Course No.: [illegible] 332 | Group No.: B[illegible]

EXPERIMENT NO. : 04

NAME OF THE EXPERIMENT : MANUFACTURING OF A JACK BY USING LATHE, SHAPER, MILLING AND DRILLING MACHINE

Date of performance: [illegible]
Date of submission: [illegible]

Name: MD [illegible]
Roll: [illegible]
Level: 3 Term: 2
Section:
Dept.: ME

OBJECTIVES:

(i) To introduce with lathe, shaper, milling, drill machines.

(ii) To operate the machine to produce the jack (machine component)

APPARATUS: 1. a. 3 phase induction motor - 3HP

b. Motor rpm - 1430

c. Variable rpm 8

maximum rpm - 315

minimum rpm - 38

d. Total feed - 30

maximum feed - 2.5 mm

minimum feed - 0.05

These all are the specifications of a lathe machine

2. Shaper machine:

A) 3 phase induction motor

b) 60 stroke per minute

3. Vertical milling machine:

a) 250 rpm

4. Bench drilling machine

Tools: 1. Lathe machine cutting tools

a) for turning

b) for drilling

c) for facing

d) for parting

e) for boring

2. Milling machine cutter

Emery 3. Amarang paper (for surface finish)

4. Slide calipers

5. End mill cutter

6. Tape and tape holder

Here, all the cutting tools are HSS

WORKING MATERIAL:

A cylinder of 39 mm dia

Surface rough

material : MILD STEEL

EQUIPMENT SPECIFICATION: A brief description of the machine parts and different components are given below:

1. LATHE MACHINE: A lathe machine is a machine tool which spins a block of material to perform various operations such as turning, drilling, parting, facing etc. That applied rotating motion to workpiece to create an object which will be the replica of the desired object

The major components are:

a. Bed: All lathe have a bed which is horizontal beam. The bed supports all major components of lathe. Beds have a large mass and are rigidly built usually from gray and nodular cast iron. Bed absorbs large amount of vibration due to machining operation. The top portion of the bed has two ways. One is hardened and machined for wear resistance. At the end of the bed there is 'Head stock' and the other end is called 'Tail stock'.

b. Carriage: In its simplest form the carriage holds the tool bit and moves it longitudinally (turning) or perpendicularly (facing) under the control of the operator. The operator moves the carriage manually via handwheel or automatically via engaging the feed shaft with the carriage feed mechanism which is power assisted. The handwheels on the carriage and its related slides are usually calibrated in making reproducible cuts.

c. Head stock: The head stock houses the main spindle, speed change mechanism and change gears. The head stock is required to be made robust due to the main cutting forces are directly involved to it. The main spindle is in general hollow to allow the long bars through it.

d. tailstock:

The tailstock is a tool and is mounted opposite to head stock. The spindle does not rotate but does travel longitudinally under the action of lead screw and handwheel.

e. Feed and lead screw:

A feed screw is a long driving shaft that allows a series of gears to drive the carriage mechanism. Both the feedscrew and leadscrew are driven by either the change gears on an intermediate gear box called a quick change gear box.

The leadscrew will be manufactured to either imperial or metric standards and will need a conversion ratio to be introduced to create thread forms from different family.

f. Chuck:

Chuck usually consists of three or four jaw. Three jaw chucks generally have a geared scroll design that makes the jaw self centering. They are usually used to hold the round cross sectional objects. Other type of chuck is four jaw independent chuck. This chuck is used to hold non-circular cross sectional object.

7. Faceplate:

A workpiece may be bolted or screwed to faceplate, a large flat disc that mounts to the spindle.

8. Mandrels:

Mandrels are placed inside hollow or tubular workpieces are used to hold workpieces that require machining on both ends or on either cylindrical surfaces. Some mandrels are mounted between the centres of the lathe.

A typical engine lathe components are:

1) Head stroke
2) Tail stock
3) Spindle
4) Slideways
5) Tool post
6) Compound rest
7) Saddle
8) Power feed clutch
9) Feed rod
10) Bed
11) lead screw
12) Half nut
13) Apron
14) Break clutch control
15) Rack
16) Motor drive
17) Gear box

2. Shaper machine: A brief discussion of shaper machine is given below-

A shaper machine is used to make smooth surface in the workpiece. Here the job is fixedly kept and tool moves over it horizontally. The material removed by shaper machine is very low. So now in modern industry shaper machine is replaced by other machines. A shaper operates by moving a hardened cutting tool backward and forward across the workpiece but cutting happens only during the forward stroke. So, the time of forward stroke has to be large. A shaper machine can be classified into standard, draw cut, horizontal universal, vertical, geared, crank hydraulic and travelling head shaper.

3. Milling machine:

Milling is the machining process of using rotary cutters to remove material from workpiece advancing (or feeding) in a direction at an angle with the tool. It covers wide variety of different operations and machines. One scales from small individual parts to large heavy duty grand milling operations.

4. Drill Machine: A geared head drilling machine is used in this experiment. It has operated on three phase electric power and generally of more rugged construction than equivalently size belt driven units.

EXPERIMENTAL PROCEDURE:

a) For external parts:

For external parts all operations are done in lathe machine. Operation steps are given below:

1. Facing: 375 rpm
feed 0.1mm perpendicular to the rotational axis

2. Turning: initial dia 32 mm
final dia 30 mm
230 rpm
feed 0.05 mm
depth of cut 1 mm

3. Turning: initial dia 30 mm
final dia 29 mm
230 rpm
feed 0.08 mm
depth of cut 0.05mm
for 30mm length

4. Drilling: 375 rpm
manual operation
8 mm dia drill bit
for 30 mm long hole

5. Drilling: 375 rpm
manually operated
15 mm dia drill bit
for 30 mm long hole

6. Boring: initial dia 15mm
final dia 16mm
depth of cut 0.5mm
375 rpm
feed 0.05mm
for 30 mm long

7. Chamfering: 45° angle
375 rpm

8. Surface finishing with file and emoning paper.

9. Parting: 230 rpm
manually operated

10. Facing the opposite face manually at 230 rpm

b) For internal part: For internal part making we used lathe machine, milling machine, shaper machine, drilling machine and tap

d) Lathe machine operation:

1. facing : 375 rpm
   0.05 mm feed perpendicular to the rotational axis

2. Turning : 230 rpm
   0.05 mm feed
   initial dia 32 mm
   final dia 30 mm
   depth of cut 1 mm
   total 45 mm long

3. Turning : 230 rpm
   0.05 mm feed
   initial dia 30 mm
   final dia 29.9 mm
   (tolerance 0.1 mm)
   30 mm long

4. Chamfering : 45° angle
   375 rpm

5. Surface finish with file and sanding paper at 375 rpm

6. Parting: 250 rpm

manually operated

7. Facing at opposite side:

375 rpm

manually operated

ii. <u>Milling machine operation</u>:

1. Sloting: with end mill cutter 10 mm dia

depth of cut 3 mm

2.5 mm cut at each step cross section

250 rpm

iii. <u>Shaper machinge operation</u>:

1. Chamfering: 45° angle

60 stroke per minute

iv. <u>Drilling machine operation</u>: Drill a hole with 5.5 mm dia drill bit

v. <u>Internal tape making</u>:

manually operated

6 mm internal dia

There was 3 type of tape we used two of them. But all 3 tapes are recommended to use for better performance.

SCHEMATIC DIAGRAM OF VARIOUS OPERATIONS:

1. FACING:

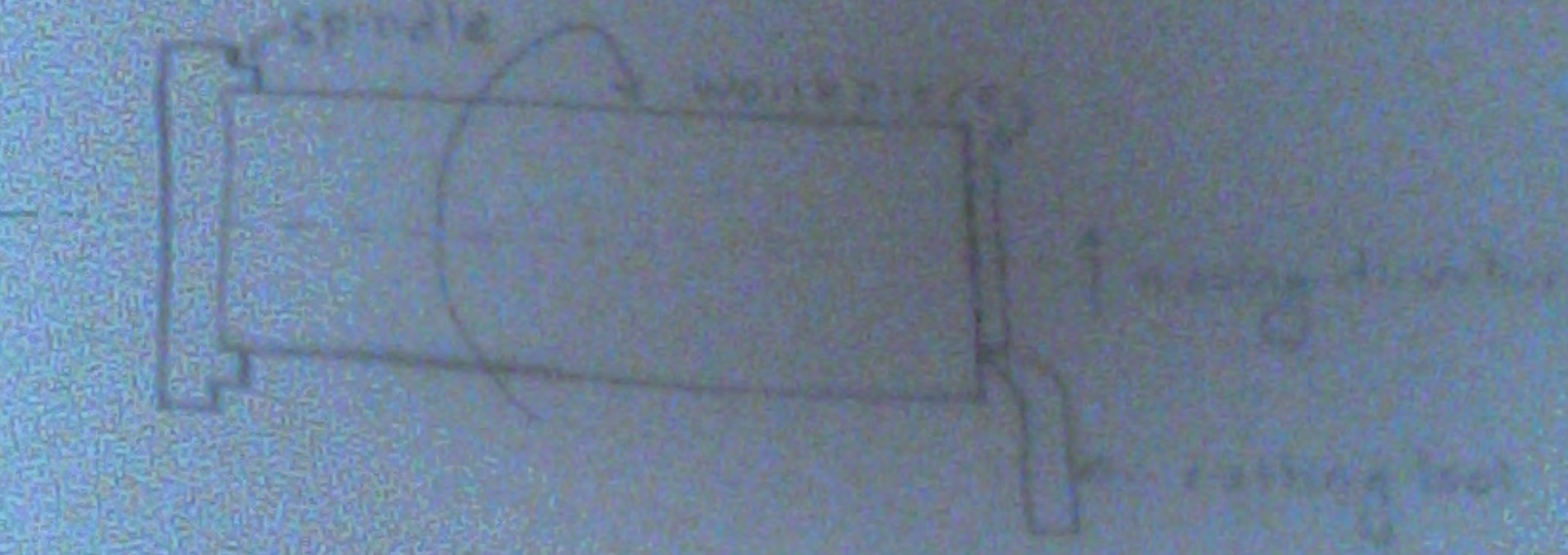


figure: facing operation in a lathe machine

2. TURNING:

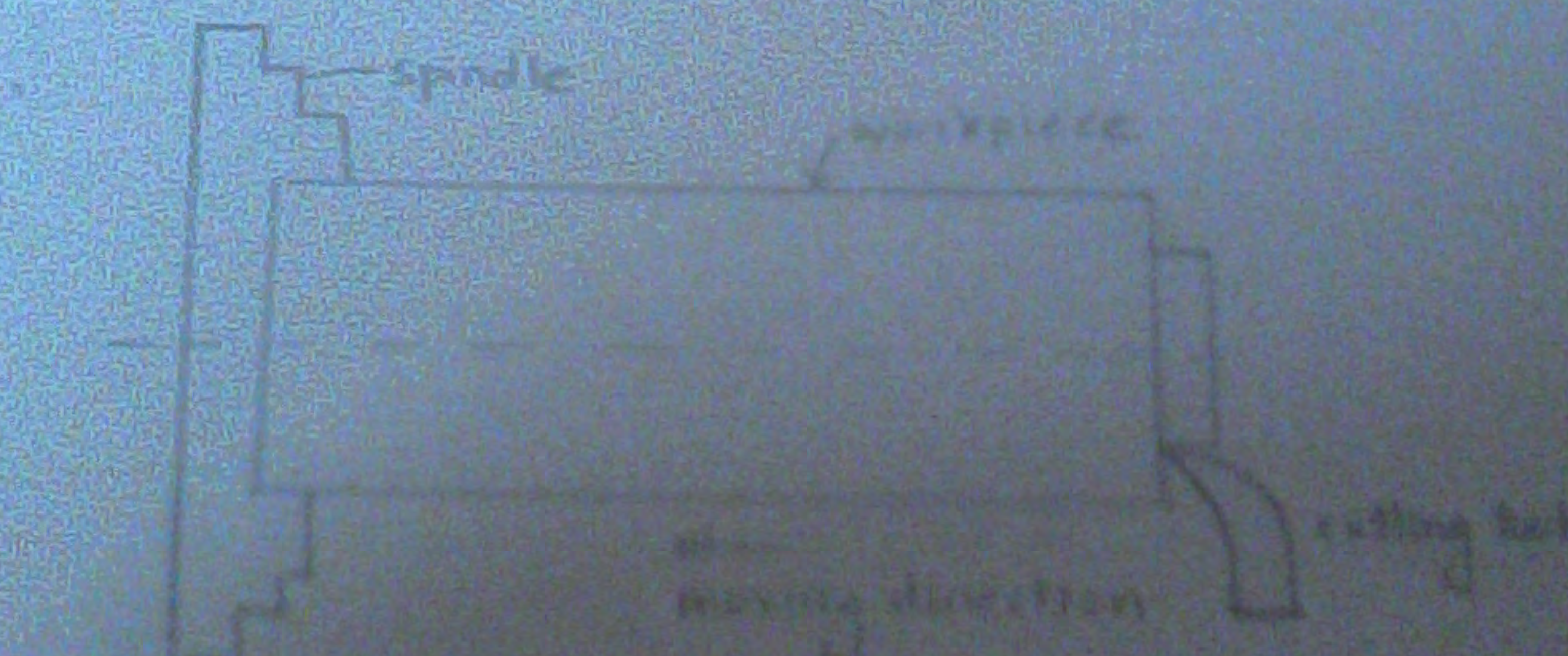
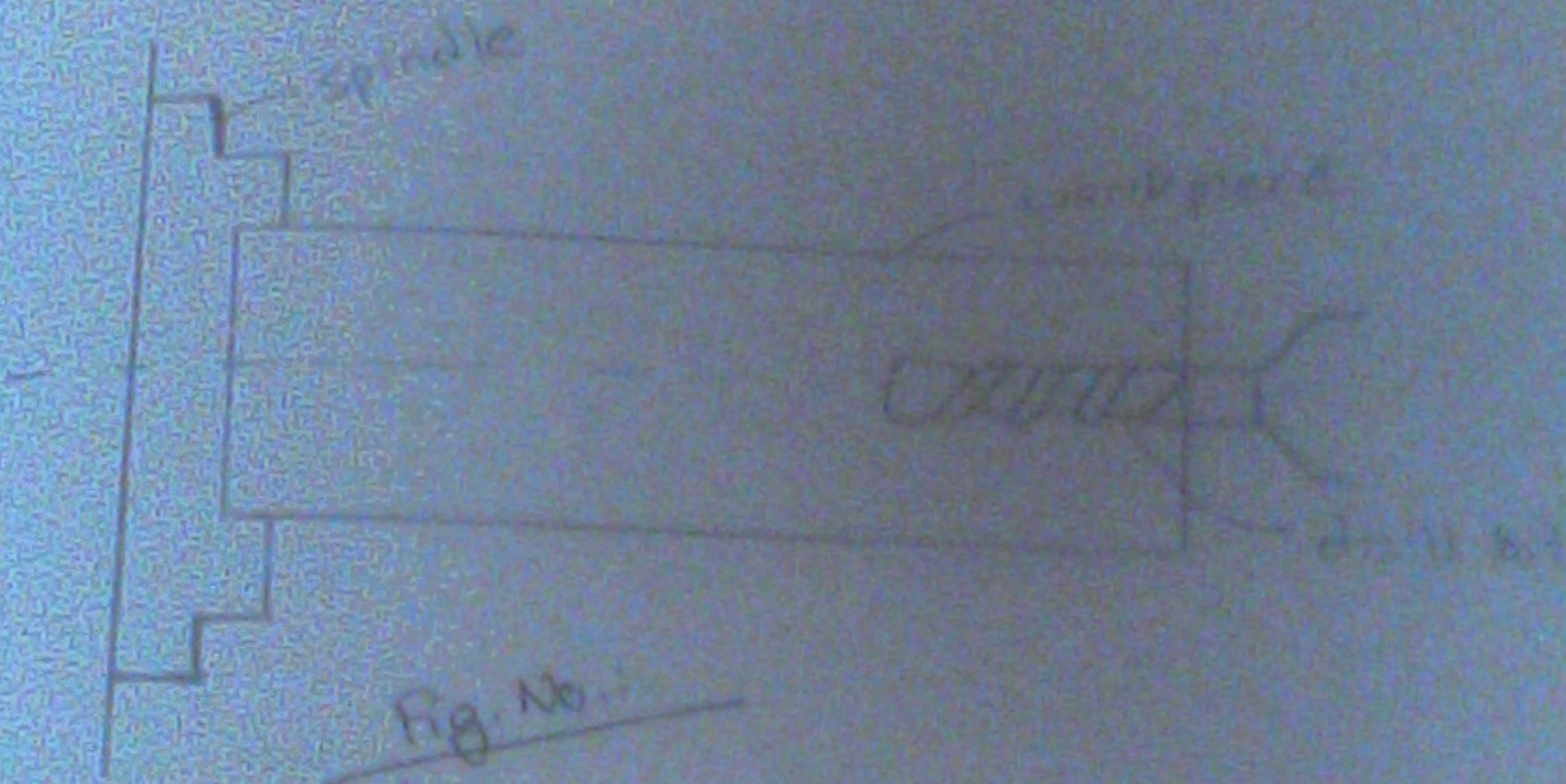


figure: turning operation in a lathe machine

3. Drilling:



~~Fig. No.~~
figure: Drilling operation in lathe machine

4 Parting:

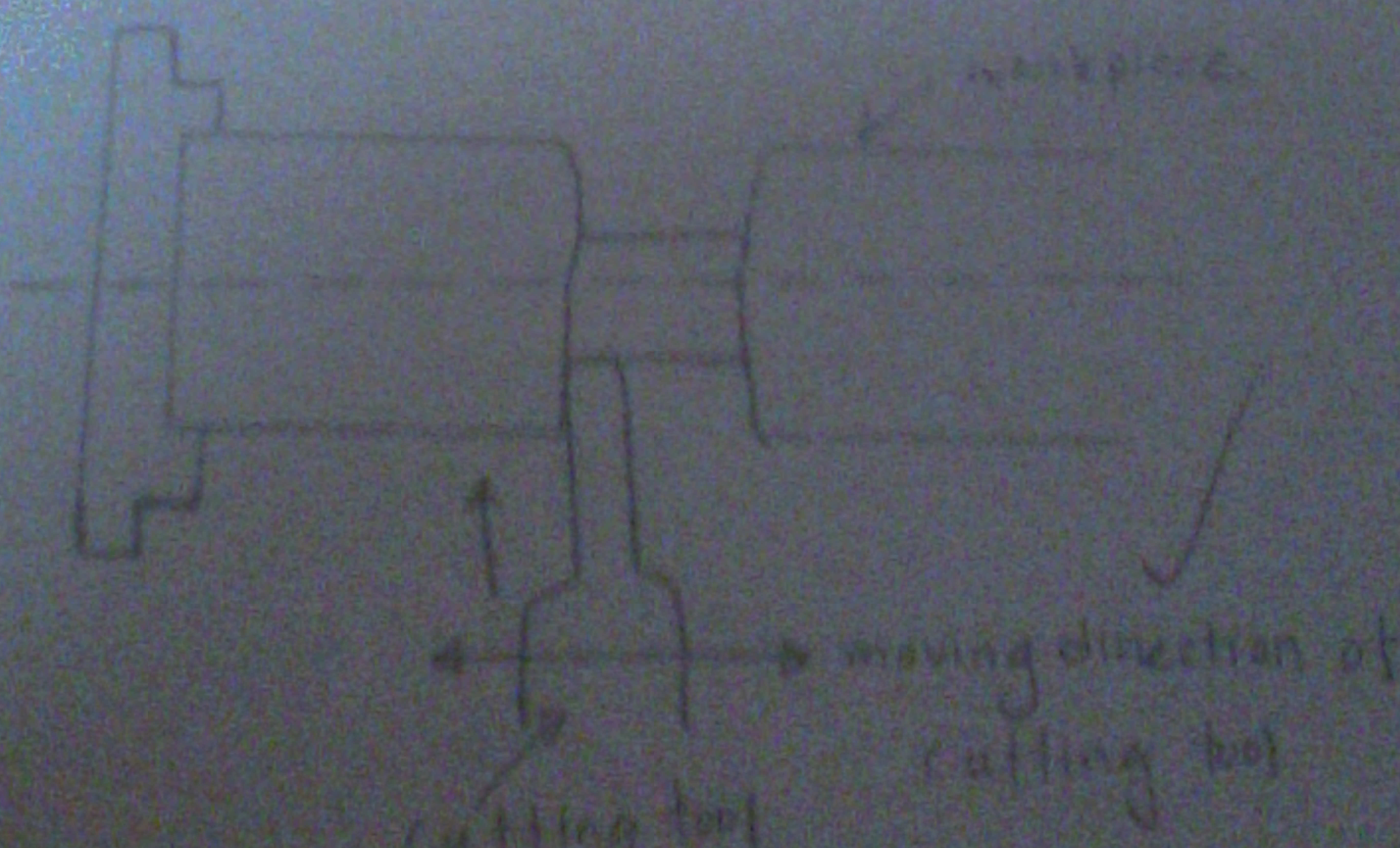


figure: Parting operation in a lathe machine

v) Boring:

figure: Boring

vi) Chamfering:

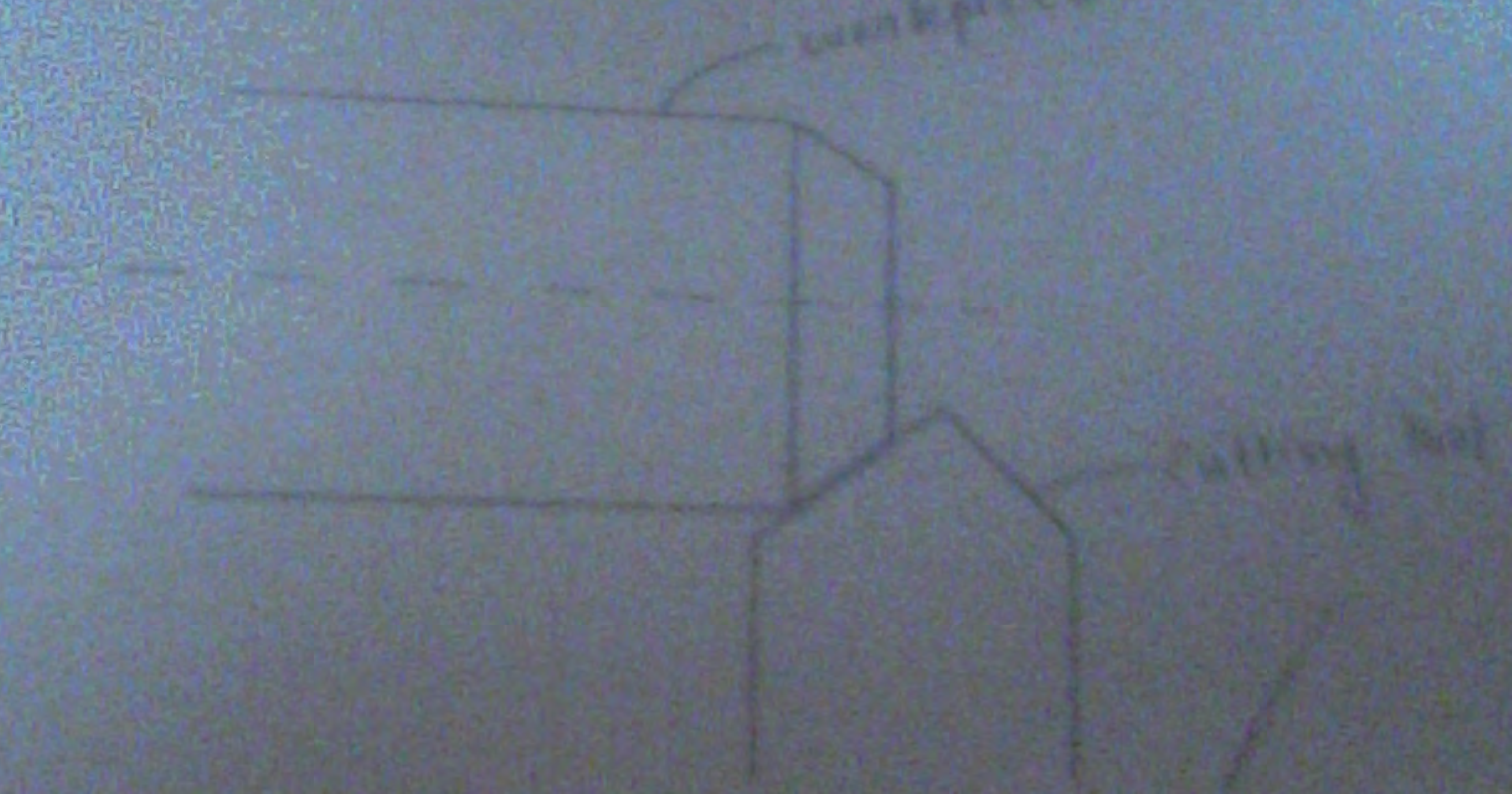


figure: Chamfering

vii) Milling operation:

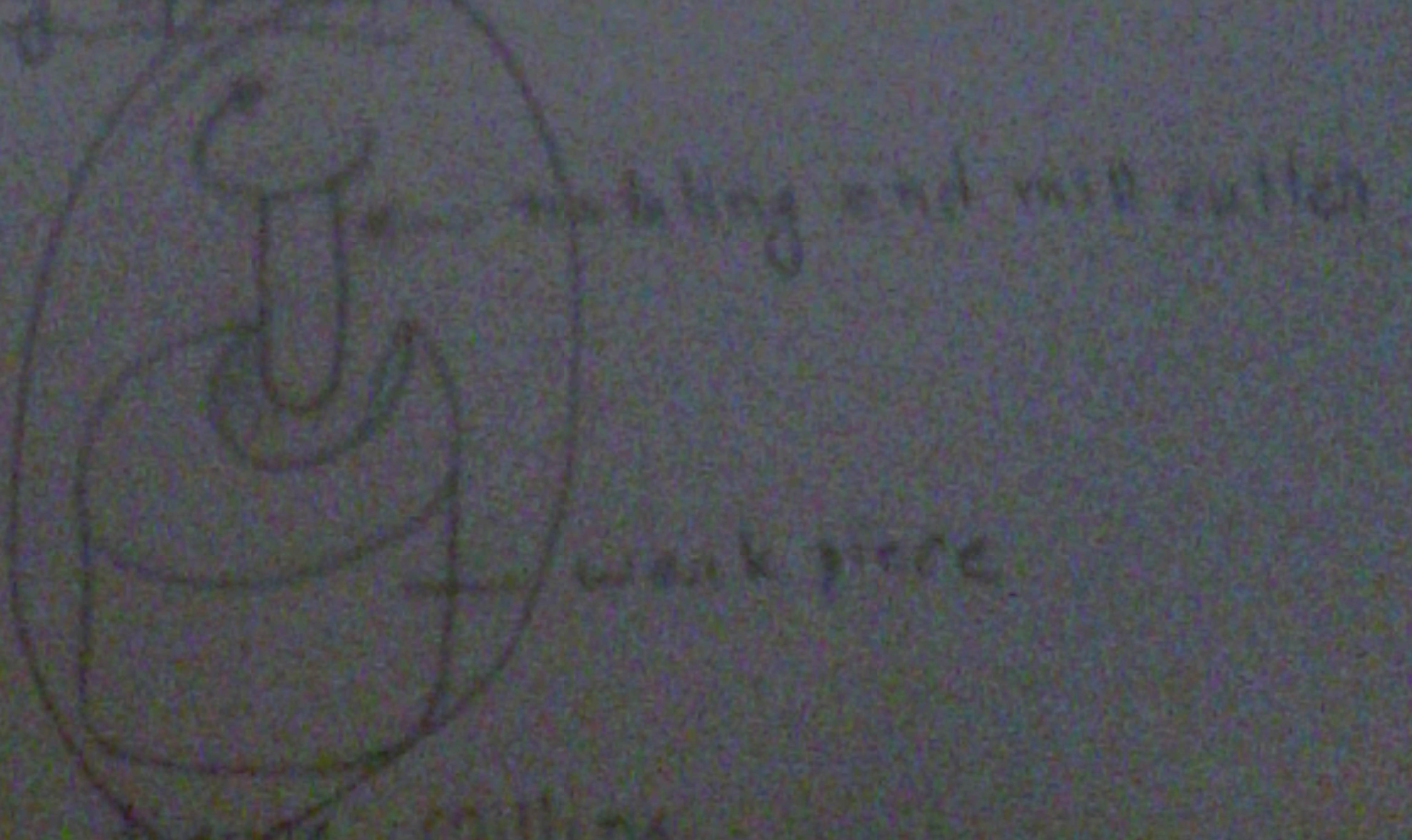


figure: milling

iii) Chamfering by shaper machine

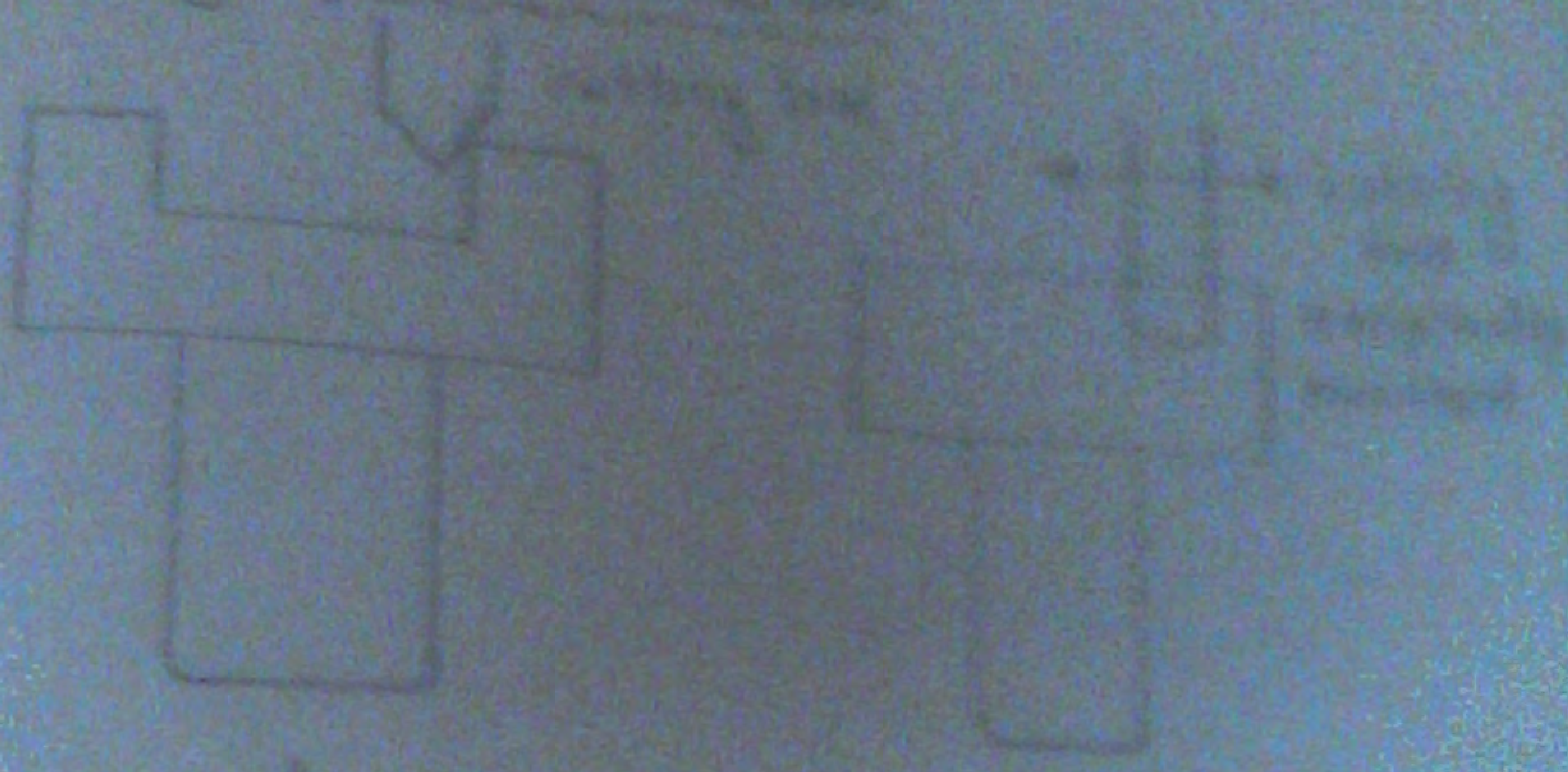


figure: Chamfering by shaper machine

iv) Drilling by drill machine:

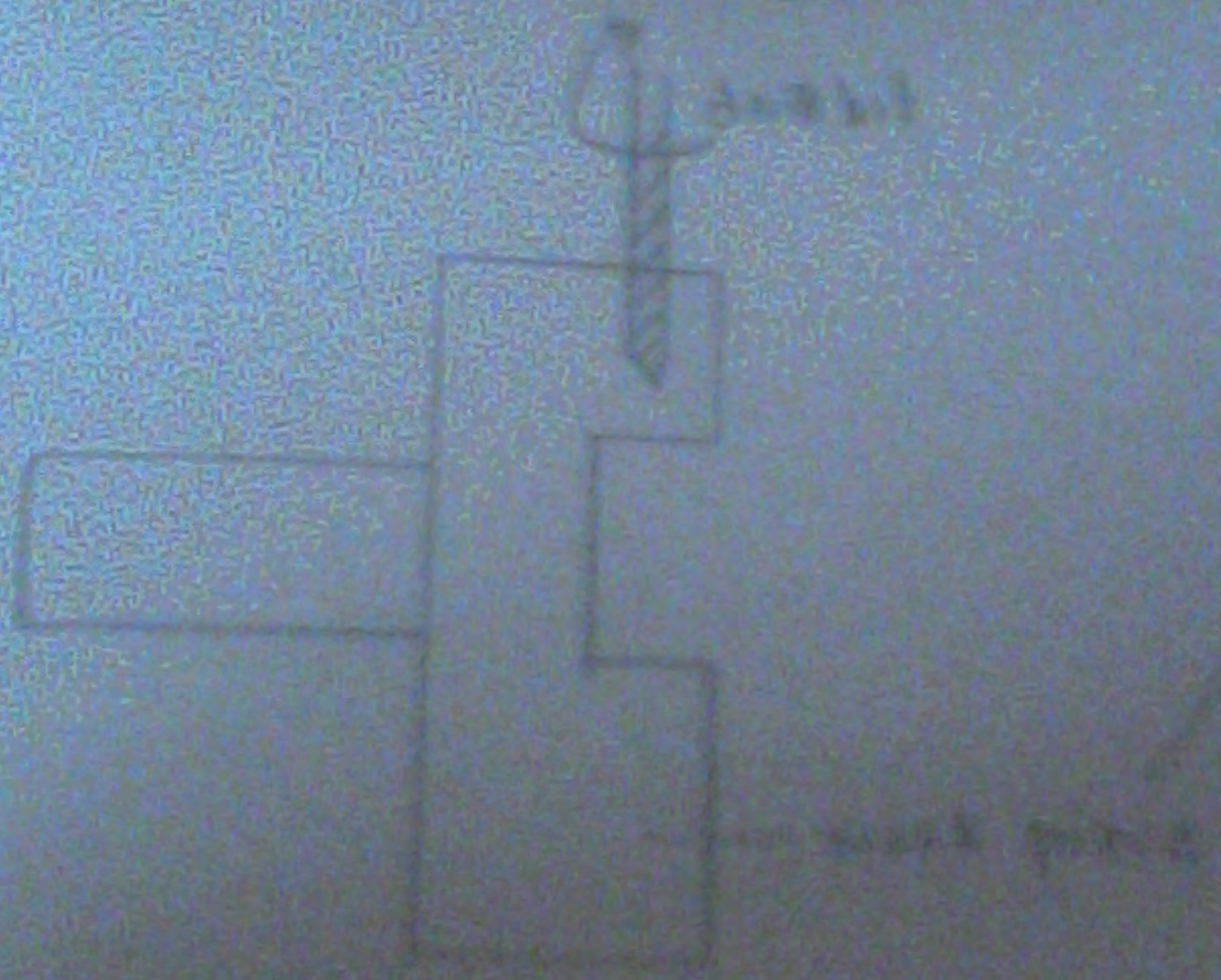


figure: Drilling by drill machine

v) Internal thread by tape:

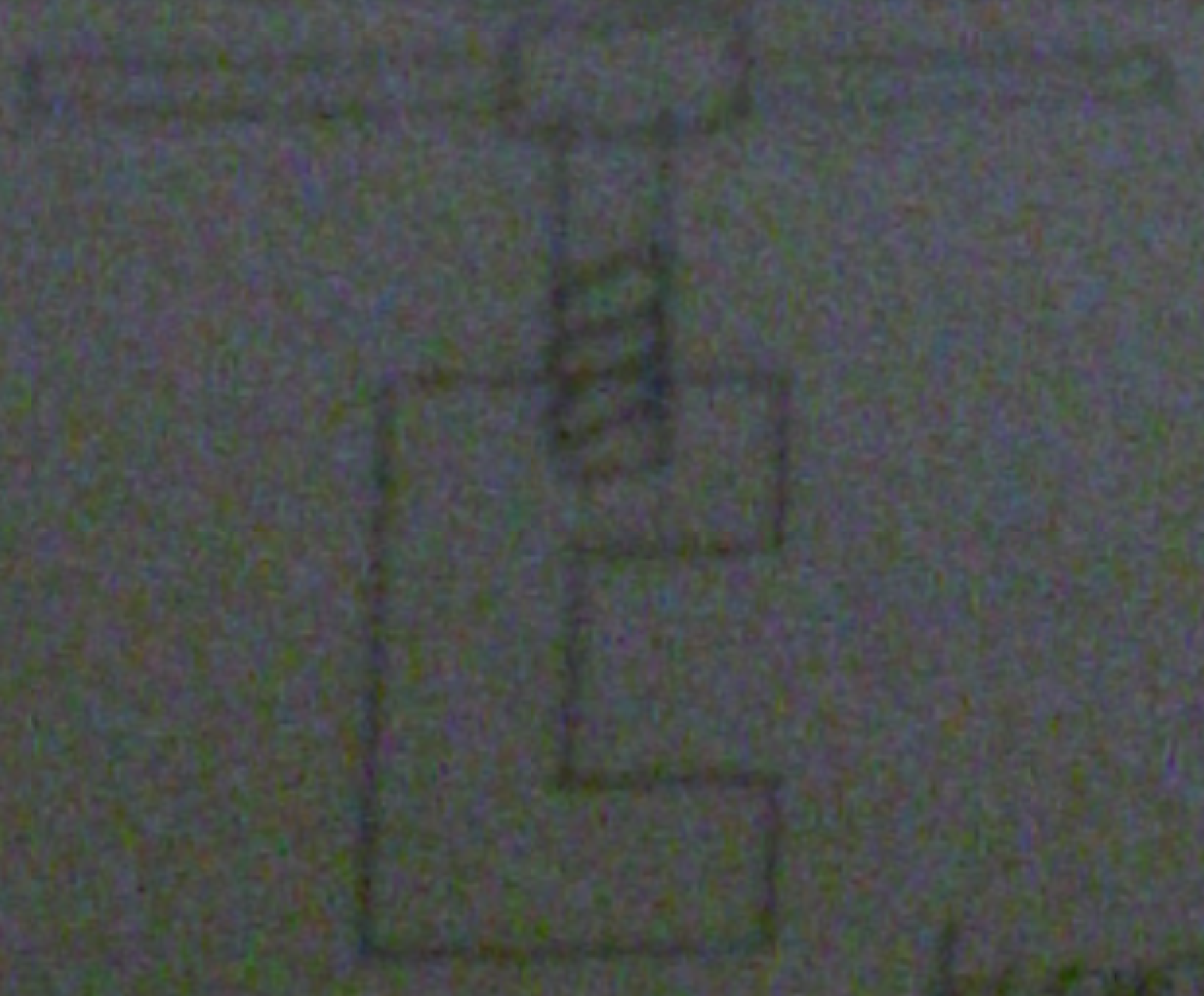
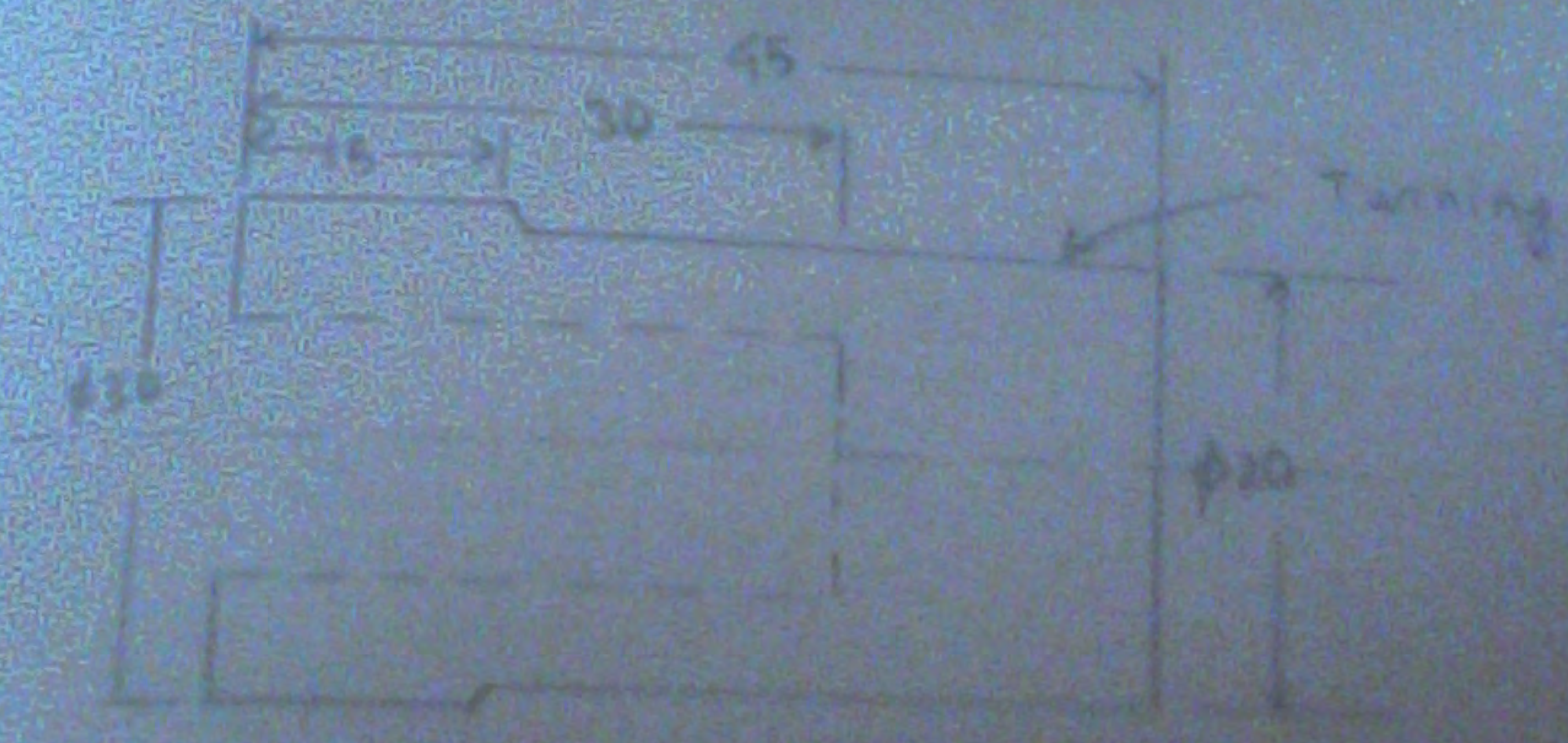


figure: tapping

View of jack:

Side view (internal part)



Side view (external part)

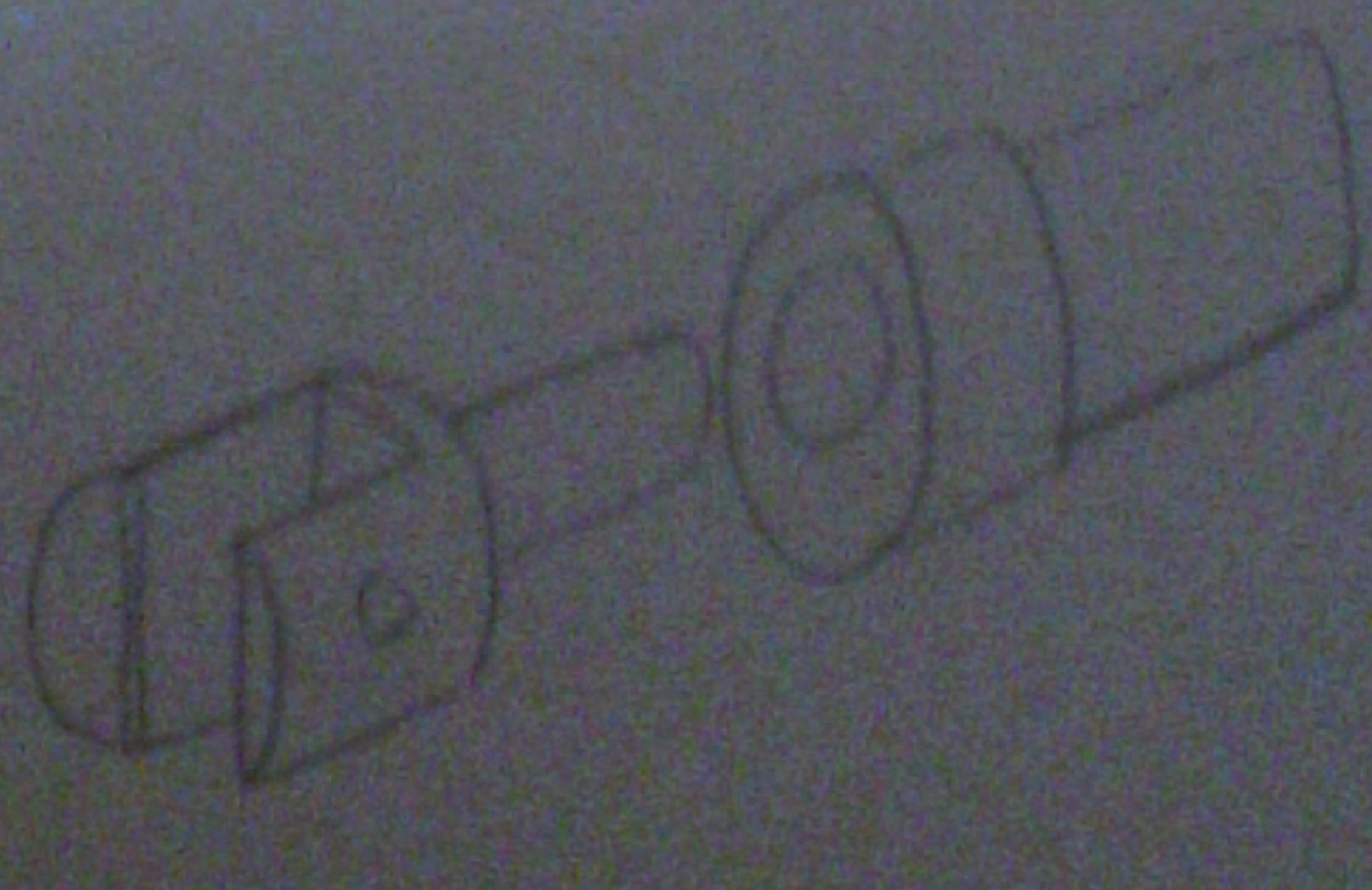


Fig. No: 3-D view of jack

Discussion:

A machine assembly jack is produced in this experiment. In this experiment we also studied the operating procedure of lathe, milling, shaper and drilling by performing various operation.

Hydraulic jack increases mechanical advantage. Different feed rate and rpm were needed in machining process. When we cut roughly and quickly we use large feed and large depth of cut in low rpm. But due to quick machining a large amount of heat is generated. So, it is needed to keep the temperature moderate. To do so, we use cutting fluid beside that it vanishes away chip. The fluid is a mixture of oil and water so that only water can't cause damage to the machine.

When we want smooth surface finish, we use small feed, small depth of cut and higher rpm. But it will take much more time. So, in general finish cut is done at last step