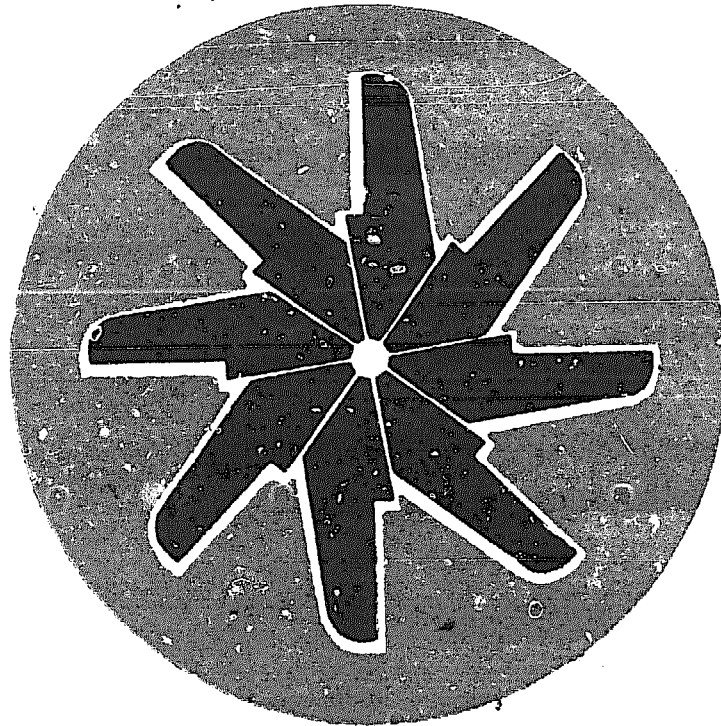


**NEW HIMALAYAN
WATER WHEELS**



**A. BACHMANN
A.M. NAKARMI**

NEW HIMALAYAN
WATER WHEELS

ANDREAS BACHMANN
AND
AKKAL MAN NAKARMI

SAHAYOGI PRESS
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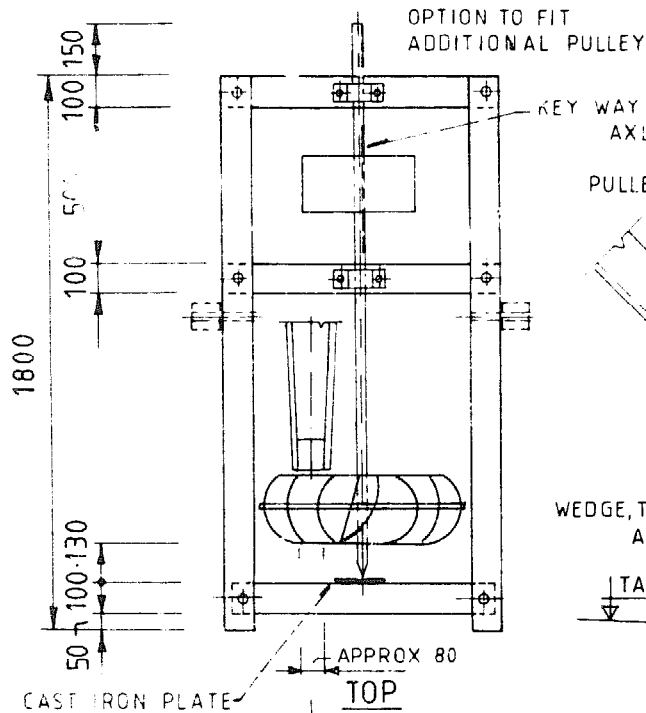


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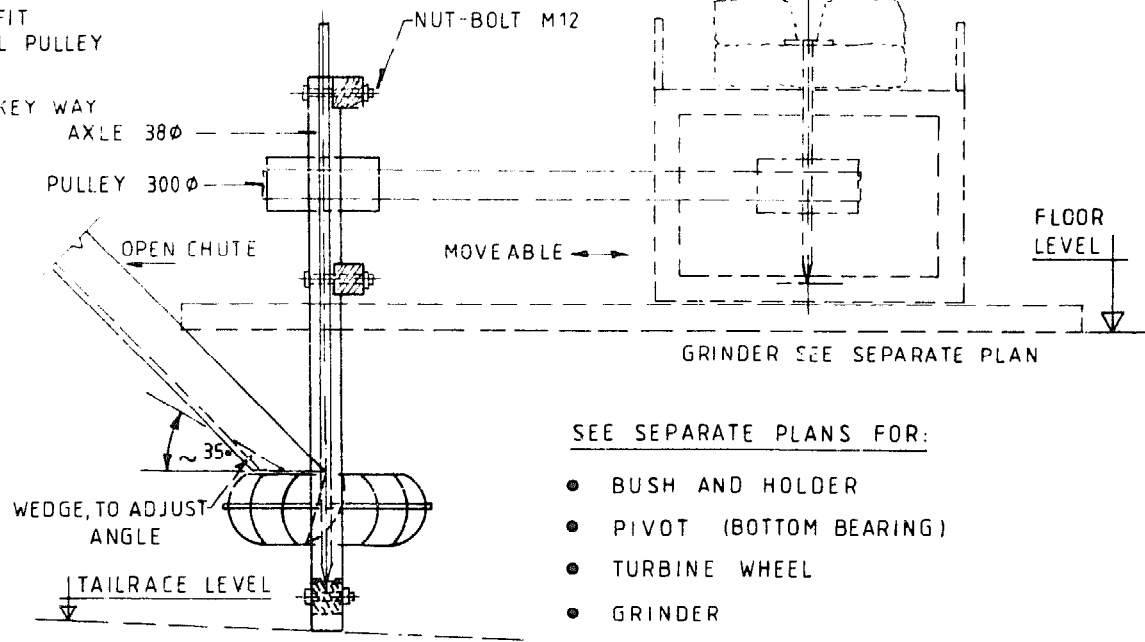
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FRONT



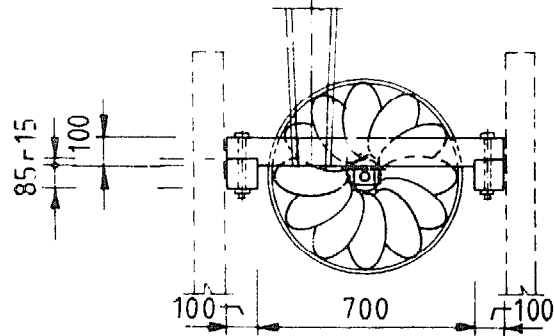
SIDE



SEE SEPARATE PLANS FOR:

- BUSH AND HOLDER
- PIVOT (BOTTOM BEARING)
- TURBINE WHEEL
- GRINDER

RPM APPROX 220

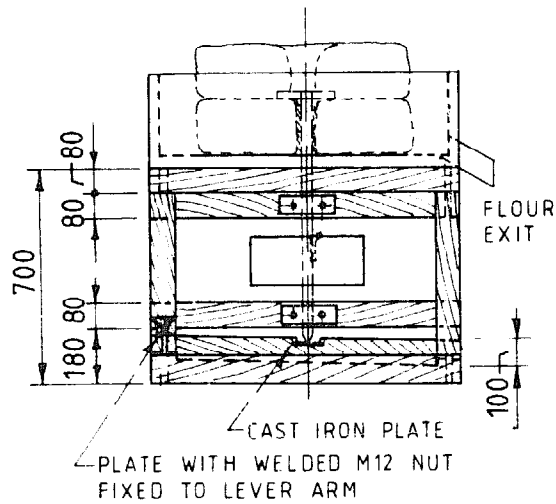


MEASUREMENTS IN MM
B.D.B

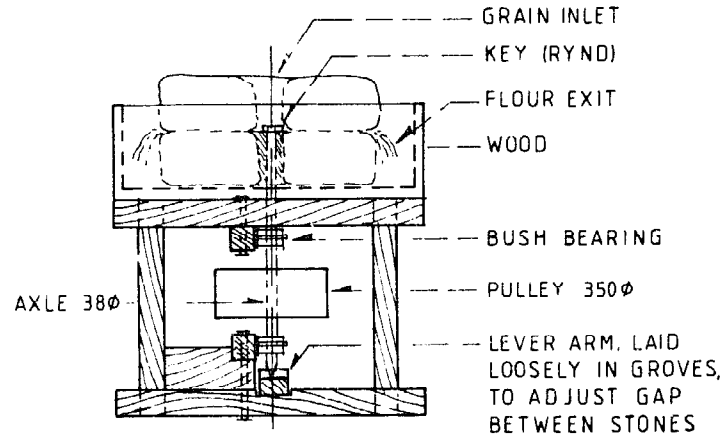
NEW NEPALI WATER MILL
 WOODEN CONSTRUCTION
FRAME FOR TURBINE

GRINDER

FRONT

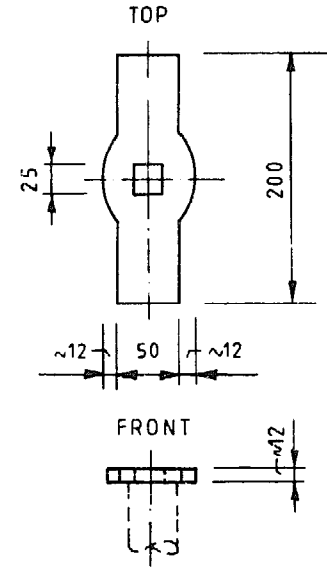


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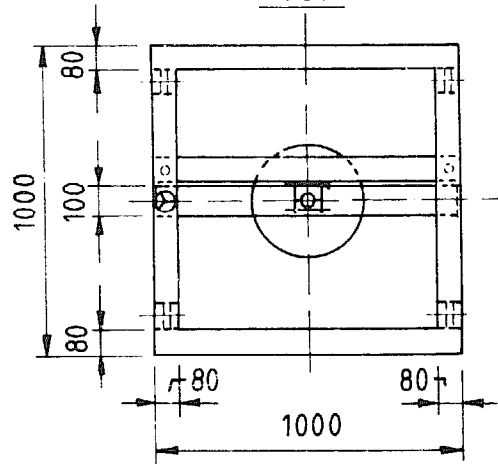


KEY (RYND)

FORGED IRON



TOP



SEE SEPARATE PLANS FOR:

- BUSH AND HOLDER
- PIVOT (BOTTOM BEARING)
- HOPPER (GRAIN FEEDER)

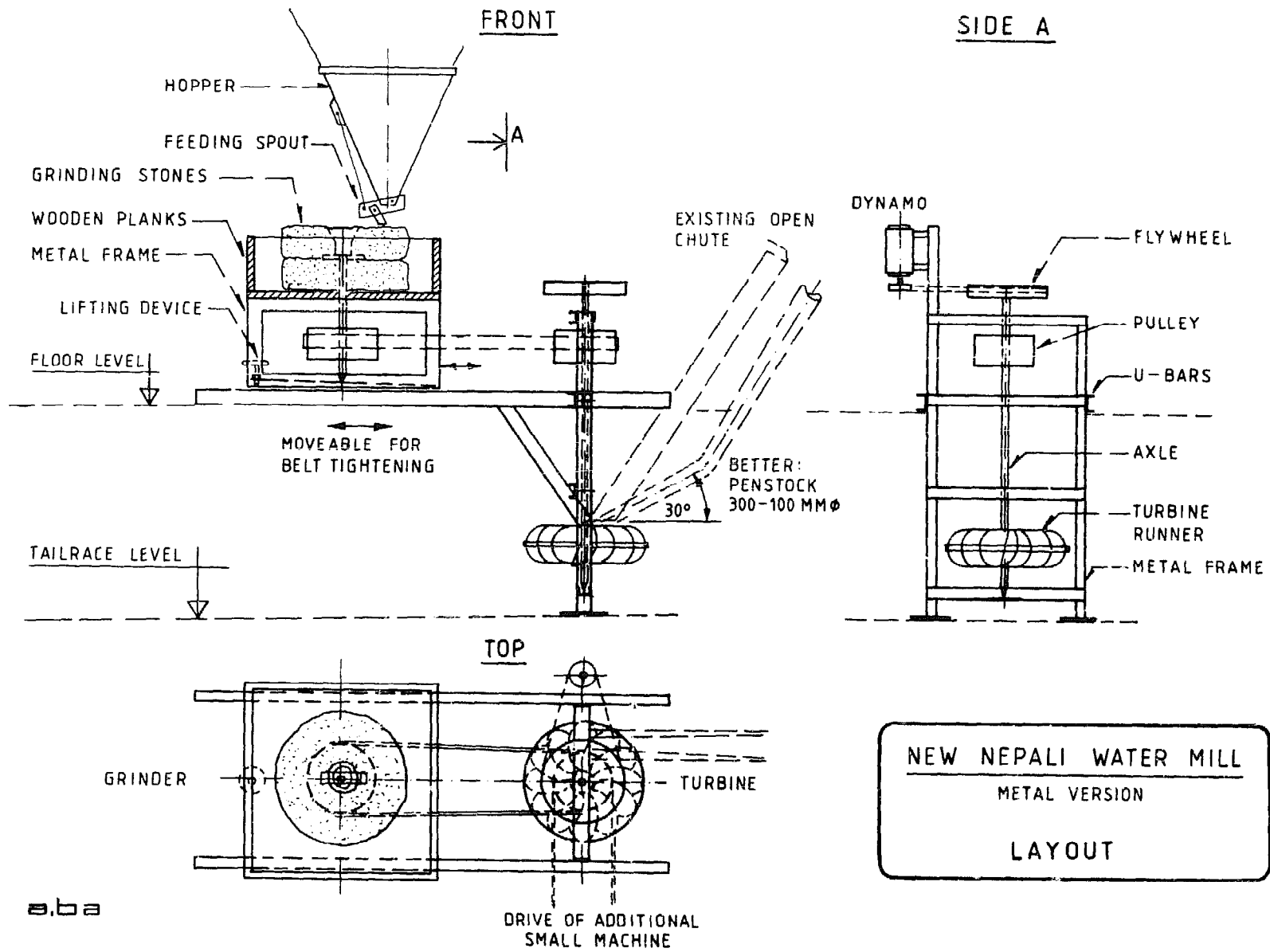
RPM OF STONE APPROX. 100-150

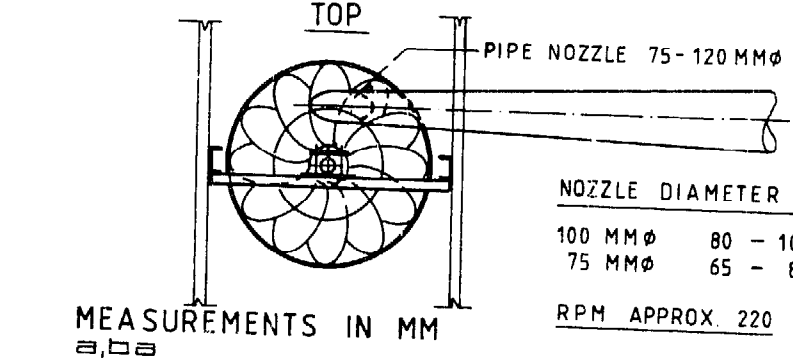
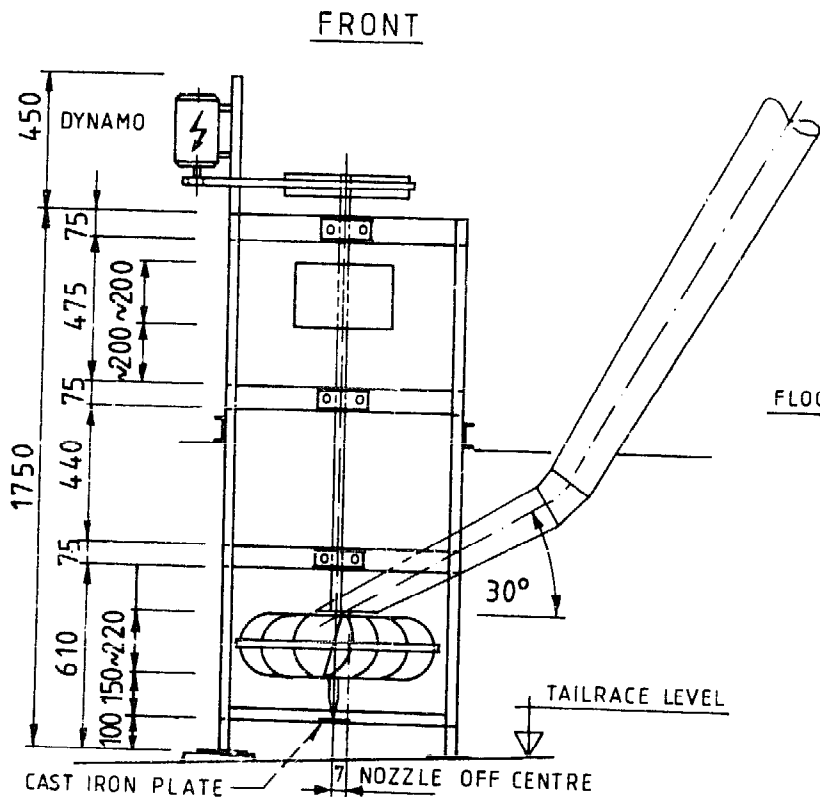
NEW NEPALI WATER MILL

WOODEN CONSTRUCTION

GRINDER

MEASUREMENTS IN MM
8.8.3

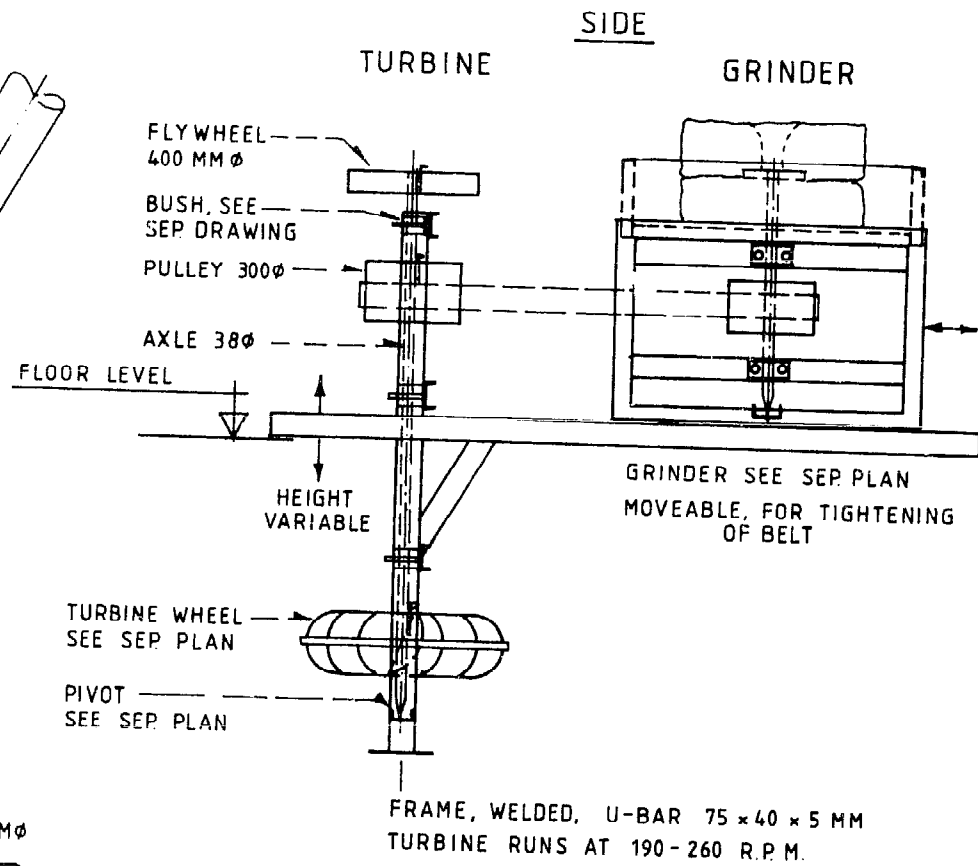




NOZZLE DIAMETER (4 MTR HEAD)

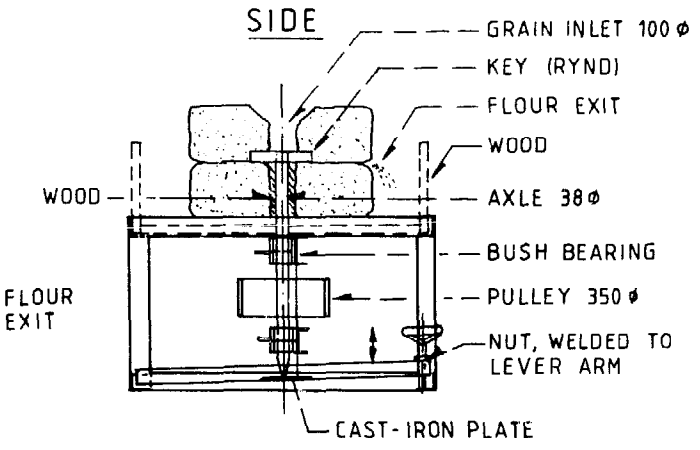
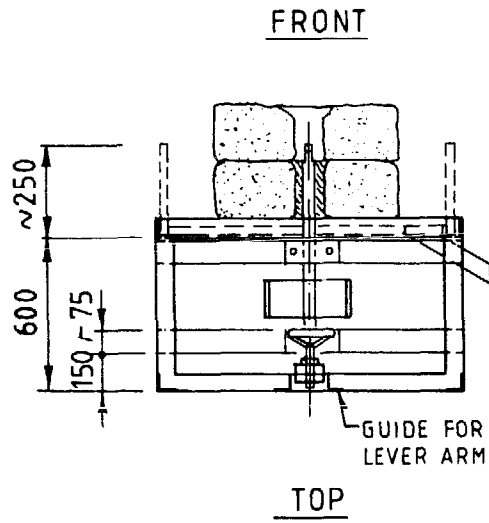
100 MM Ø	80 - 100 LTR / SEC
75 MM Ø	65 - 80 LTR / SEC

RPM APPROX. 220

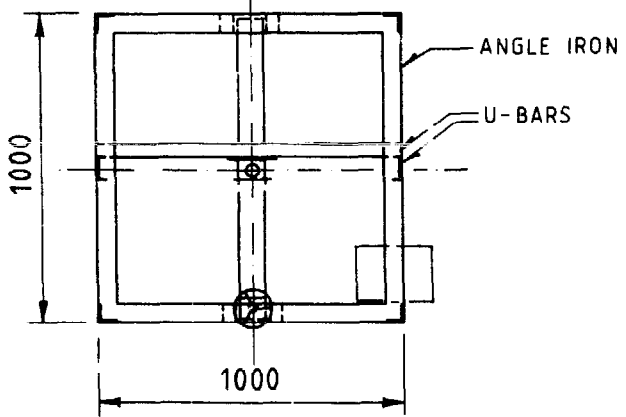
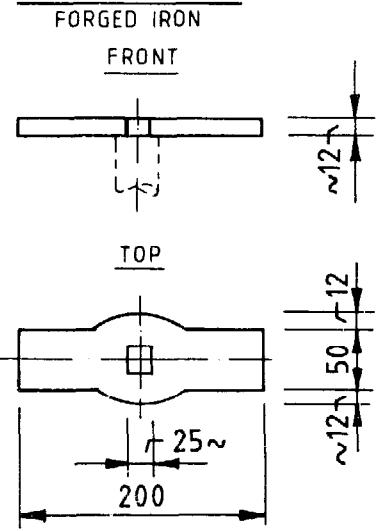


NEW NEPALI WATER MILL
METAL VERSION
FRAME FOR TURBINE

GRINDER



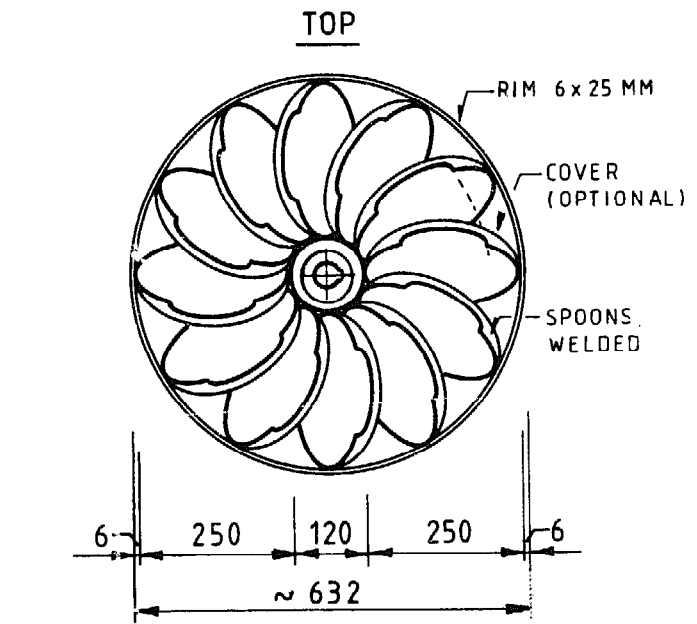
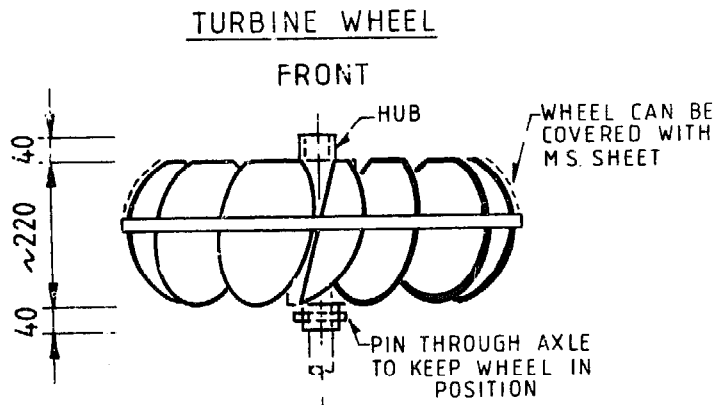
RYND (KEY)



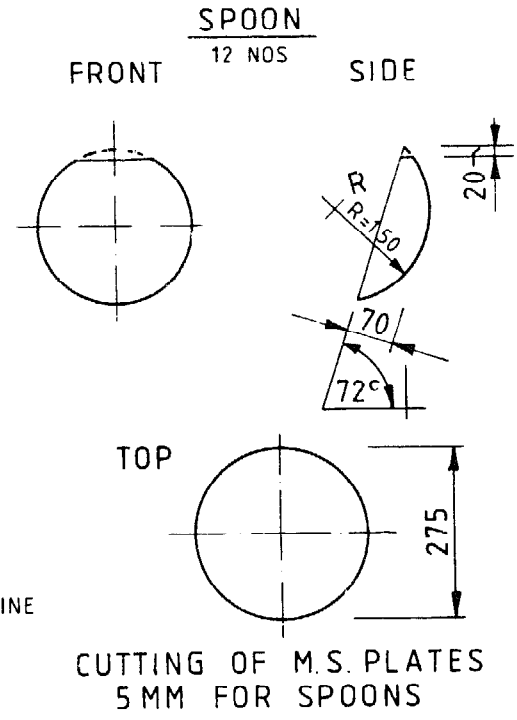
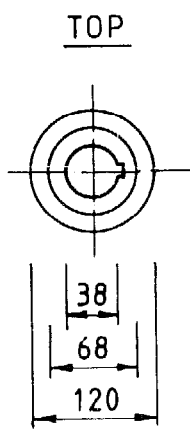
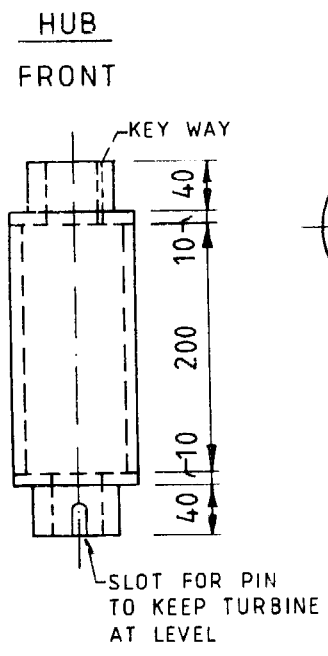
- R.P.M OF STONE APPROX 100 - 150
- MATERIALS:
 - U-BAR 75 x 40 x 5 mm
 - ANGLE-IRON 65 x 65 x 6 mm
 - BUSH & BOTTOM PIVOT → SEP SHEET

MEASUREMENTS IN MM
8.8.8

NEW NEPALI WATER MILL
 METAL VERSION
 GRINDER

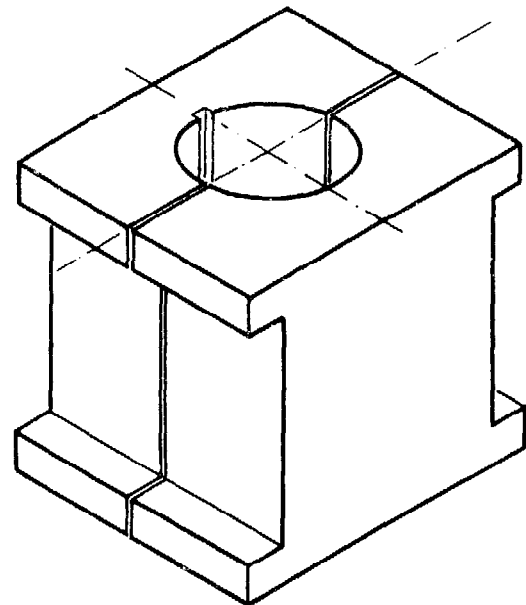
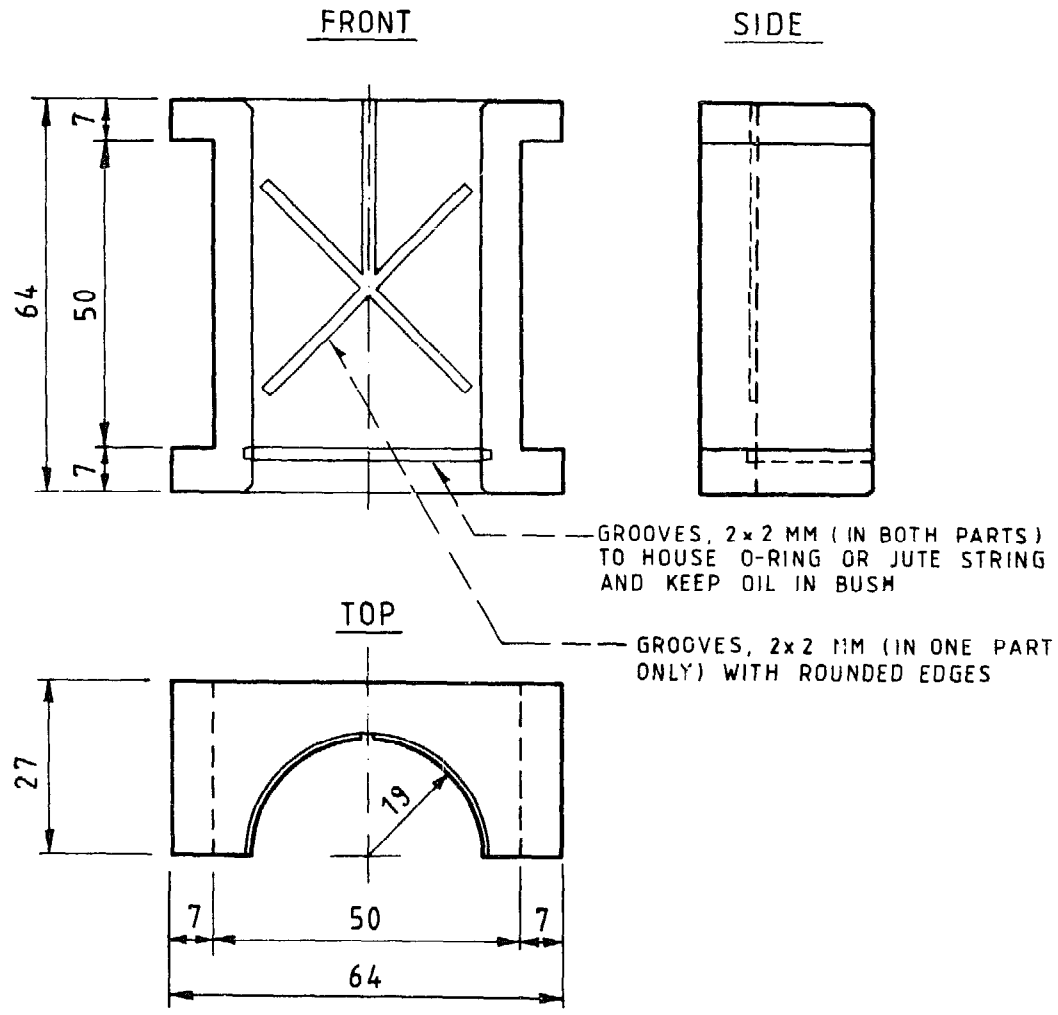


MEASUREMENTS IN MM



NEW NEPALI WATER MILL

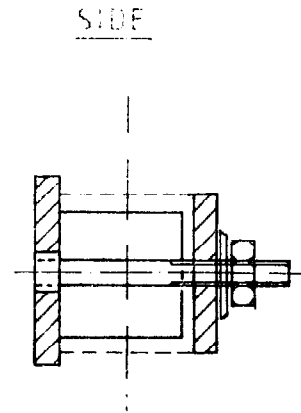
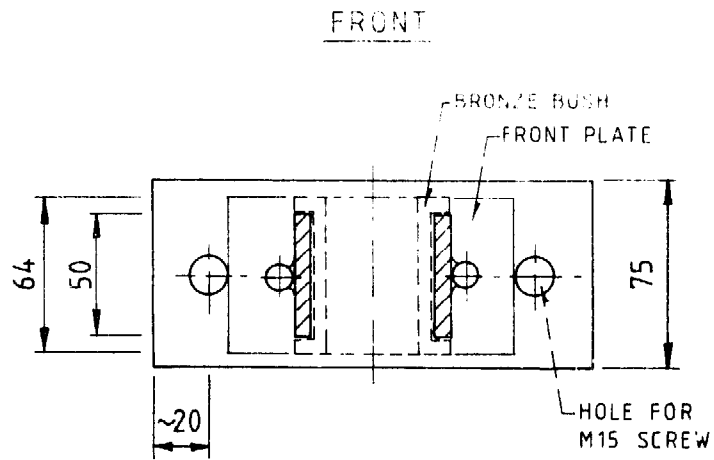
TURBINE WHEEL



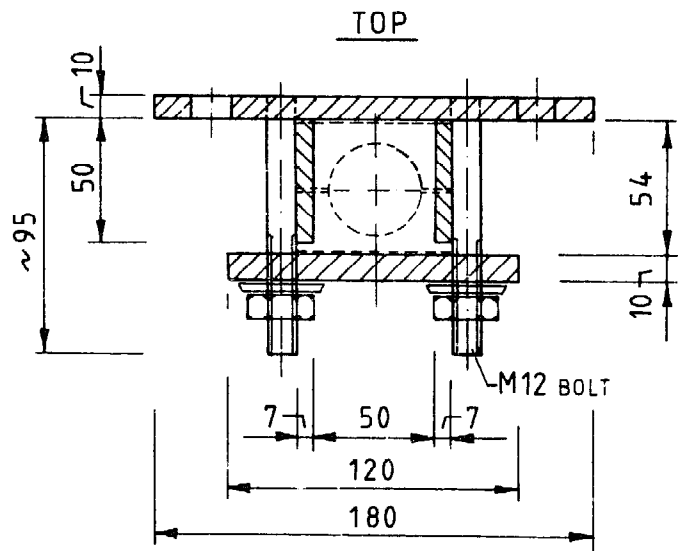
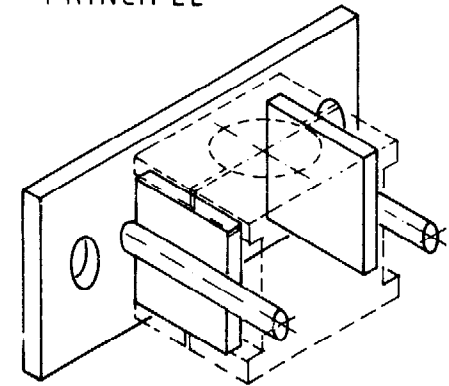
ASSEMBLY / ISOMETRIC

NEW NEPALI WATER MILL
TURBINE + GRINDER
BRONZE BUSH

MEASUREMENTS IN MM
≡, □ ≡



PRINCIPLE



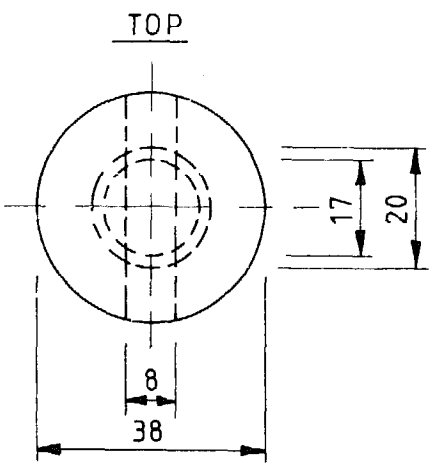
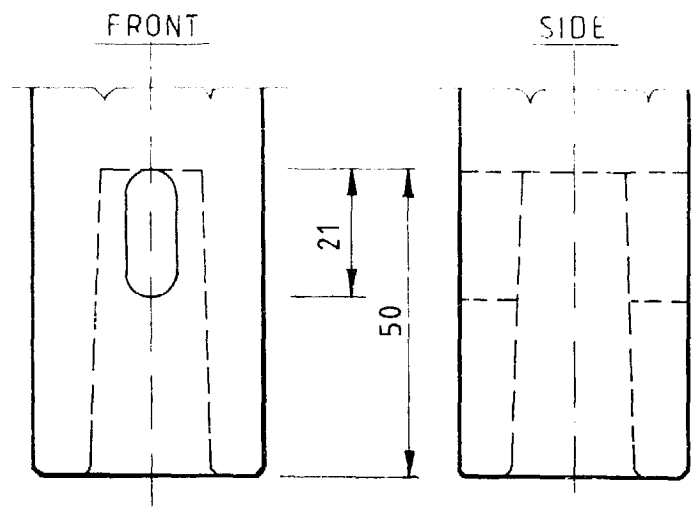
MEASUREMENTS IN MM
0.00

MATERIAL: MILD STEEL
BRONZE BUSH: SEE SEP. DETAIL

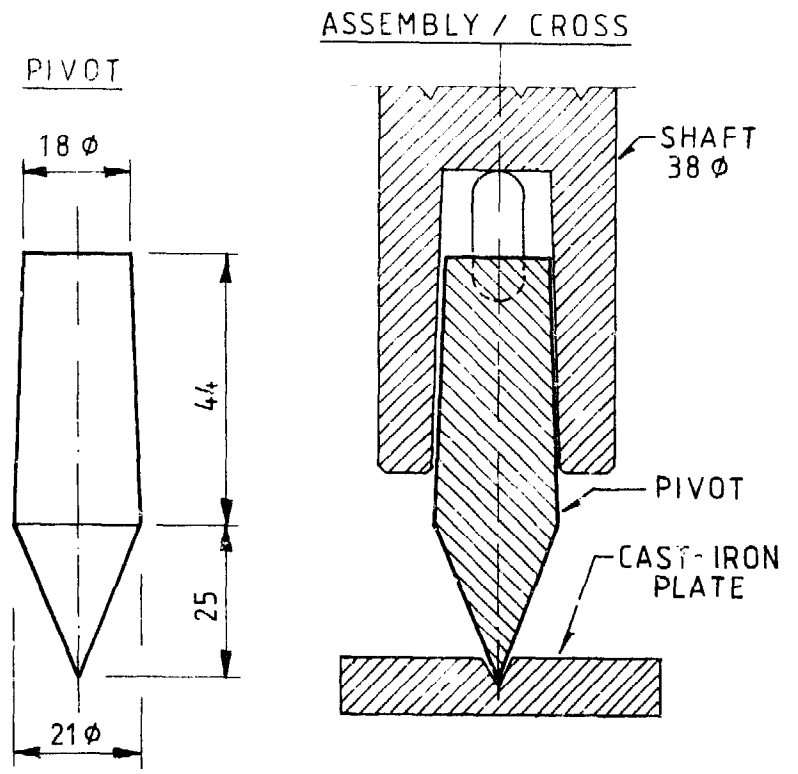
NEW NEPALI WATER MILL

TURBINE AND GRINDER

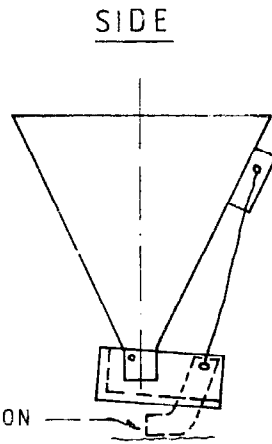
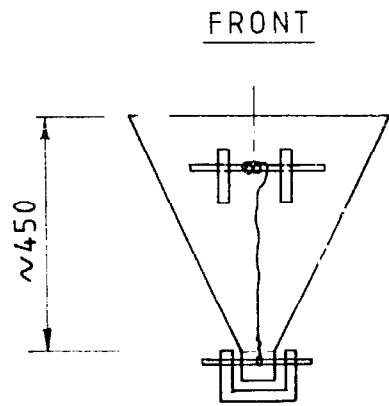
AXLE - FIXATION



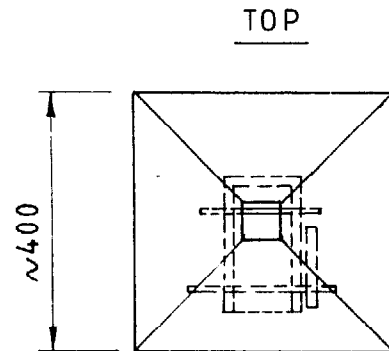
MEASUREMENTS IN MM
a,ba



NEW NEPALI WATER MILL
TURBINE + GRINDER
PIVOT ASSEMBLY

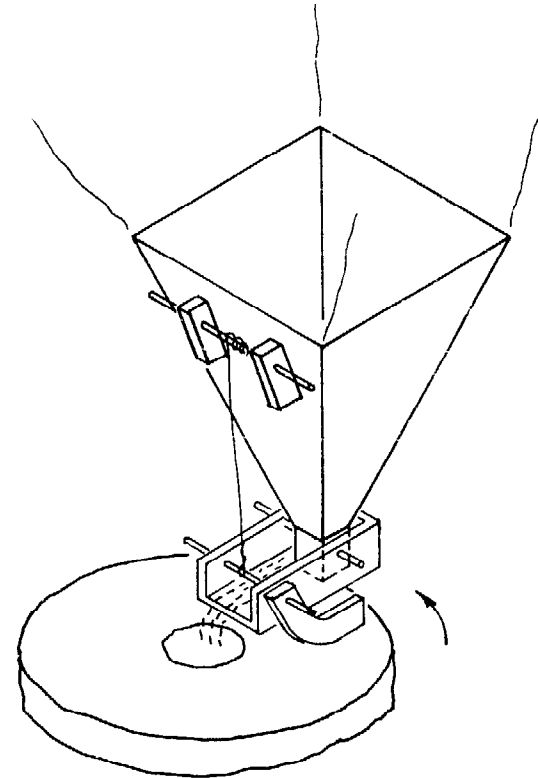


„BIRD“; VIBRATION
KEEPS GRAIN
MOVING



A HOPPER CAN BE MADE OF
BAMBOO OR METAL, OR OF
OTHER MATERIALS.

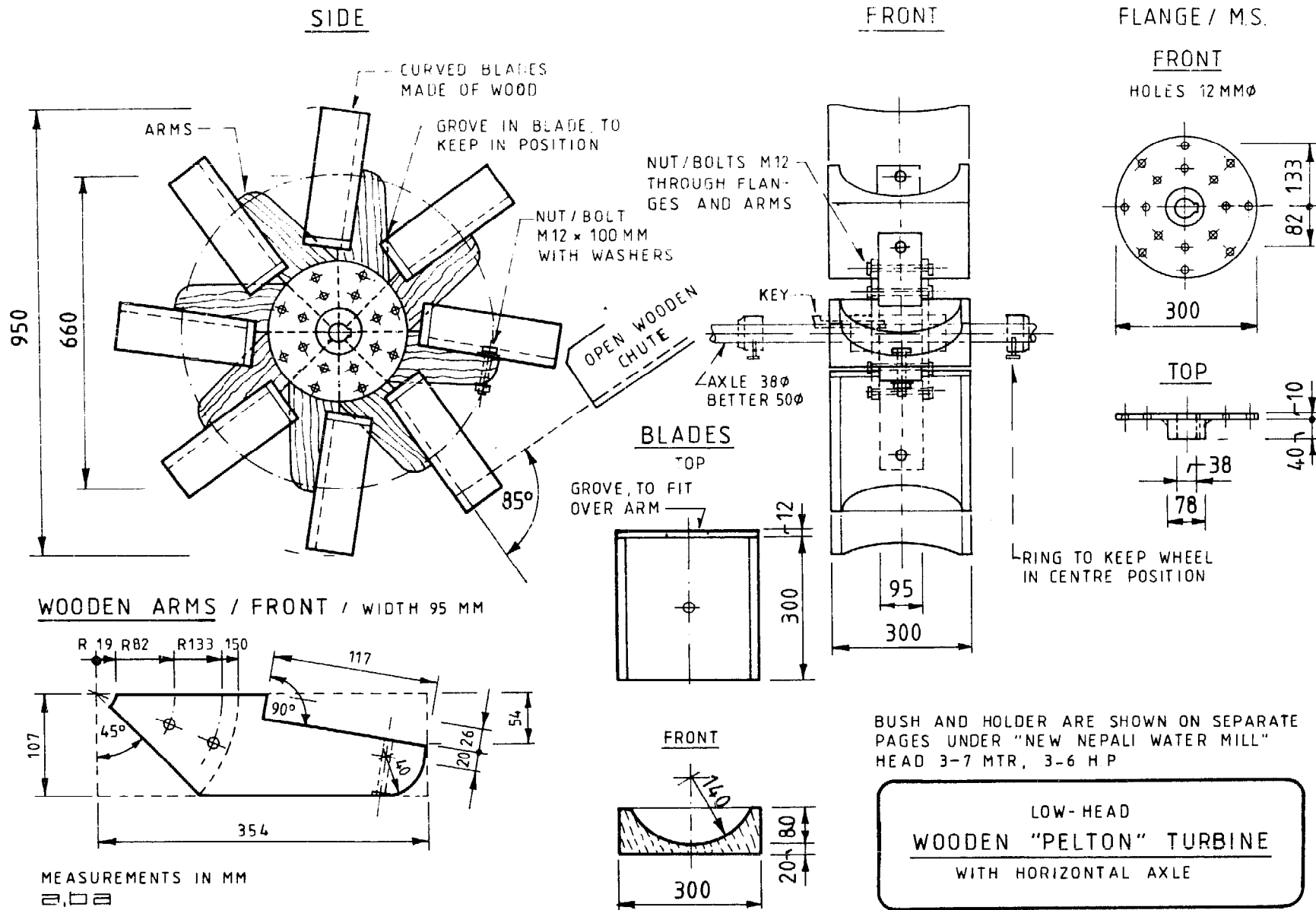
MEASUREMENTS CAN BE
DIFFERENT THAN THESE
ONES.

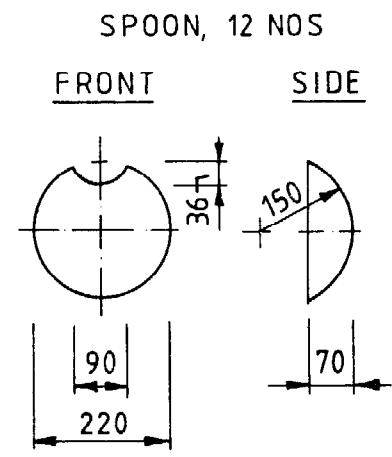
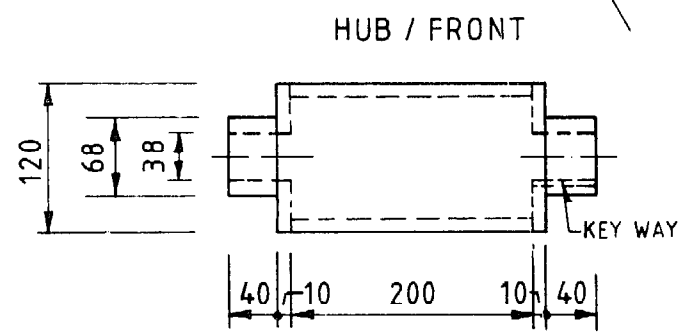
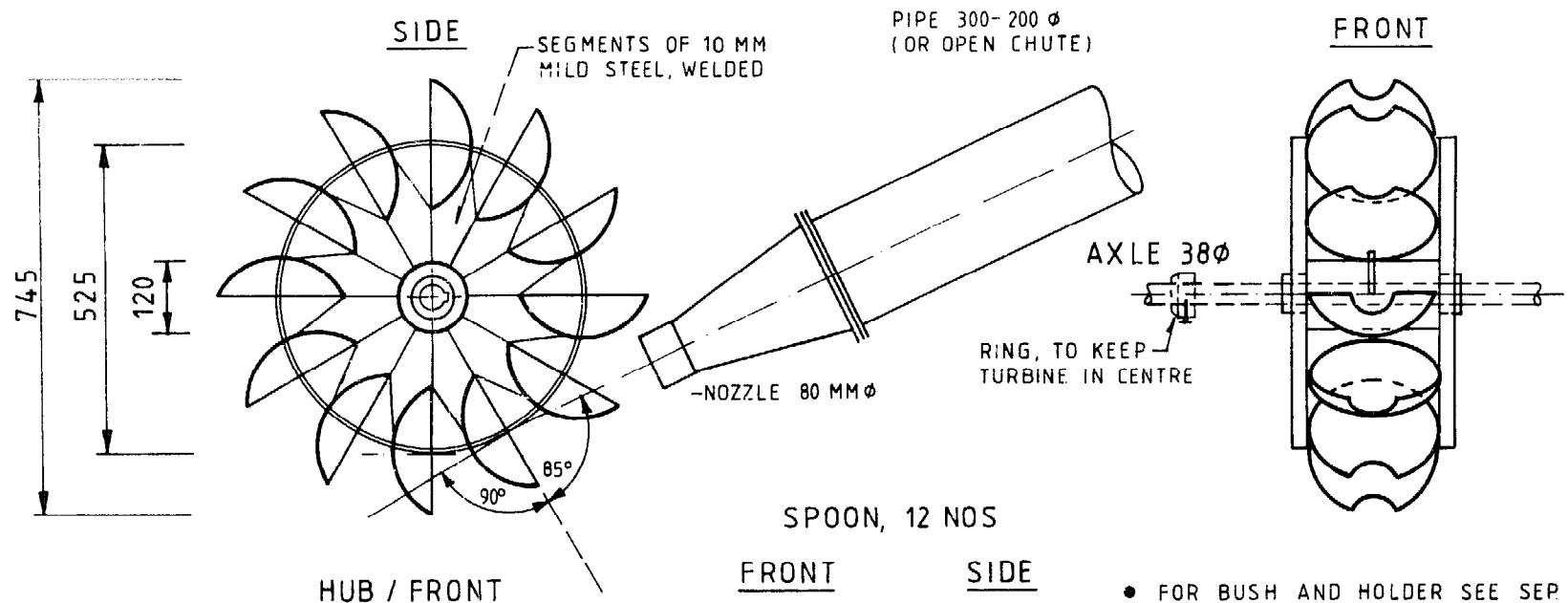


NEW NEPALI WATER MILL

HOPPER

MEASUREMENTS IN MM
8.108 6/83





- FOR BUSH AND HOLDER SEE SEP. DRAWING, UNDER "NEW NEPALI WATER MILL"
- TURBINE RUNS AT APPROX. 200 R.P.M. WITH 50 LTR/SEC AND 7MTR HEAD

MEASUREMENTS IN MM

SPOONS FORGED INTO SHAPE
 CUTTING: 275 MMφ, 3MM THICK

LOW HEAD
PELTON TURBINE
 METAL VERSION

CONSTRUCTION MATERIALS

NATURAL GRINDING STONES These stones are cut from larger stones with hammer and chisel. These stones are often found in river beds, quite near the traditional mill sites. People prefer the flour ground by such stones, because the speed is quite low the flavour remains very good.

Traditionally the upper stone rotates, and the lower stone is laid on the ground above the supporting wood-beam structure (the water wheel is directly below it).

The sizes of the stones vary and may be from 60 to 90 cm diameter. The millers change them depending upon the flow of water available to turn the water wheel.

The upper stones turns anti-clockwise, seen from above (for traditional reasons). As it is loosely laid on an iron key the speed should not exceed 150 rpm.

Interesting enough, people often prefer to have such natural grinding stones (where they can afford to wait for the rather slow grinding) for reasons of better taste.

CAST GRINDING STONES

They are to be bought in shops; and they are imported from India. The material consists of, for example, 75 percent Emery.

These stones are harder, and need less frequent re-dressing compared with natural stones. As they can run at higher speeds they have also a higher productivity. However, the higher speeds heats the material being ground, detracting from its flavour, and also decreases its storage life. In mills using these stones, it is the lower one that rotates (clockwise, seen from above).

The diameter ranges from 60 to 90 cm, but the 60 cm diameter stone is mostly used. Caution that these stones remain dry, especially during transportation, otherwise they will be spoiled!

WOOD

Water wheels and mills made of wood may be justified where wood is quite easily available. Wood has advantages; it can be cheap, local carpenters can handle it, the maintenance and replacement can be managed locally - the device can be copied quite easily by others, and thus technology transfer is facilitated.

On the other side, wood has some acute limitations. In a country like Nepal good quality wood is not that easily available. Even small water wheels are quite heavy, making transportation to remote areas difficult. Wood absorbs water and when it freezes, the wood is spoilt. Durability is reduced by exposure to water and regular drying. Another limitation on quick development of wooden water wheels may be the lack of information on good construction methods.

These days, metal parts, such as axles and bushes, can be incorporated into wooden water wheels. This facilitates construction and results in a better product.

METAL

Turbines made of metal need to be made in specialized workshops. The sizes range from a few horse power to very large ones. With smaller sizes the weight remains quite reasonable, precision and strength guarantees a long lifespan, large production can be done by several manufacturers. Modern information is available: it concentrates mainly on metal turbines.

BEARINGS

Many different bearings are available. It is, however, not easy to say which are good ones on the local market: sometimes they are "re-conditioned" bearings, meaning a combination of old and new bearings. Bearings in the rural context may cause maintenance problems. Proper alignment and replacement also are difficult.

BUSHES Bushes can be made locally and are readily understood, as this material is also used in other machines. If the original pieces wear-out they can be replaced by oil-soaked wooden blocks. */**

PENSTOCK Pipes are essential for any turbine which works with pressure (Pelton; Francis, etc.) and where increased power production is required. Penstocks are normally made of mild steel sheet in Nepal. Of late HDPE has also been used.

OPEN CHUTES Are used for traditional water mills to run the low head horizontal axle water turbines. Open chutes are also successfully used in Bhutan for traditional, horizontal axle water wheels. Latest trials show that open chutes can successfully run low-head "Pelton", MPPU-type turbines - New Nepali Water Mills.

* "Bearing Design and Fitting", by Ian Bradley, :1965
Model and Allied Publications, Argus Books Ltd.
available: META Publications, Marblemount/WA 98267 - USA

** "Oil Soaked Bearings: How to make them", by John Collet,
Appropriate Technology Journal Vol 2, No. 4
available: IT-Publications, 9 King Street, London WC2E, 8HN
U.K.

LIST OF APPLIANCES / R.P.M + H.P. REQUIREMENTS			
S.No.	MACHINE	R.P.M.	H.P./MACHINE
1	<u>GRINDING DEVICE</u> , 600-700 mm ϕ Local stones (capacity approx. 12-16 kg/hr)	100 - 150	1 - 2
	<u>GRINDING DEVICE</u> , 610 mm ϕ Emery stones (casted) (capacity 75 kg/hr) (capacity 1 Muri/hr)	200 - 500	2.5 - 5
2	<u>RICE HULLER</u> , No. 5 (cap. 90 kg/hr; 1/4 Muri/hr)	600 - 750	2.5 - 5
	<u>RICE HULLER</u> , No. 4 (cap. 250 kg/hr; 3 Muri/hr)	1000	5 - 10
3	<u>OIL EXPELLER</u> , No. 3 3 Bolts, approx. 150 kg (cap. 15 kg/hr; 1/4 Muri/hr)	400	3 - 5
	<u>OIL EXPELLER</u> , No. 5 4 Bolts, approx. 350 kg (cap. 45 kg/hr)	175	5
	<u>OIL EXPELLER</u> , No. 6 6 Bolts, approx. 450 kg (cap. 60 kg/hr)	175	7.5
4	<u>CHURA MILL (RICE FLATTENER)</u> - 75 cm ϕ (size 3 HP) (cap. 75 kg/hr; preboiled)	200	3 - 5
5	<u>THRESHER MACHINE</u> (capacity 800 kg/8 hrs a day)	400	1 - 2.5
6	<u>CIRCULAR SAW</u> , 350 mm ϕ (max. cutting 125 mm)	1500 - 2000	2
7	<u>PLANING MACHINE</u> (max. width 150 mm)	2000 - 3000	1
8	<u>WOOD TURNING LATHE</u> (max. 300 mm ϕ) (max. 600 mm length)	100 - 300	1
9	<u>DYNAMO</u> , DC. 12 V, 400 W approx.	1000 - 1200	1/2
10	<u>EL. GENERATOR</u> , AC 220 V, approx. 1 kW	2800	1.3
11			