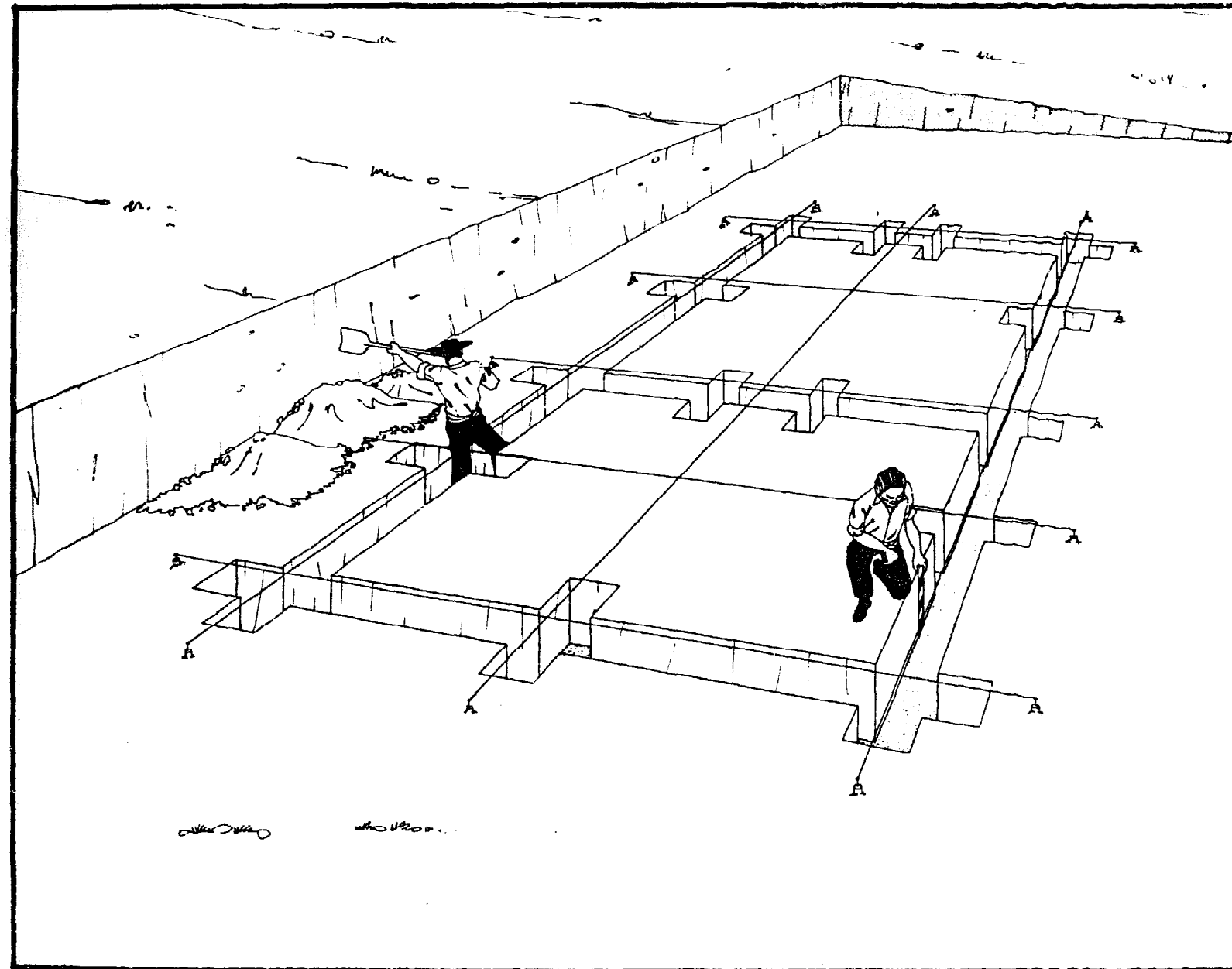
A. He is digging the hole.

Q. What is the maestro doing?

A. He is checking the depth of the hole.

Q. How deep should the hole be?

A. It should be 50 cms. deep.



DRAWING #6

In this picture, the men are laying the foundation for a house made with Modern Adobe.

Q. What is the man in the white hat doing?

A. He is laying large stones to make the foundation.

Q. What is the helper on the right doing?

A. He is placing a rod (caña) which will be used later for reinforcing the adobes.

Q. How does he know where to put the rod?

A. He is using a line of string for a reference.

Q. How did the maestro know where to place this string?

A. He put it in the middle of the two strings that he used to mark the foundation.

Q. What is the helper on the left doing?

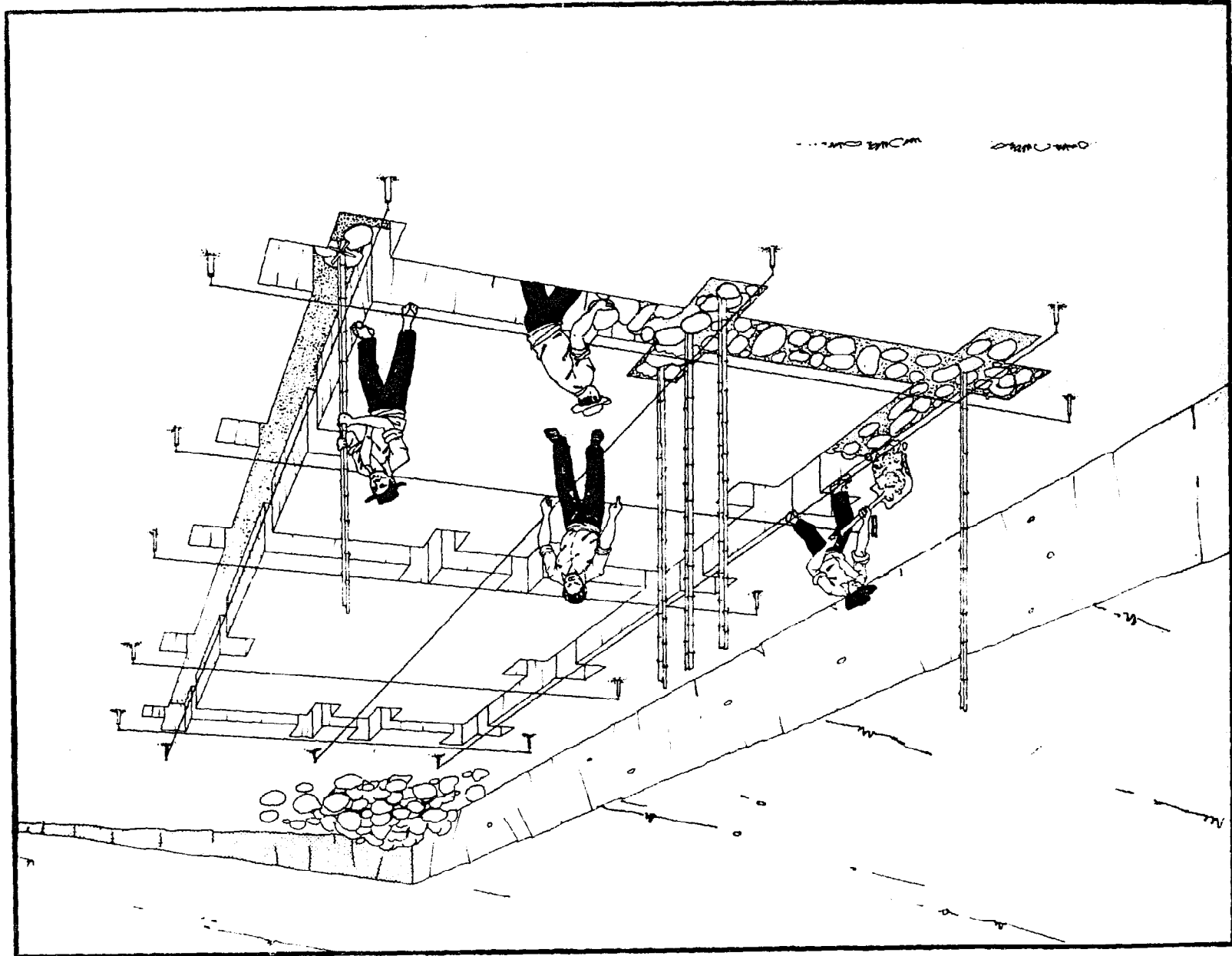
A. He is putting mortar on the foundation.

Q. What is the best type of mortar to use for a foundation?

A. Mud mixed with lime.

Q. Why is this the best?

A. Because lime helps the mortar to resist water.



DRAWING #7

In this picture, the men are making the sobre cimienta (moisture barrier).

Q. What is the man in the white hat doing?

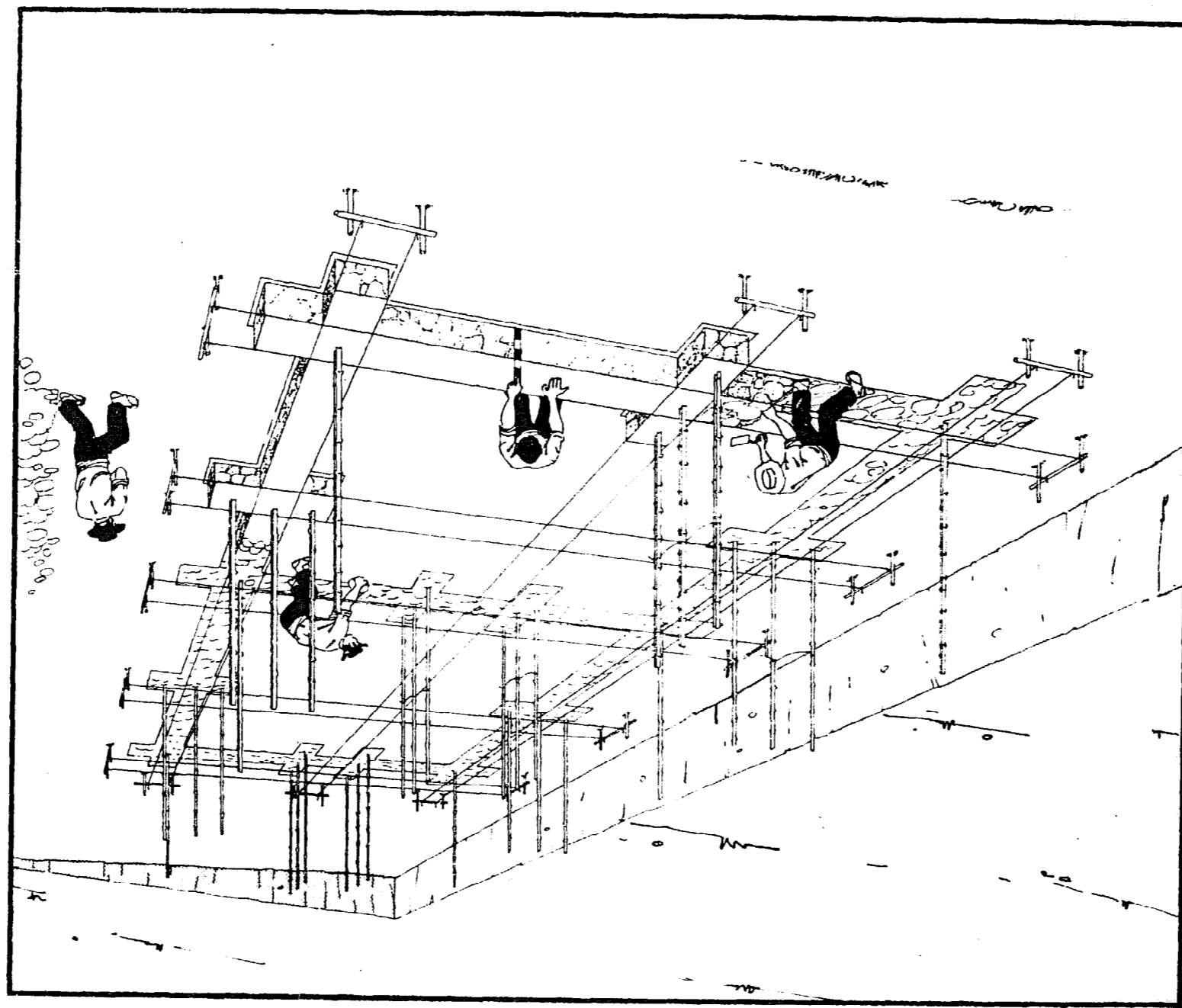
A. He is making the sobre cimienta.

Q. What is the maestro doing?

A. He is checking the height of the sobre cimienta.

Q. How high above the ground should the sobre cimienta be?

A. 50 cms.



DRAWING #8

The men are laying the adobes.

Q. What is the man in the white hat doing?

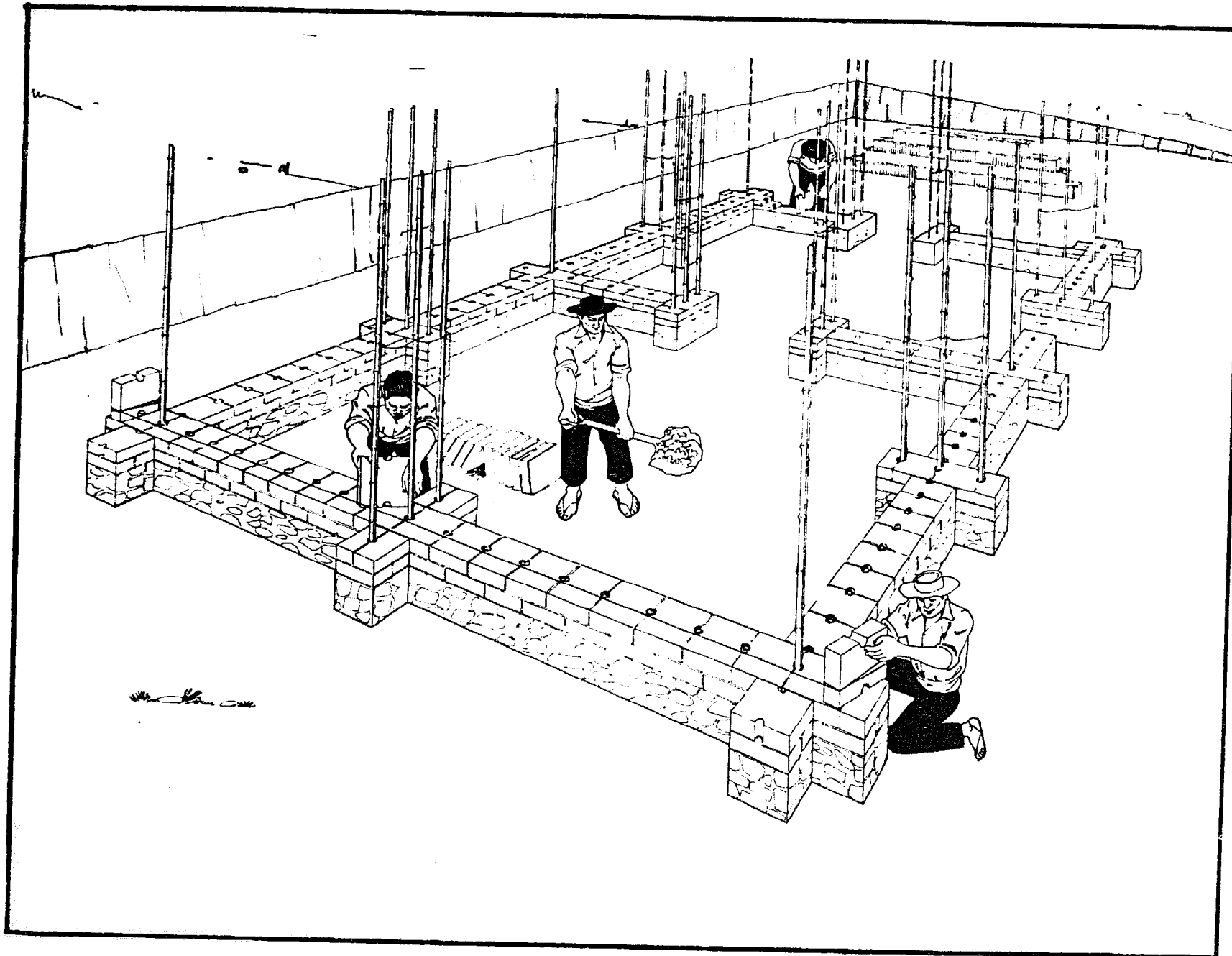
A. He is tying string to an adobe. This will help to guide the placement of the adobes and help to keep each layer of adobes level.

Q. Does everyone know how to use this method?

Note to Instructor: If anyone does not understand, you should demonstrate how to do it. The correct process is explained in the booklet, Improving Building Skills.

Q. What is the maestro doing?

A. He is making the mocheta (pilaster).



DRAWING #9

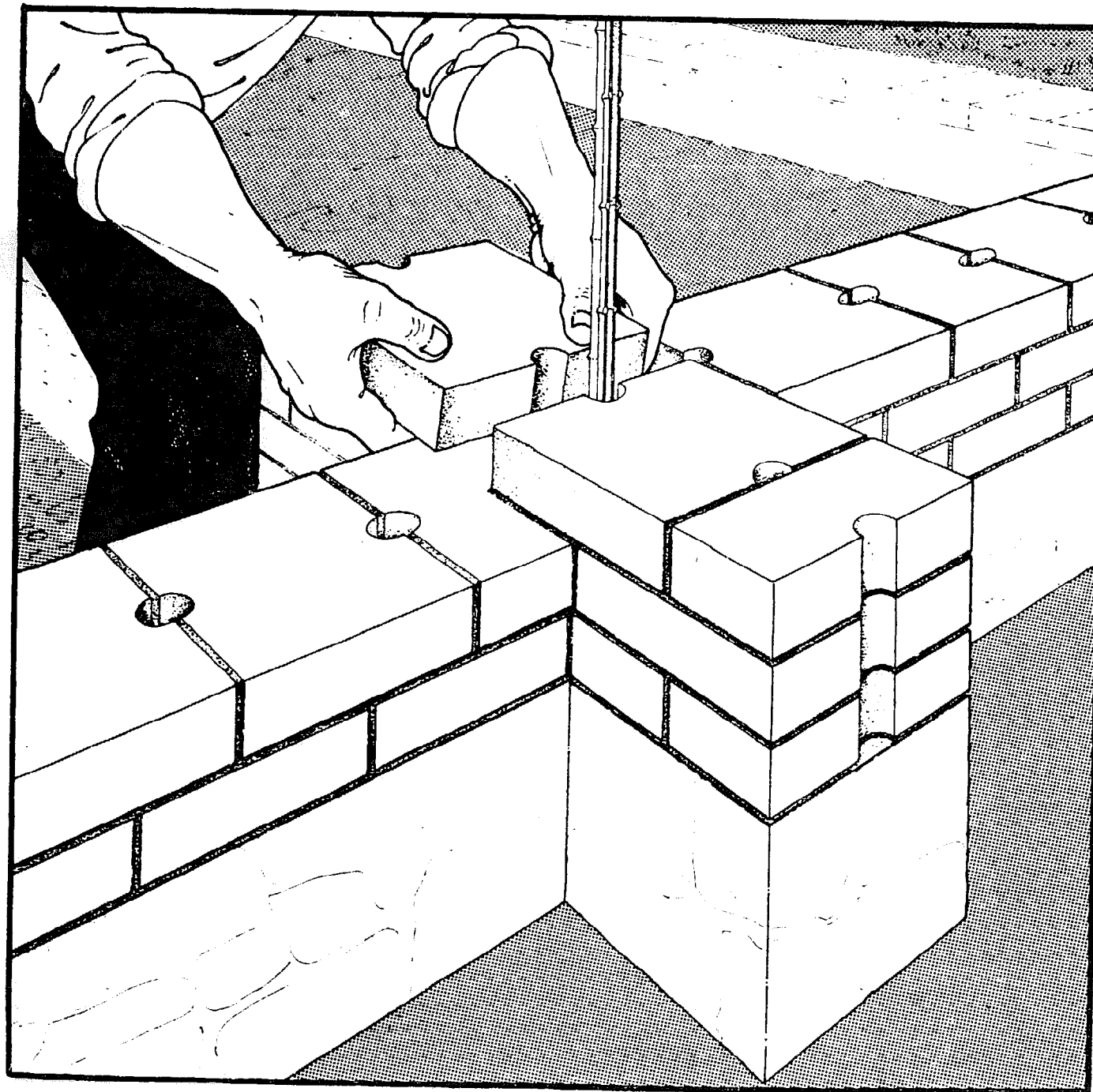
This is a drawing of how to make a mocheta (pilaster).

Q. What two things are different from the usual way of laying these adobes?

- A. 1) A half-adobe has been used to start the mocheta.
2) The large adobes have been turned so that the notches are facing the caña.

Q. Does everyone understand this?

Note to Instructor: To make sure that everyone understands, demonstrate this to the class.



DRAWING #10

The men are putting horizontal reinforcing between the adobes.

Q. What materials are the men using for horizontal reinforcement?

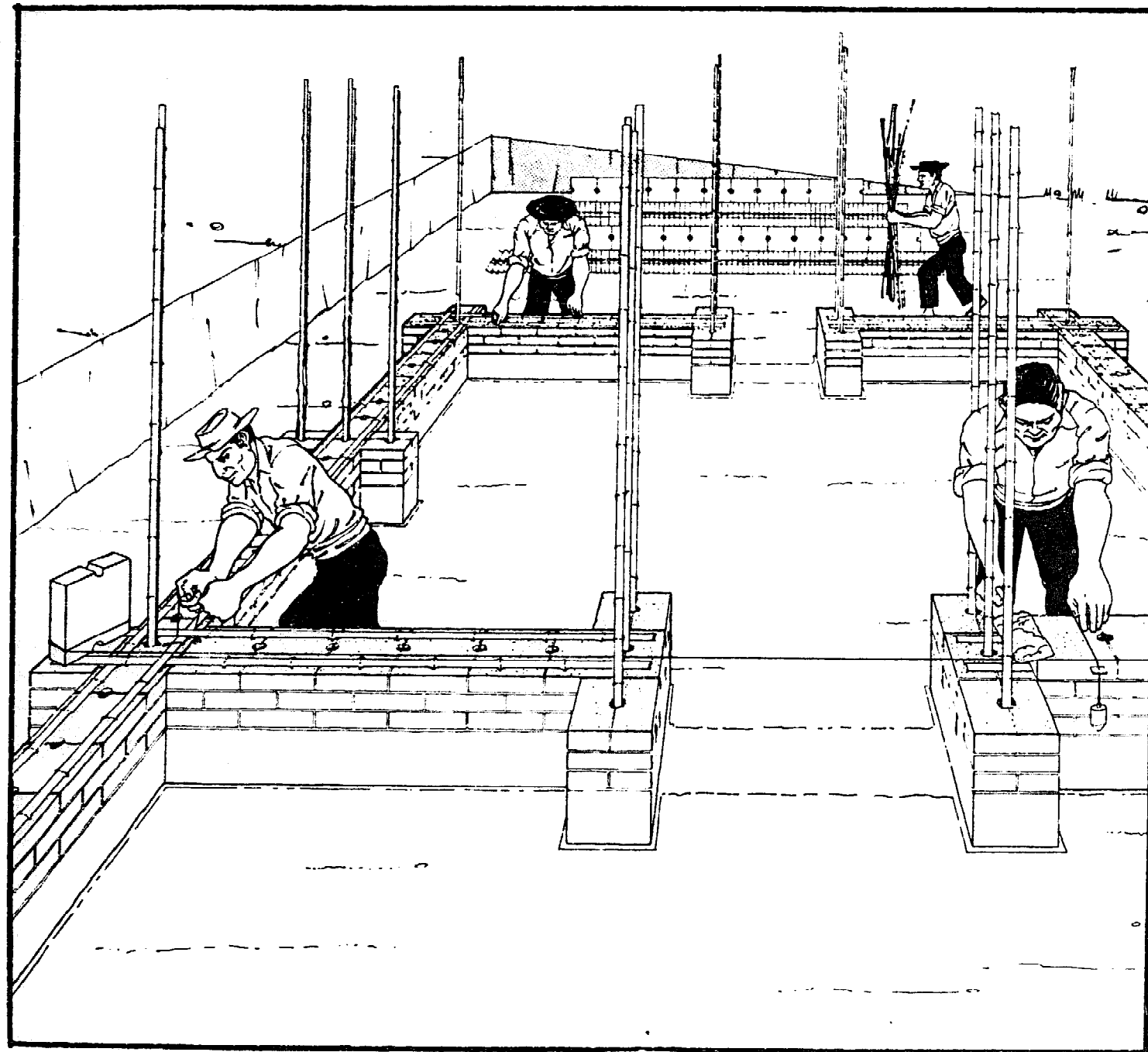
A. They are using cane.

Q. What other materials could be used?

A. Bamboo, iron.

Q. At what level do the men put the cane?

A. On the third level.



DRAWING #11

In this picture, the maestro is putting the next layer of adobe over the cane reinforcing. He has checked the position of each adobe to make sure it is level.

Q. Why is it necessary to make sure the adobes over the cane are level?

A. Because each cane is not exactly straight. An uneven level could be laid without checking properly.

Q. How does the maestro check to make sure it is level?

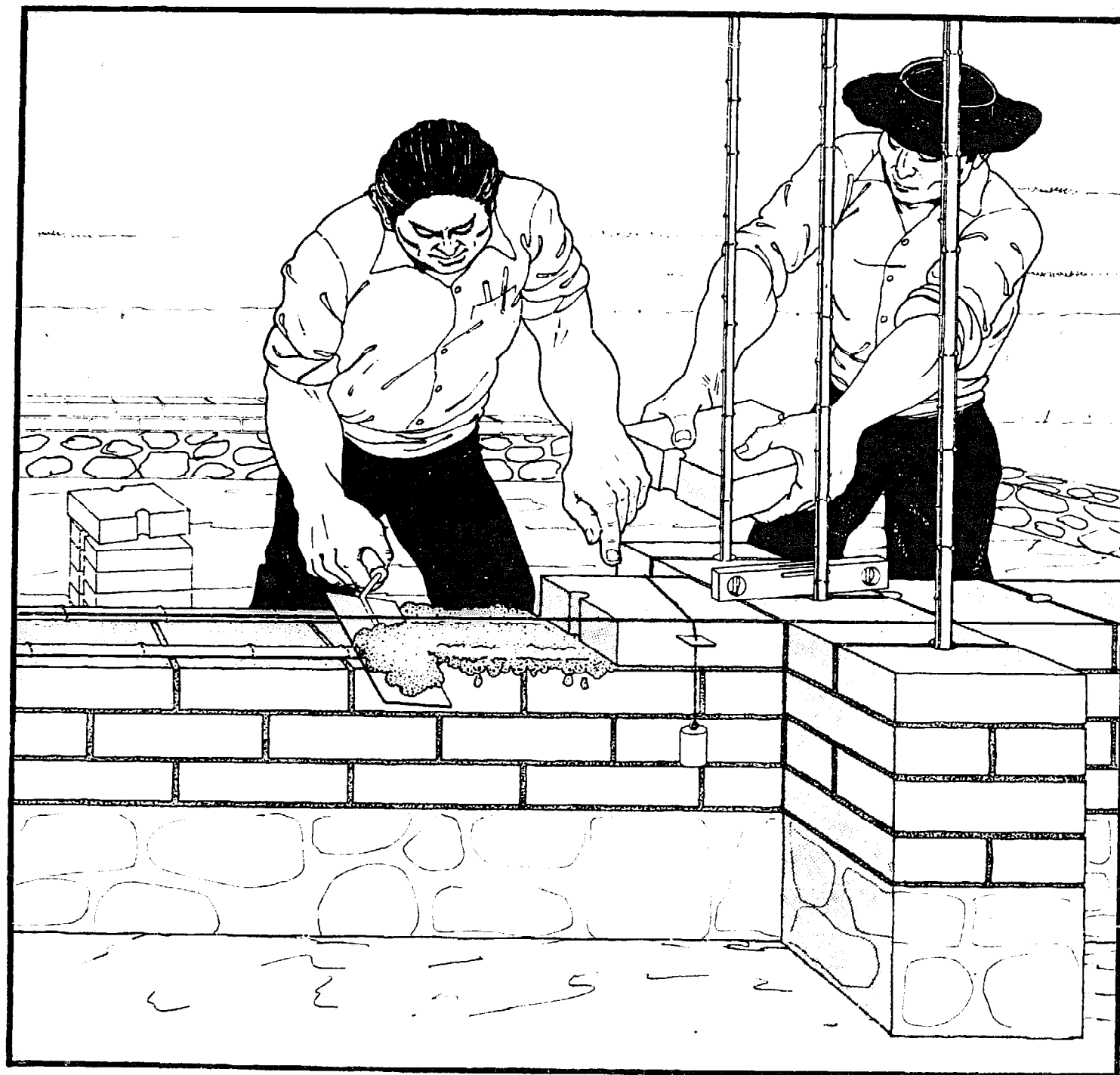
A. He uses a plumb and a level.

Q. Does everyone know how to use these?

Note to Instructor: If anyone does not understand how to use a plumb and a level, demonstrate their use to the class. The correct procedure for each is shown in the booklet, Improving Building Skills.

Q. After the first layer of adobe has been laid over the canes, how long should you wait before laying another layer?

A. One day.



DRAWING #12

In this drawing, the wall is almost completed and only three or four more layers of adobe are needed. The maestro and his helper are tying wire to one of the canes used as vertical reinforcement. As the last layers of adobe are put on the wall, the free end of the wire will pass up through the hole with the cane. After the last level of adobe has been laid, the wire will be used to attach the collar beam (viga collar).

Q. What size wire is best to use?

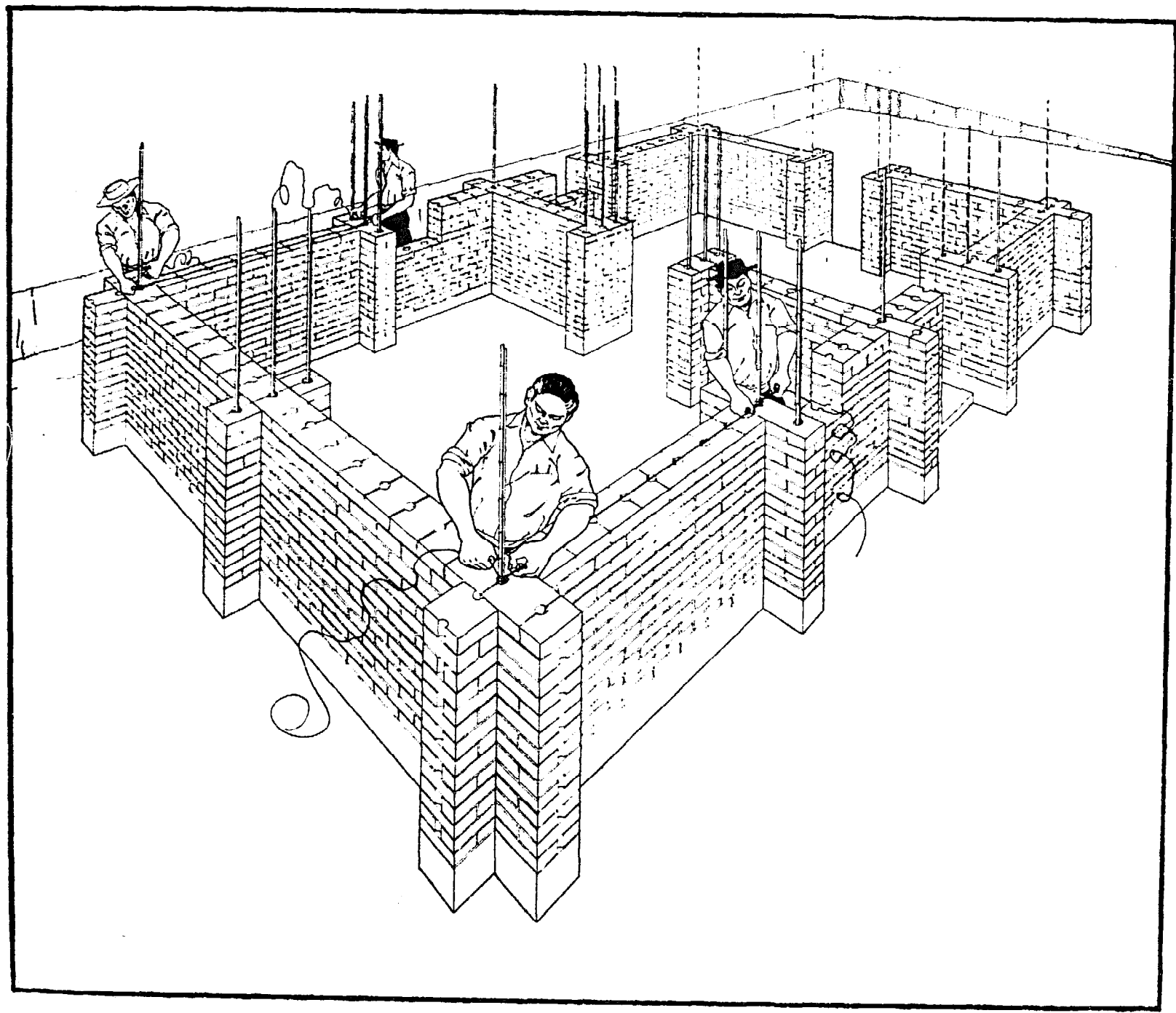
A. No. 12 construction wire.

Q. Can other sizes be used?

A. Yes, but no smaller than No. 16 construction wire.

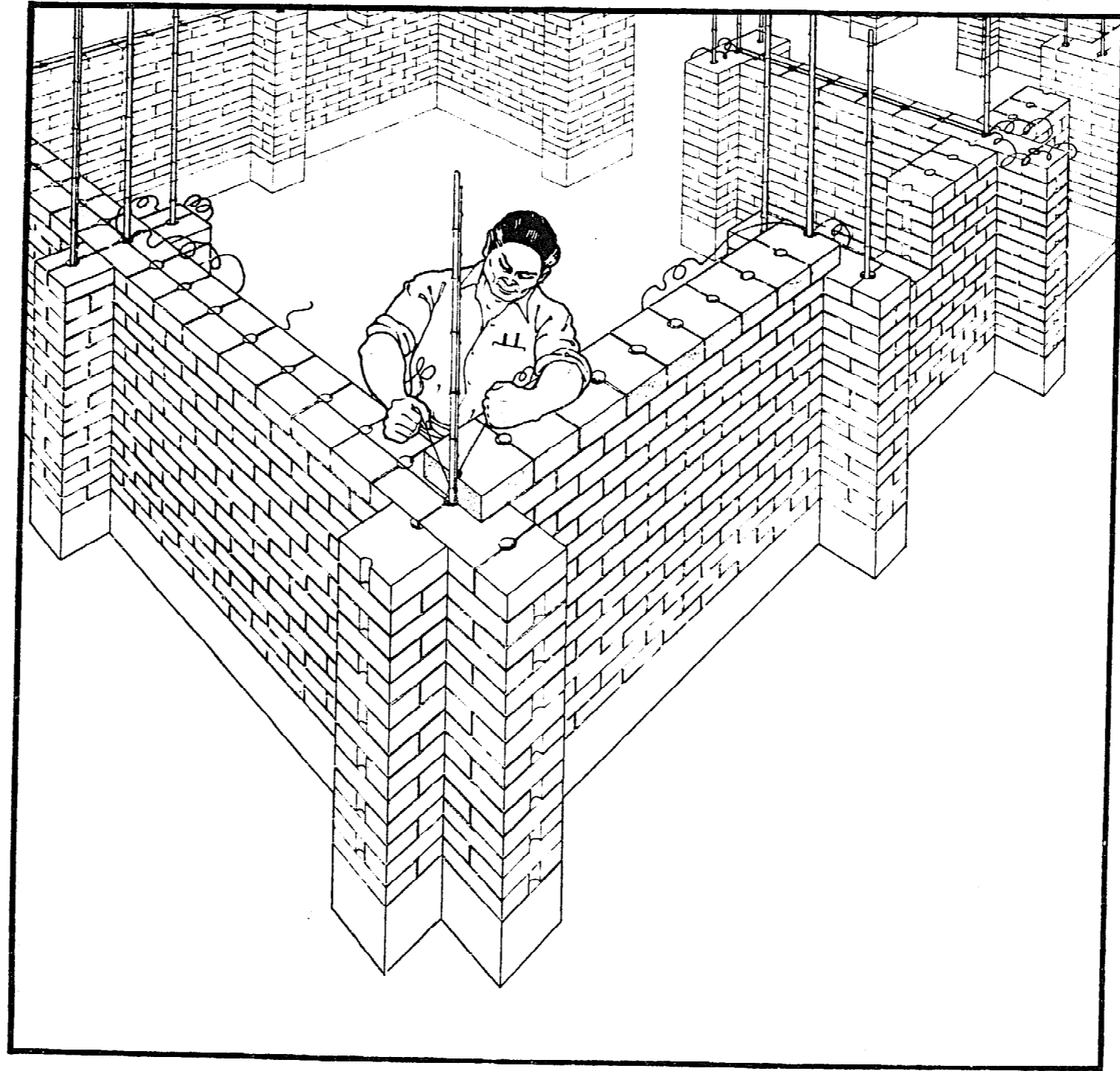
Q. Does it have to be construction wire?

A. Yes. Other types of wire are not sufficiently treated to resist moisture and corrosion.



DRAWING #13

In this drawing, the maestro has put a layer of adobe over one of the wires and is pulling the end up along the rod.



DRAWING #14

In this drawing, the men are preparing the wood for the collar beam (viga collar).

Q. What types of joints are the men in the black hats cutting?

A. These are espigas (or rebajos).

Q. What are they used for?

A. To make joints in the corner.

Q. What type of joints have been cut by the man in the white hat?

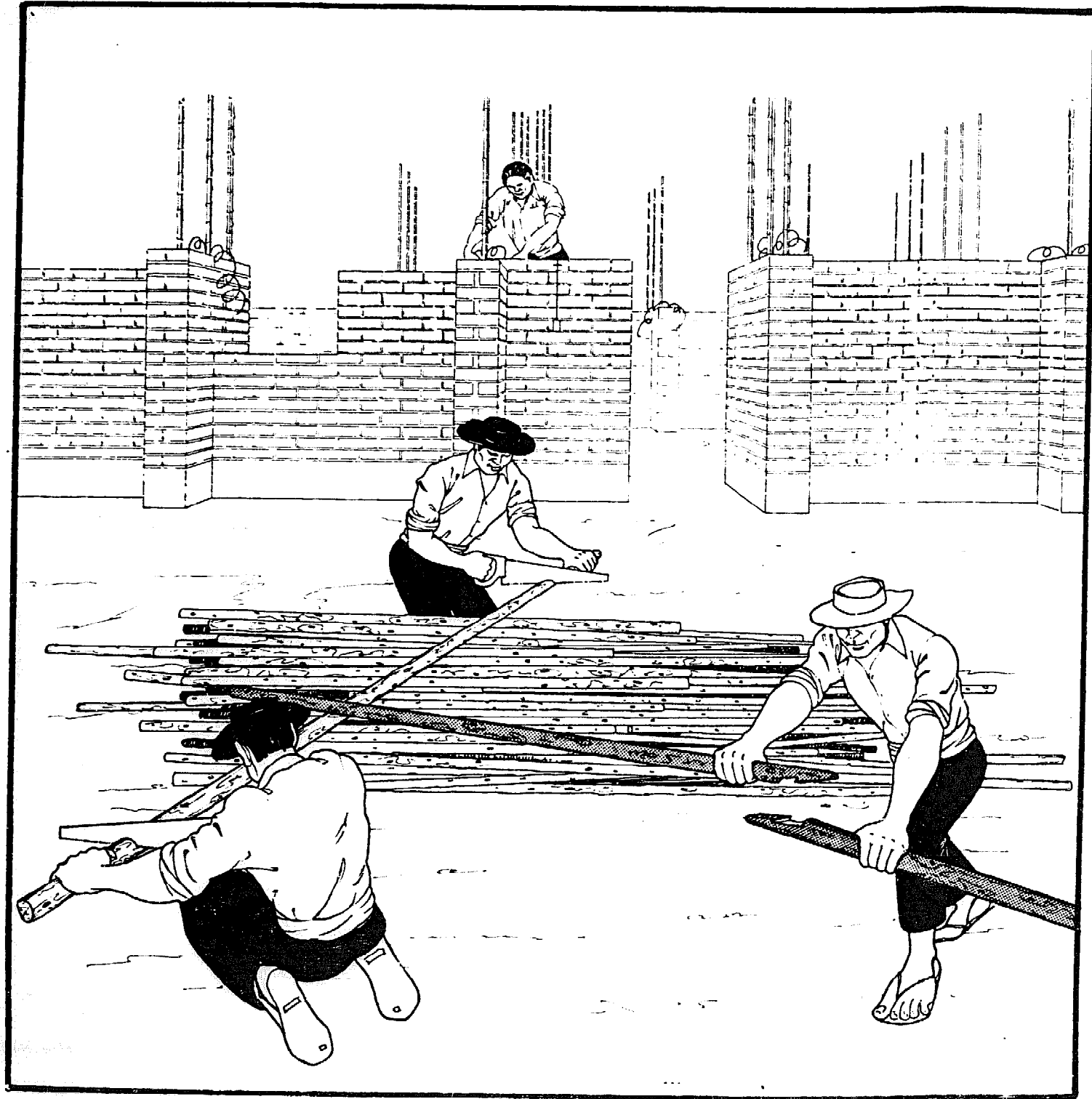
A. He has made a cadena.

Q. What is the cadena used for?

A. For splicing two pieces of wood.

Q. Does everyone understand how to make a cadena?

Note to Instructor: This is a new type of joint. Demonstrate to the class how to make this joint. This and other joints are described in the booklet, Improving Building Skills. In the class, use a model of this joint to show the class how strong this joint is.

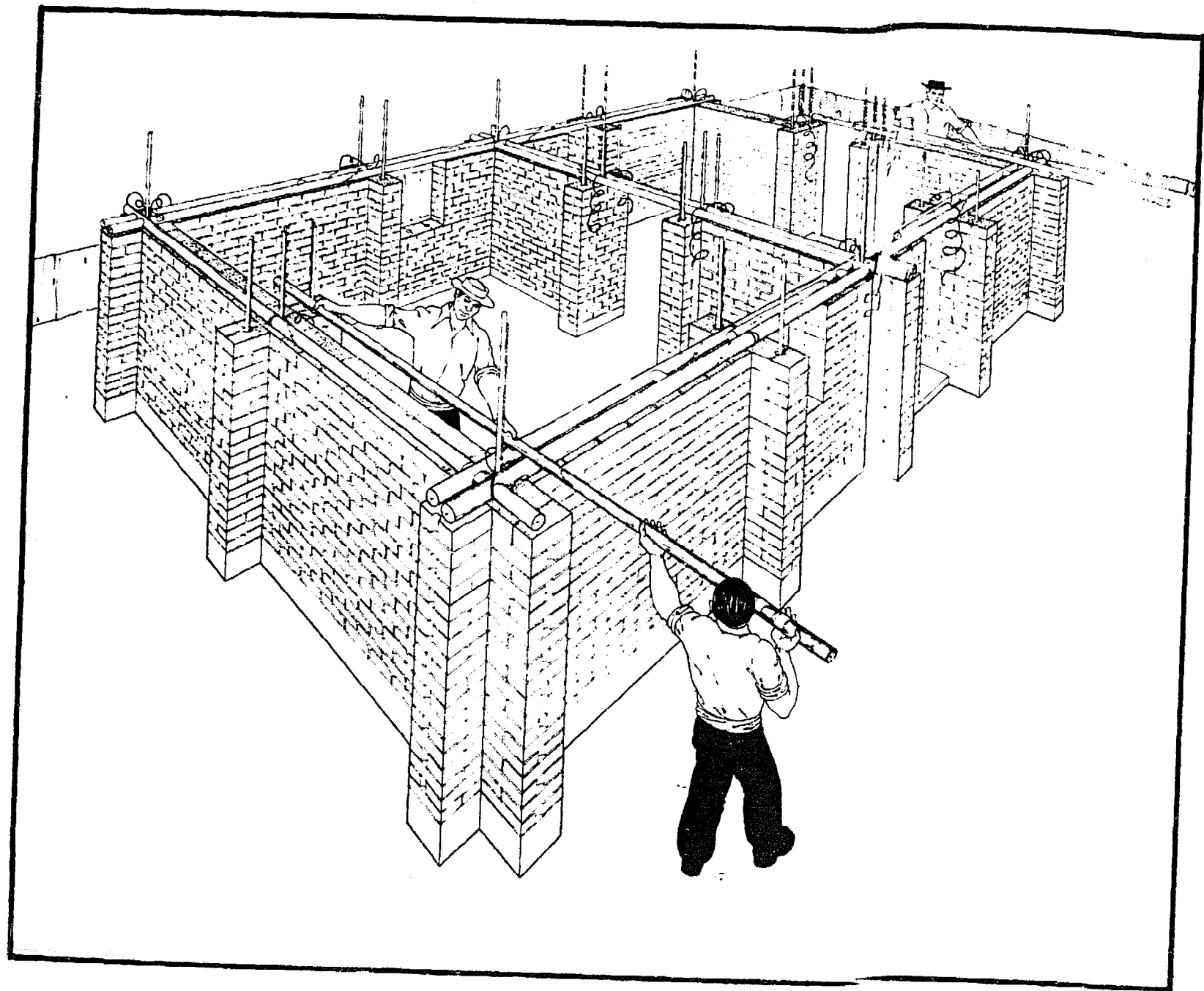


DRAWING #15

In this drawing, the men are placing the collar beam on the wall.

Q. What are the three purposes of the collar beam?

- A. 1) To tie the walls together at the top.
2) To help distribute the weight of the roof.
3) To help prevent the house from twisting in an earthquake.

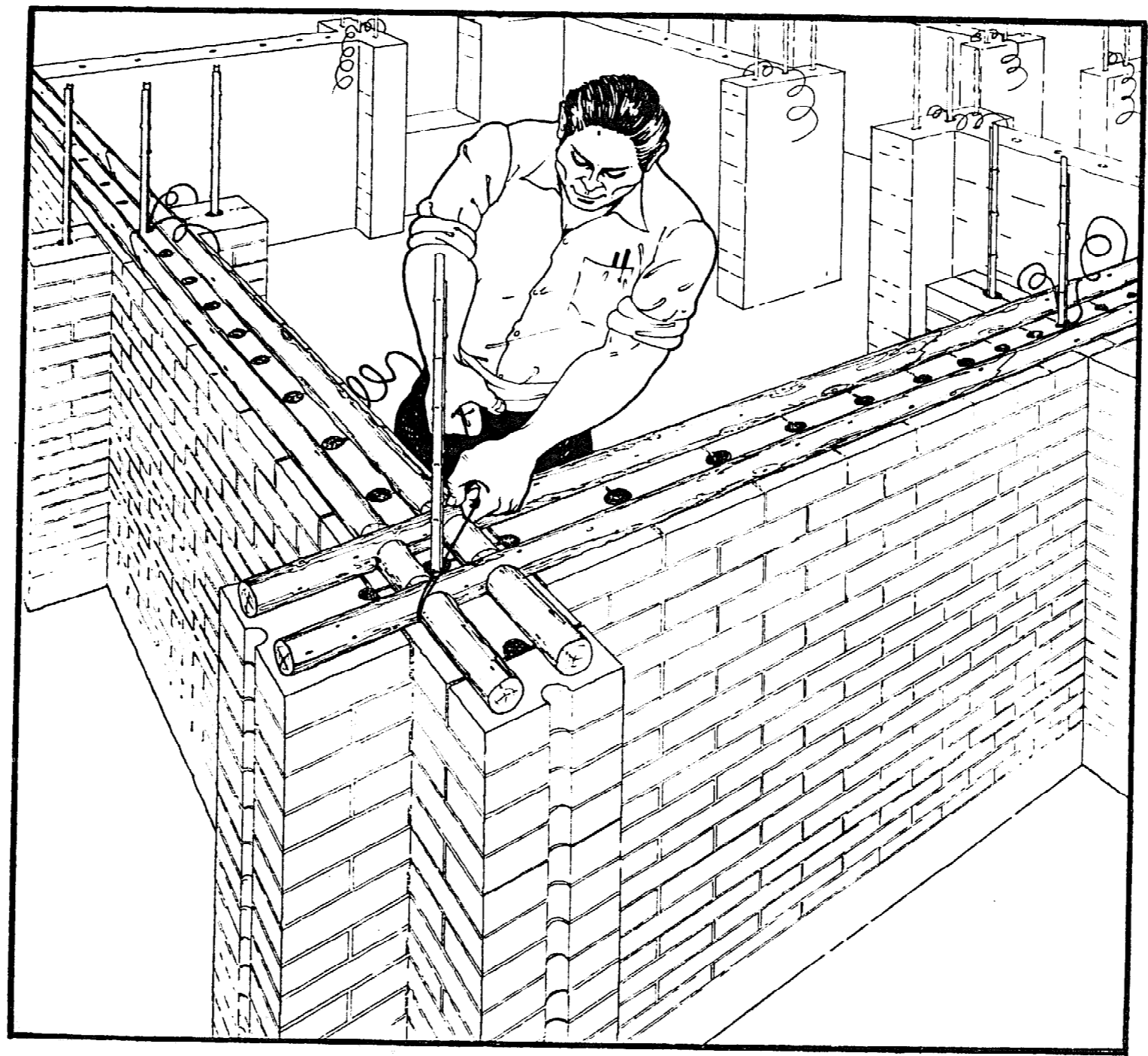


DRAWING #16

In this drawing, the maestro is tying the collar beam down to the wall.

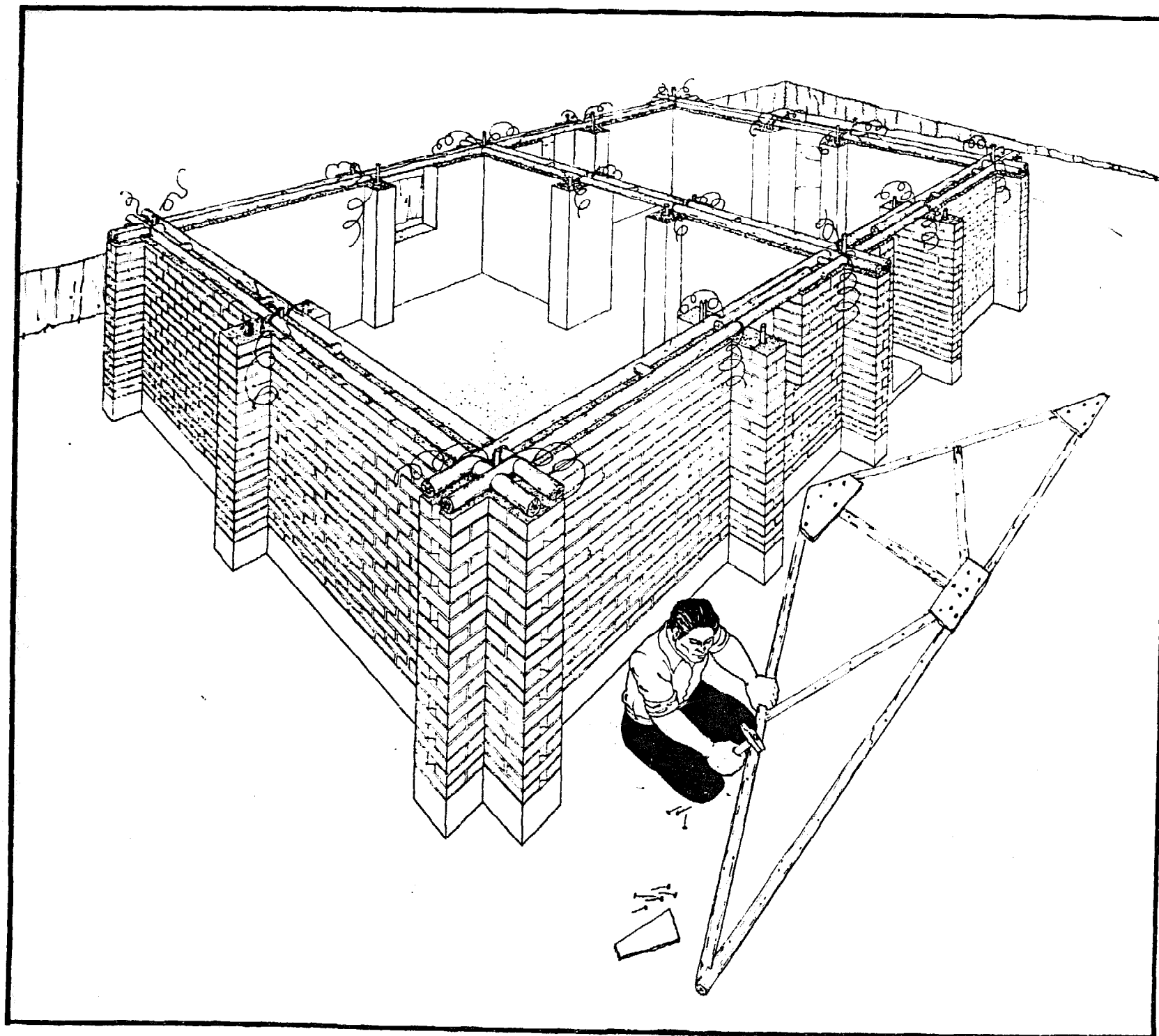
Q. What is he using to tie the collar beam to the wall?

A. The wire that he tied to the cane earlier and which came up through the adobe beside this rod.



DRAWING #17

In this drawing, the maestro is making a truss for the roof.



DRAWING #18

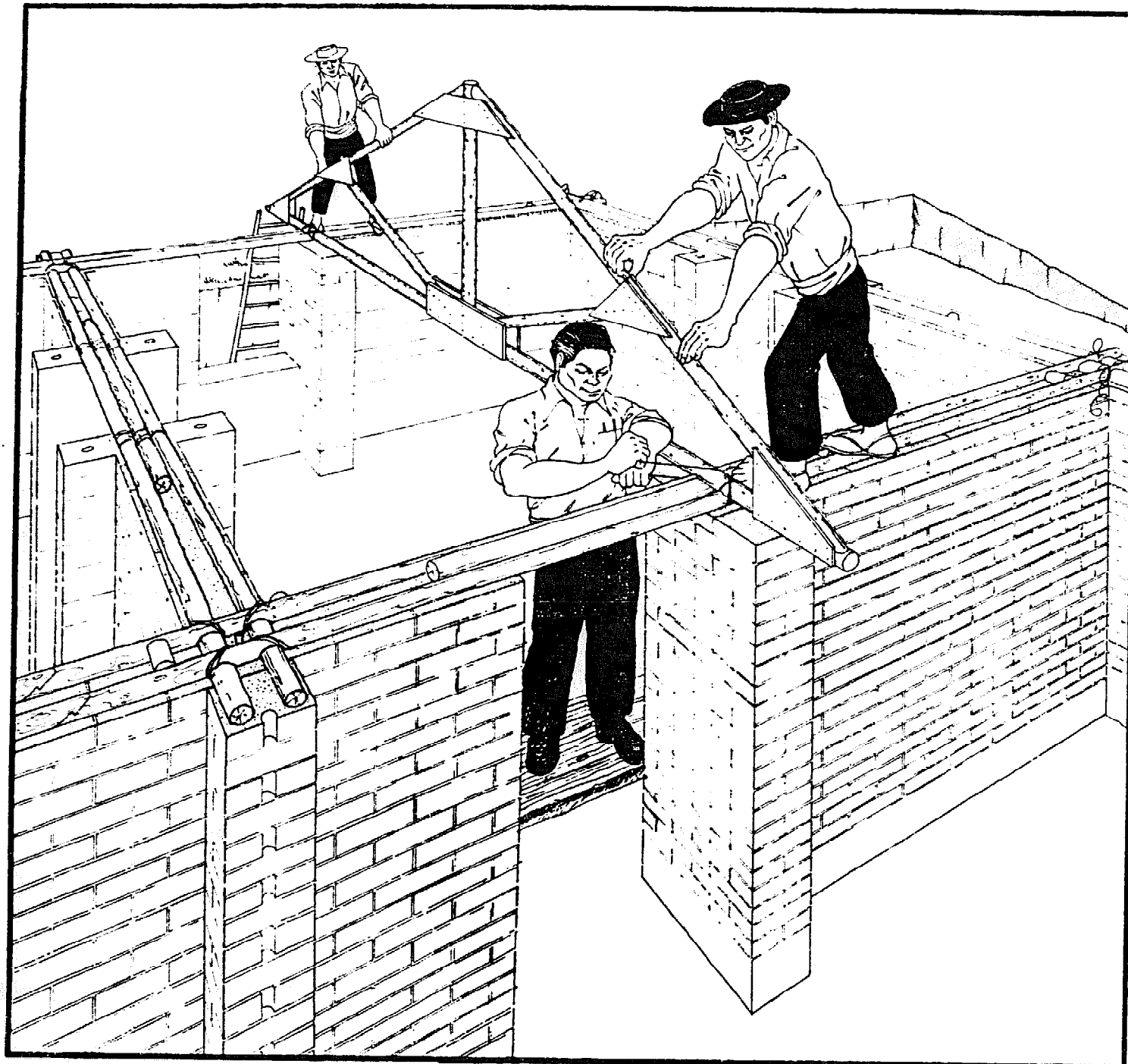
In this drawing, the men are fastening the truss to the collar beam.

Q. Should the maestro cut a joint in the collar beam to help hold the truss?

A. No. It will weaken the collar beam.

Q. Should the maestro cut a joint in the truss to help hold the truss in place?

A. Yes, but no more than 1/3 of the way into the wood.



DRAWING #19

In this drawing, the trusses have been placed on top of the wall.

Q. What is the maestro pointing at?

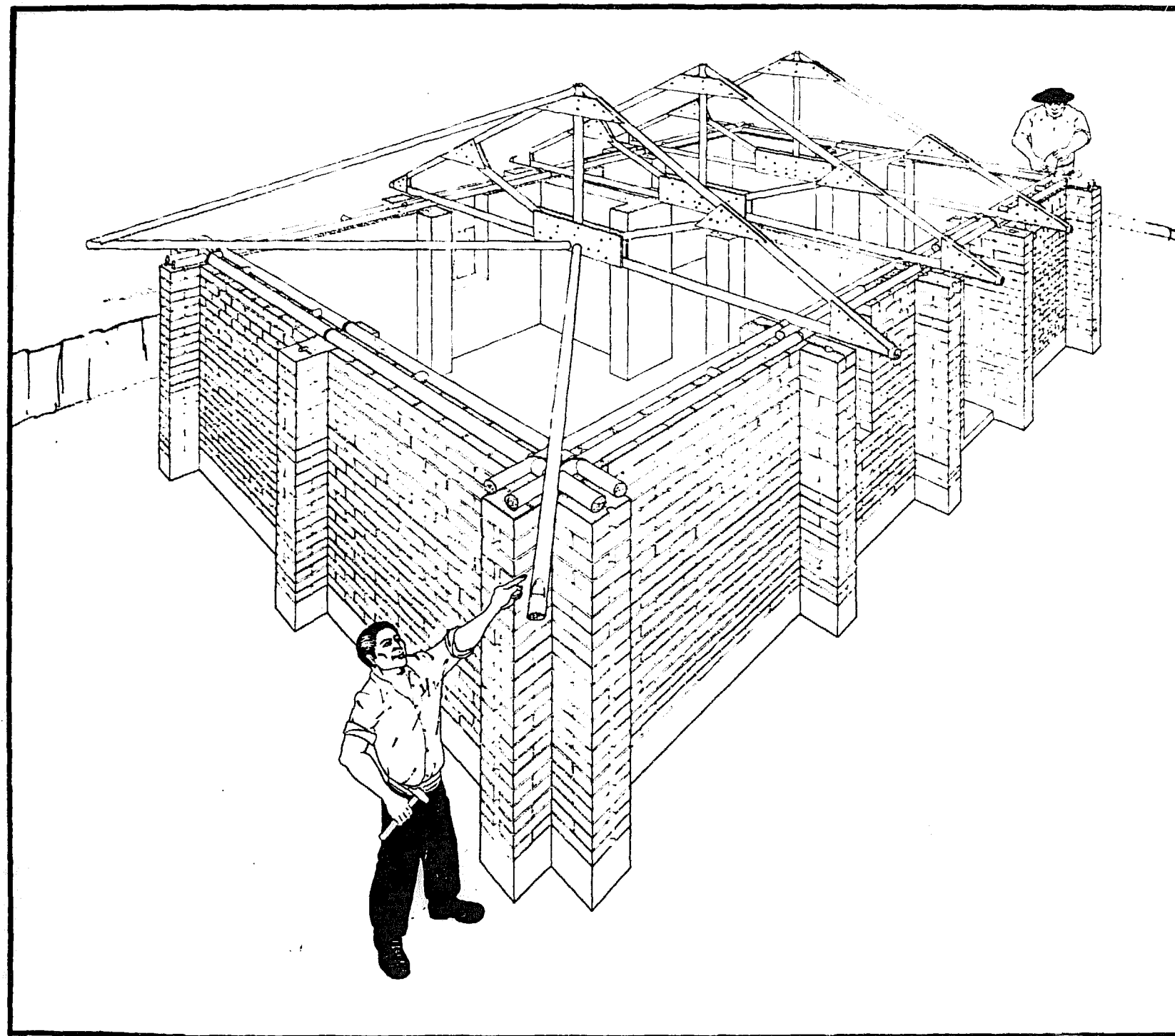
A. He is pointing at the wood pole (tronco) on the end of the wall.

Q. What will this be used for?

A. As a half-truss to support the roof frame.

Q. Why has no gable (tímpano) been built?

A. Because this roof will have four faces (4 aguas).

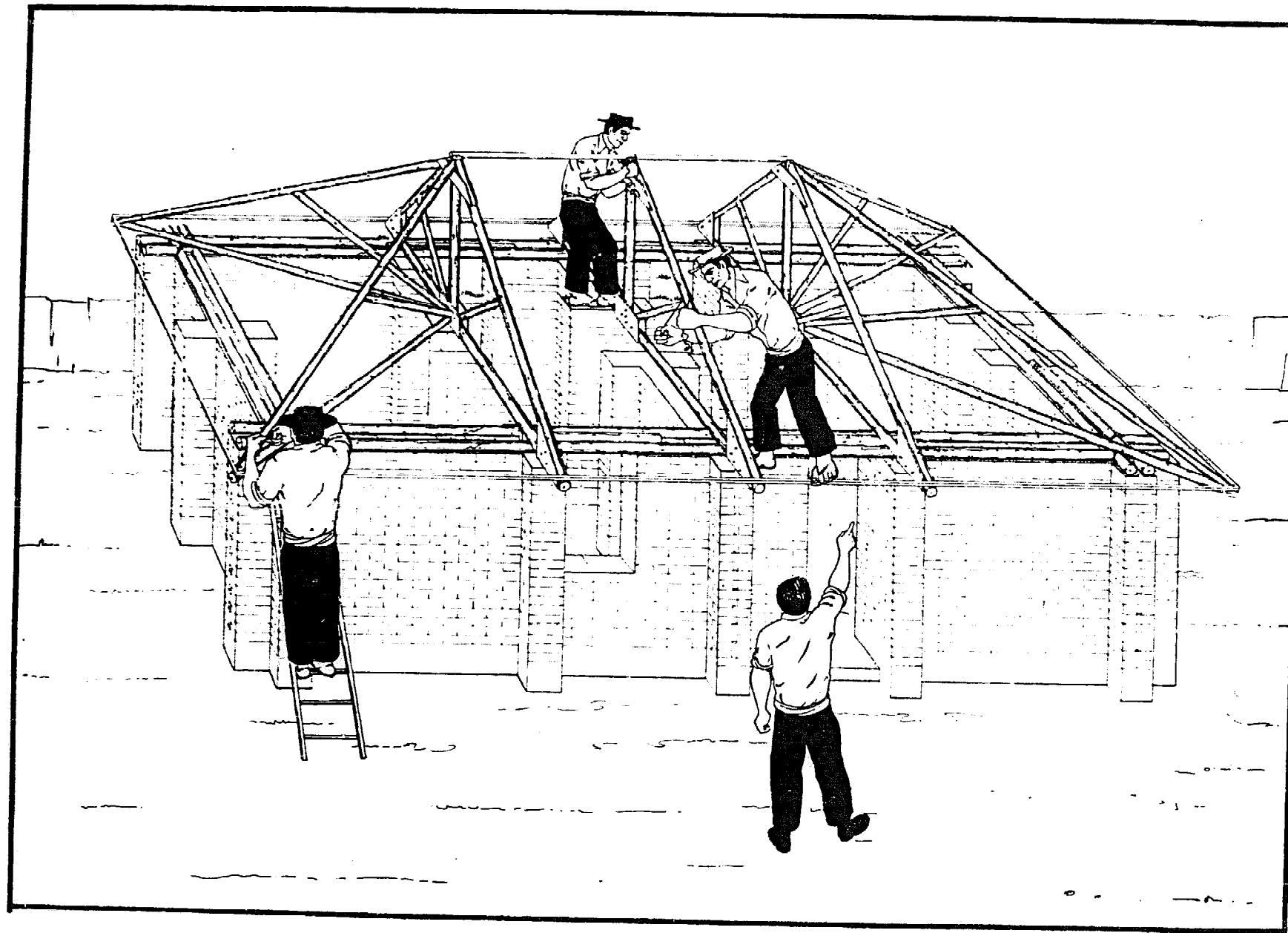


DRAWING #20

In this drawing, the men are attaching the frame for the roof.

Q. What are the men using for the frame (viguetas y tirantes)?

A. Wooden poles.

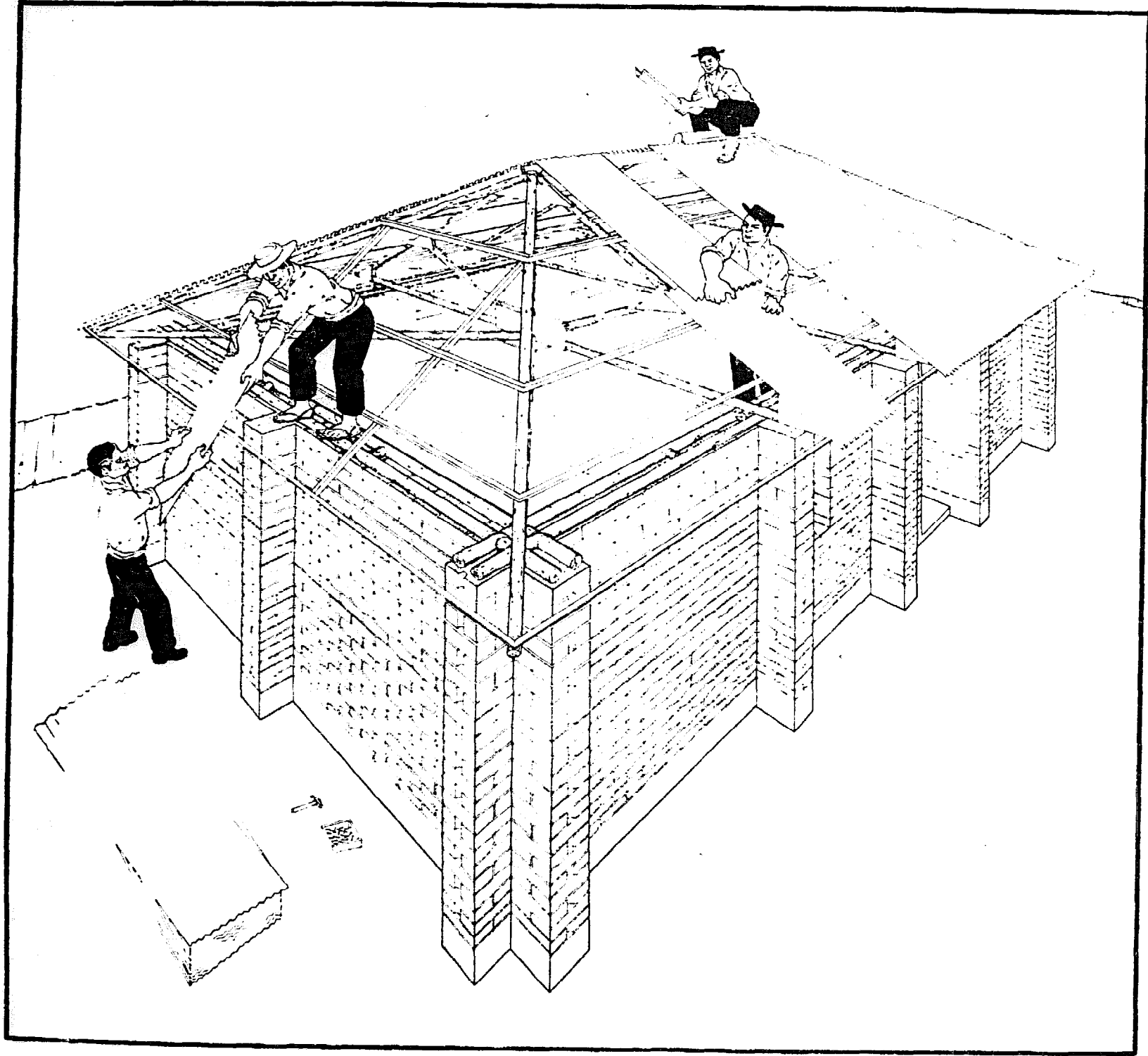


DRAWING # 21

In this drawing, the men are attaching the sheets of Eternit.

Q. Why is Eternit used?

- A. 1) It is lightweight and reduces the need for more trusses,
thus the roof is safer in an earthquake.
- 2) It is good for insulation.



DRAWING #22

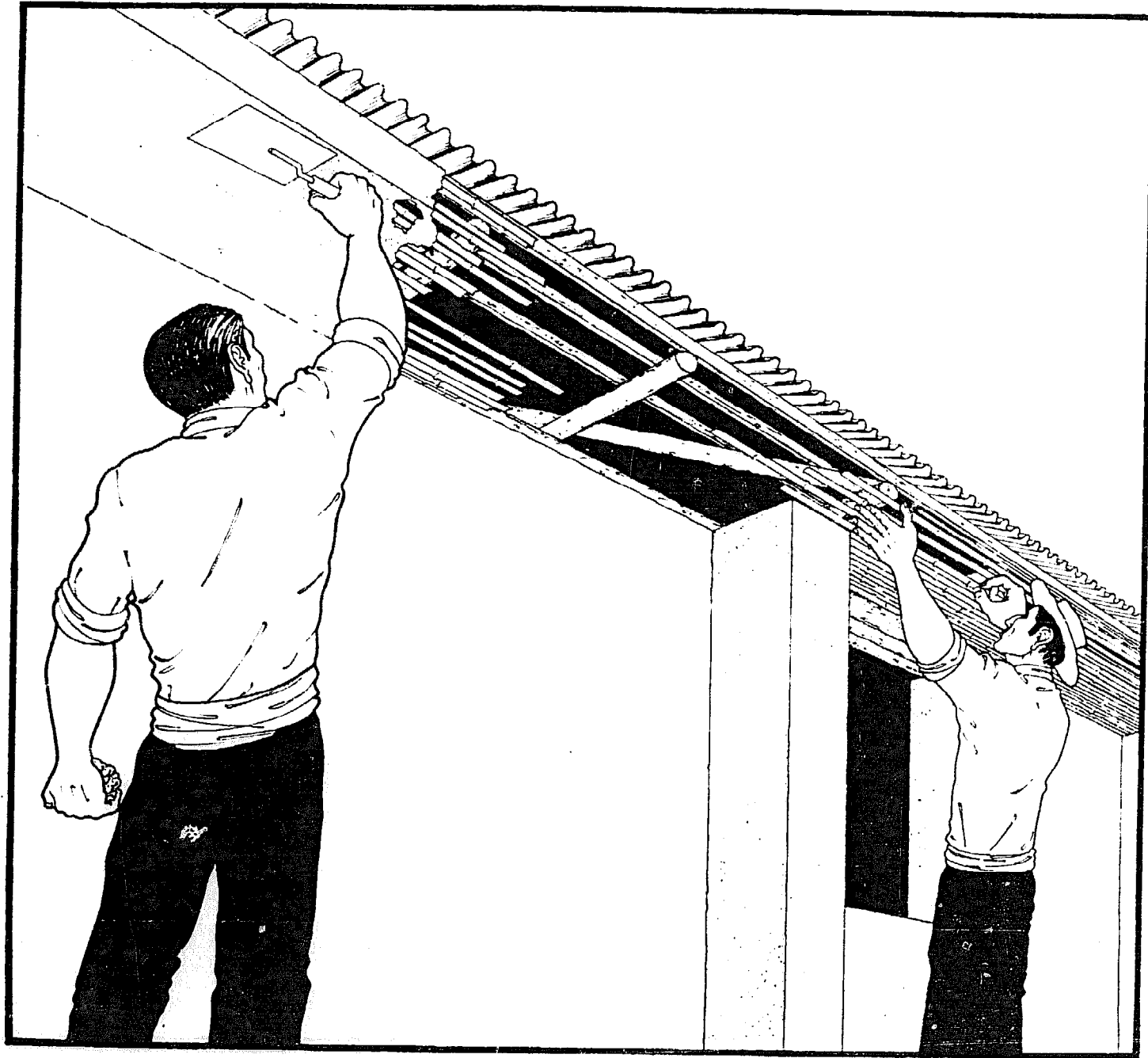
The men are building the eaves of the roof.

Q. How are the eaves built?

A. With cane covered with mortar.

Q. What is the best way to make this mortar?

A. With mud and lime.



DRAWING #23

In this drawing, the men are covering the walls with stucco.

Q. Why are they covering the walls with stucco?

A. To help protect the adobes from rain.

Q. What is the man in the white hat doing?

A. He is marking the place for the kitchen and latrine.

Q. What is the minimum distance between the house and the kitchen?

A. Two meters.

