Svaadar
Design Rationale

Components:

1. Rails
2. Slider
3. Shafts
4. Attachment

Rails:

- There are 2 identical rails, each of which is a cuboidal slab at the bottom along with a semi-cylinder on top of it. The cuboidal slab causes the rails to be firm on the ground, while the semi-cylinder top reduces the friction between the rails and slider.
- The rails are 220 cm long, to facilitate for the variation in the diameters of manholes from 90 cm to 180 cm.
- A cross-section of the rails would show a 4 cm long, 2 cm tall rectangle along with a semicircle of radius 2 cm above it.

Slider:

- The slider is a cuboidal box of length 20 cm, breadth 25 cm and height 10 cm.
- At its centre, there is a 10.2 cm wide cylindrical hole to freely permit the shafts from moving vertically through it.
- On its sides, there are two holes that run across the length of the slider. These holes are each 1.5 cm away from the slider's vertical edges. The holes are of a similar shape to that of the rails, but the length of the hole is made 4.1 cm, the height of the cuboid is 2.2 cm and the radius of the semi-cylinder is 2.2 cm. This increase in the dimensions of the holes, relative to the rails, permits the sliders to move sideways.

Shafts:

- There are 15 cylindrical shafts, each 1 m long and 10 cm wide. This facilitates for the variation in the depth of manholes from 75 cm to 14 m.
- Through the centre of the shaft, a pipe (used for water supply), and a wire (used to power the motor in the attachment), pass through to a water and electricity source on the ground.
- Each shaft has 12 holes, each 1 cm wide. The holes are present at 3 different heights of 12 cm, 50 cm and 88 cm from the top. At each height, the 4 holes are in pairs towards the sides of the shaft, so that 2 rods, provided separately, can pass through the holes and rest on the slider, locking the shafts in place.

- The shafts also have an interlocking mechanism within them. For this, each shaft has a cylindrical extension of 9 cm at the bottom, but this extension is only of diameter 6 cm. For 1/3rd of the outer surface of this extension, there is protrusion outwards of 2 cm, to align back with the normal width of 10 cm. At the top of each shaft, for 1/3rd of the inner surface, there are 2 outward protrusions of 2 cm each at heights 0 – 3 cm and 6 – 9 cm from the top. Thus, when 2 shafts are to be attached, the user simply has to join the two shafts and twist one of them so that they lock in place.
- There is also one shaft provided that is not straight but is in an L-shape. This shaft permits the attachment to either be directly attached vertically to the shafts or to be attached horizontally, using the L-shape shaft.

Attachment:

- The attachment comprises a motor, attached to the wire, and a hollow hemispherical net-like covering of radius 20 cm, preventing large objects from passing through. It helps to contain the waste, permitting the blades to cut it, without pushing it away. The hemisphere also helps in acting as a shield, so that the blades do not damage the walls of the pipes.
- The motor rotates an axle, that in turn rotates a cone supporting 3 blades. The blades run at high speeds, cutting through whatever is clogging the sewer lines or the manholes.
- Close to the motor, a nozzle is welded to the inner surface of the hemisphere, to which the pipe is attached. When the blade is cutting through the clog, the water from the pipe flushes out the waste down the sewer line. This prevents reclogging of the manhole.