

chains are arranged spirally around the rod and are so spaced that they will scrape the entire periphery of the tube where the cracking takes place and carbon is deposited. The chains are thrown out by centrifugal force as the rod is rotated, so that the links strike the inner wall of the tube with considerable force.

The arrangement of the stirring rod in the tube, and the manner of its operation, are shown by figure 44. The lower end of the rod is detachably connected to a vertical shaft that extends upward through a stuffing box in the bottom of the tar neck and has its lower end keyed in a bevel pinion which intermeshes with the corresponding pinion on a short horizontal shaft driven by a chain from below. The entire series of carbon stirrers in a single furnace is operated by a motor-driven line shaft, which is so arranged that the stirring rods on one side of the furnace revolve in one direction while those on the opposite side rotate in the reverse direction. Clutches are attached to each short horizontal shaft, so that any number of stirring rods can be thrown out of gear while the others are being rotated.

The general arrangement of the stirring rod drive is clearly shown in Plate VII, *A*. It is apparent that if the rods are continuously rotated in a given direction no means is afforded for cleaning the rod and the chains attached thereto, so that carbon will collect until the accumulation extends to the wall of the tube. The presence of carbon on the surface of the rods and on the chain itself does not, however, interfere with the operation of the apparatus until the amount becomes sufficient to impede the movement of gases through the chamber. When this point is reached, the flow of oil into the tube must be stopped and the rod removed and cleaned.

Much more trouble was experienced with this building up of carbon on the stirring rod during the early stages of the experimental work when the crude oil was being used than has occurred in recent operations in which distillate oil was used. An idea of the character of the carbon formation upon the rods during the early stages of operations may be gained from Plate VI, *B*, showing the condition of a rod after operation in the furnace for a number of days.

After the rod has been cleaned of carbon by means of air hammers or any similar device it can be replaced in the tube and used again. With the use of the distillate oil and the decreased temperatures and pressures at which the later experiments have been conducted, the period of operation of the rod in the tube has been materially lengthened. At the outset a rod could be operated only 10 to 24 hours, when the amount of carbon deposition would compel its removal. It has been found possible to increase the length of service to anywhere from 7 to 10 days, with occasional runs of even longer duration.