DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept.Bk.No.: 81/27

AN EASILY CONSTRUCTED CONCENTRATING TABLE

GEOLOGICAL SURVEY

by

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DME No.: 88/81

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AN EASILY CONSTRUCTED CONCENTRATING TABLE

ABSTRACT

A shaking table that can be built by small mining operators has been designed to produce concentrates of heavy minerals.

The table is simple to build, has low power consumption and high throughput and has been used successfully to treat ores of lead, tin, gold, bismuth and molybdenum.

Slope of table, strength of bump, rate of feed and waterflow can be adjusted during operation for optimum recovery.

INTRODUCTION

This report has been prepared to assist a handyman, with limited capital, build a concentrating (or shaking) table for the separation of high density minerals such as gold, tin and galena from less dense country rock and gaugue. This table possesses several advantages over commercially available shaking tables, such as the Wilfley Table. The most important advantages for tables of this size include:

a) High feedrate - up to 2 tonne/hour

b) Low power consumption - a 100 watt electric motor is sufficient to shake the table

c) Low rate of water consumption - up to 35 l/minute.

d) Can be adjusted while operating

e) Low cost of maintenance, because of the simplicity of construction

f) Light weight - less than 0.6 tonne

g) Cheapness and ease of construction - there are no complex and expensive castings required - the table is moved by centrifugal force; there are no complex toggles

and pitman arms nor other geared deck motion producing mechanisms

One of the authors (KAS), has constructed and operated five such tables for concentrating:

a) galena at Cap-a-lot Mine near Mount Isa, Qld.

b) tin on the Atherton Tableland, Qld.

c) gold at Lug-E-Nor Mine near Gympie, Qld.

d) bismuth and molybdenite at AW-Mine near Deepwater, N.S.W.

e) gold at Kitticoola Mine, near Palmer S.A. (See photograph fig. 13.4, page 151 in Armstrong, 1978)

Results from these tables were very good with recovery of galena up to 97%, and for free gold up to 90%. The rates of ore feed averaged 1.25 to 1.5 tonne per hour of minus 80 mesh (less than 0.18 mm) deslimed material.

These concentrating tables were constructed from imperial measurements and these measurements converted to metric are given in the text and in Figure 1. Slight variations in size from those given are not important.

CONCENTRATING TABLES - GENERAL

Modern shaking tables are concentrating devices that consist of a plane surface inclined slightly in the direction of the shorter dimension, and include a mechanism to shake this surface longitudinally with a bumping action. To increase the efficiency and the size of material that can be handled, longitudinal cleats or riffles are required. To some extent the shaking table operates in a manner similar to that of a gold pan, but provides continuous mechanised production. Successful tables have been designed to handle base metal ores as coarse as 6 to 10 mm and coal as coarse as 55 mm.

For a very good description of shaking tables and their principle of operation see Taggart (1945) pages 11-59 to 11-90, and for a less detailed description, Taggart (1964) pages 225 231.

OPERATION OF CONCENTRATING TABLE

The shaking motion of this table is achieved by an adjustable out of balance wheel (4) (See Figs 1A and B), the bump stop arrangement (6), and the geometrical arrangement and springiness of the legs (11). The bump stop, halts the table at the end of its movement in the direction that the ore travels.

Water is added to the feed box (14), and also along the length of the top side of the table via 5 mm holes 100 mm apart in 13 mm galvanised water pipe, (17 in Fig. 1A and B) to help carry the feed along and down the table. This table requires about 15 litres per minute for fines (less than 40 mesh-0.425 mm) and up to about 35 litres/minute for coarse feed (8 mesh - 2.36 mm).

The height and spacing of the riffles depends on the size of the feed. The riffles should be higher and more closely spaced for coarser grained feed. The height and spacing of the riffles in Figure 2 are well suited to feed less than 8 mesh (2.36 mm).

The slope of the table can be adjusted by means of sliding wedges (Fig. 2C). The deck clamps (7 and 8) hold the table top rigid on the upper moving frame and must be loosened for slope adjustment.

CONSTRUCTION AND MATERIALS

The table is made of timber and mild steel. Seasoned oregon is recommended for the frames and 25 mm thick marine ply for the deck (or table top). Although many types of wood have been tried for the legs, the most satisfactory has been seasoned spotted gum

because it retains flexibility for longer.

The deck clamps (7,8) are made of mild steel about 12 mm thick.

The tabletop and top frame is offset as shown in figure 3. So that the alignment of the top brackets of the legs is maintained on the top frame, and to give the table a slight side motion at the discharge end, the bottom and top leg brackets are rotated to the angles shown.

The slope adjustment lifting wedges (Fig. 2C) are made of any hardwood and grooved. The movement of the wedge is achieved by rotation of a threaded mild steel rod 20 mm diameter and about 2400 mm long which is secured to the moving wedges, and passes through a suitable nut attached to the moving frame. A handwheel is attached to the end of the rod for ease of adjustment.

The stabilising rod (13) about 12 mm diameter and about 880 mm long mild steel, is mounted on the feed side of the bottom frame (3), and to the underside of the deck (1) by eyes. The rod is attached at an angle of about 60^{o} in both side elevation and in plan to follow the movement of the deck. The following procedure may be used to determine the point of attachment to the underside deck frame: the lower end of the rod is attached to the bottom frame (3) at a suitable point (See Fig. 1A). The table is then rocked through its normal distance of movement by hand, and the free end of the rod is moved until a point is found on the deck frame such that the free end of the rod, if attached to this point can follow the movement of the deck frame without undue stress on the point of attachment.

The hinges (12), which can be strong gate hinges are mounted to the moving frame (2) and to the deck frame inside the splash plate (15 in Fig. 2A).

The driven weighted pulley (4) is any suitable pulley to which a position-adjustable weight can be attached. A suitable pulley is shown in Fig. 1A and B with dimensions. The position of the weight should be adjustable so that the force providing movement to the table is adjustable. Only about a 100 watt - electric motor is required to drive the pulley.

The riffles used have been made from American Sugar Pine but other timber may be suitable. A suitable timber will be unaffected by water and be slow wearing. The width of each riffle is 12 mm and the height tapers uniformly from about 18 mm to 1 mm over about 220 mm. The arrangement and position of the riffles is shown in Fig. 2H, the ends at the discharge end of the table being 1 mm high. The riffles should be attached to the deck with brass or bronze nails.

TABLE ADJUSTMENTS

Maximum recovery, concentration and through put cannot be achieved similtaneously. Adjustments to obtain optimum results are as follows:

1) Slope of the table - adjusted by loosening the deck clamp (7) and operating deck tilting mechanism to raise or lower the edge of the table and then tightening clamp (7).

2) Strength of bump - adjusted by shifting the weight on pulley (4) and/or adjusting the bump screw (6 in Fig. 1C). Following these alterations the tension in the coil spring (5 in Fig. 1D) should be adjusted so that the spring is under compression over half the table movement.

3) Rate of feed.

4) Water flow rate - 15 litres per minute for fine material

up to about 35 litres per minute for coarse material (up to 8 mesh - 2.36 mm).

OPERATIONAL HINTS

For coarse material (40 to 8 mesh - 0.425-2.36 mm), the most suitable pulley speed is about 250 rpm, a table movement of about 25 mm and a soft bump. For fine material (less than 40 mesh - 0.425 mm), the pulley speed should be up to about 300 rpm with a table movement of about 20 mm and a stronger bump.

Should the pulp (feed) become thickened and accumulate on the deck, deck movement may stop or move only occasionally due to the increased inertia of the deck. The water flow rate should be increased and bump adjustment should be made to increase the strength of the bump. The pulp accumulation should rapidly clear.

Feed and water flow rates are adjusted visually.

If the radial rod (13) becomes slack, the table will tend to deliver the concentrates near the discharge end.

The speed of rotation of the weighted pulley (4) should be uniform, and the table should be strongly mounted on a firm level foundation, preferably concrete.

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Mineral Resources

K A Salgo
per IGF

K.A. Salgo
Prospector
Mineral Resources

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Taggart, A.F., 1945. Handbook of Mineral Dressing, - Ores and Industrial Minerals. John Wiley & Sons, New York (1954 printing).

Taggart, A.F., 1964. Elements of Ore Dressing. John Wiley & Sons, New York (3rd printing 1964).

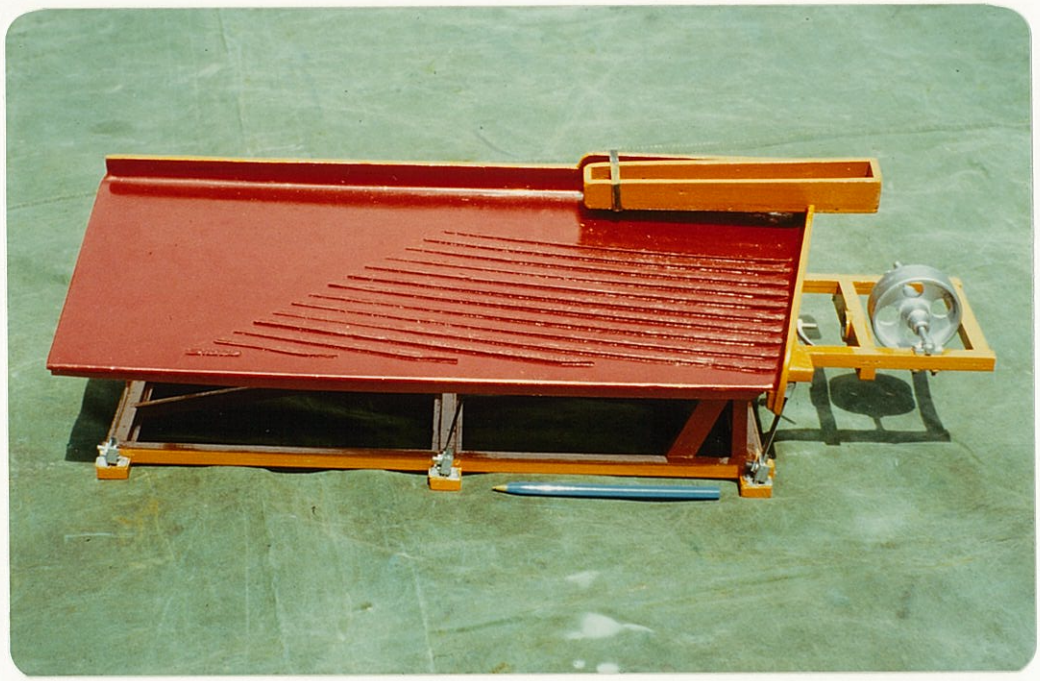
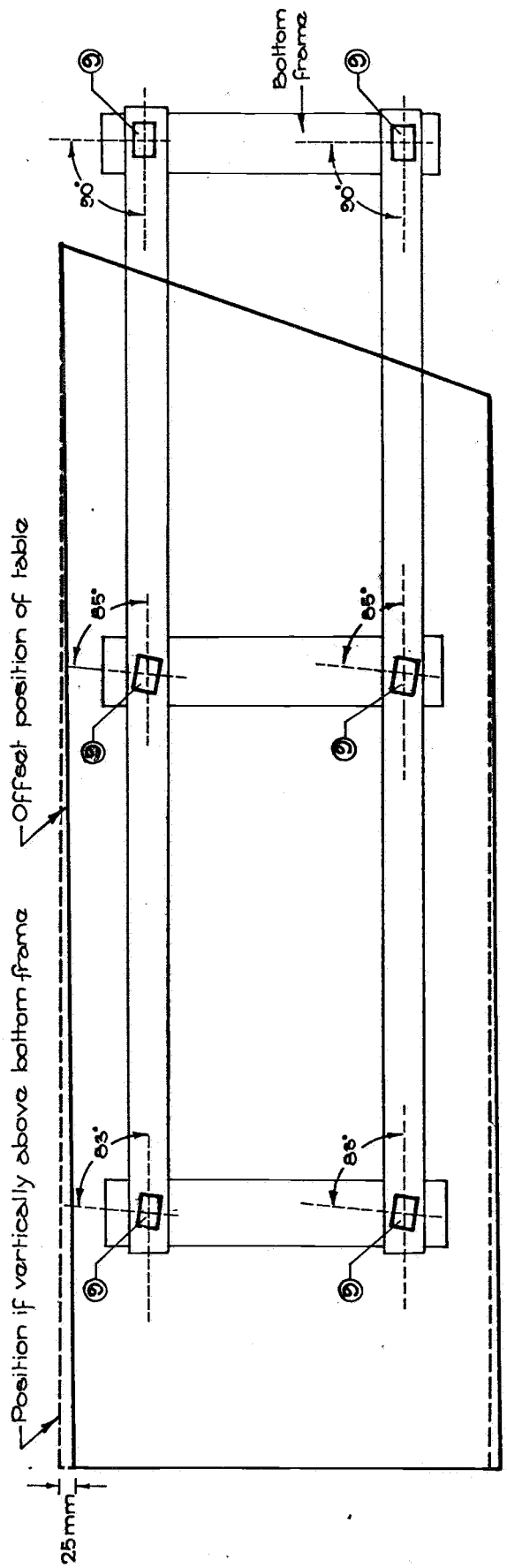


Plate 1. A non-working model of a concentrating table.

Feb 1981, Slide No. 15903



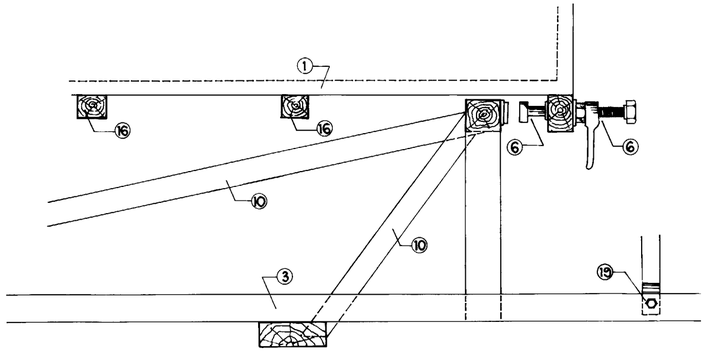
PLAN VIEW - Top frame not shown
G.....Leg bracket

Note: See also plans; 81-85 and 81-86.
Diagram is not to scale.

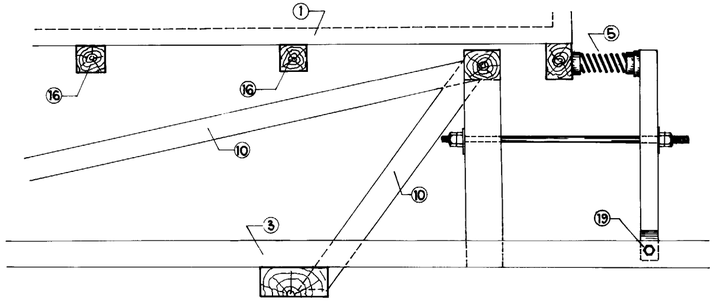
Figure... 3.

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED	C.D.O. 30-3-81 DATE
CONCENTRATING TABLE FOR HEAVY MINERAL SEPARATION	DRAWN C.J.W.	SCALE ——
ANGLES of BOTTOM LEG BRACKET and OFFSET of TABLE TOP	DATE Jan '81	PLAN NUMBER S15296.
	CHECKED	

Job No. 2277.

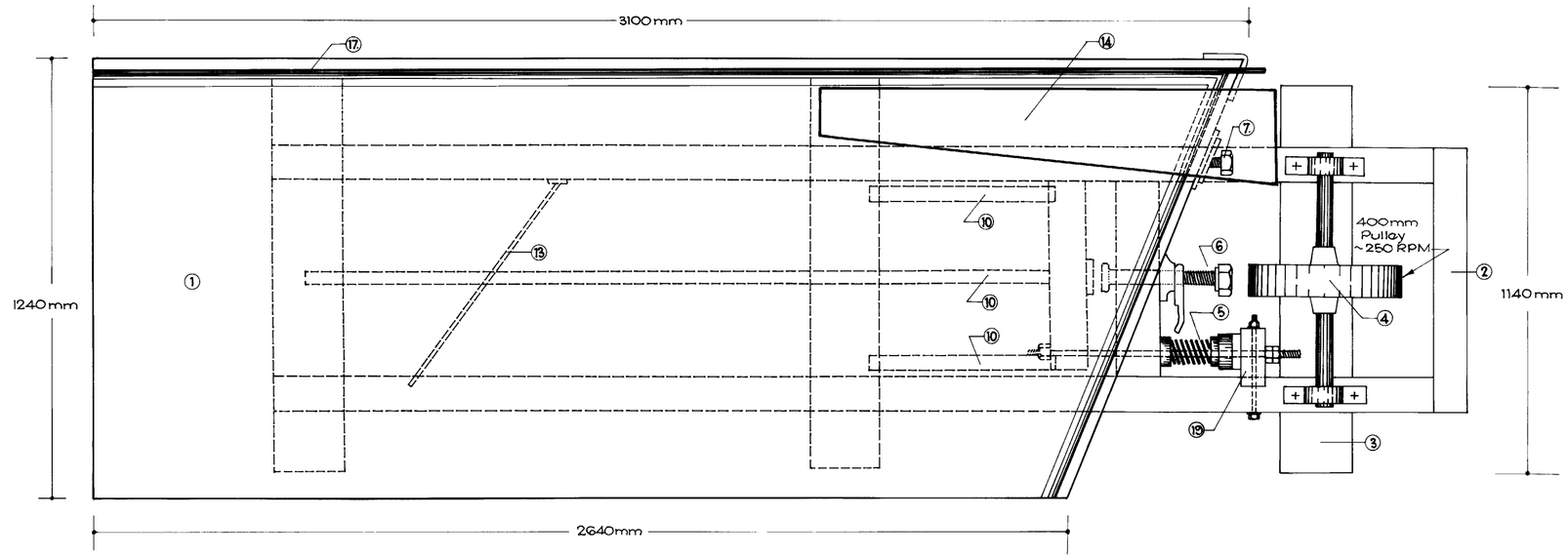


C. SIDE ELEVATION
To show adjustable bump stop

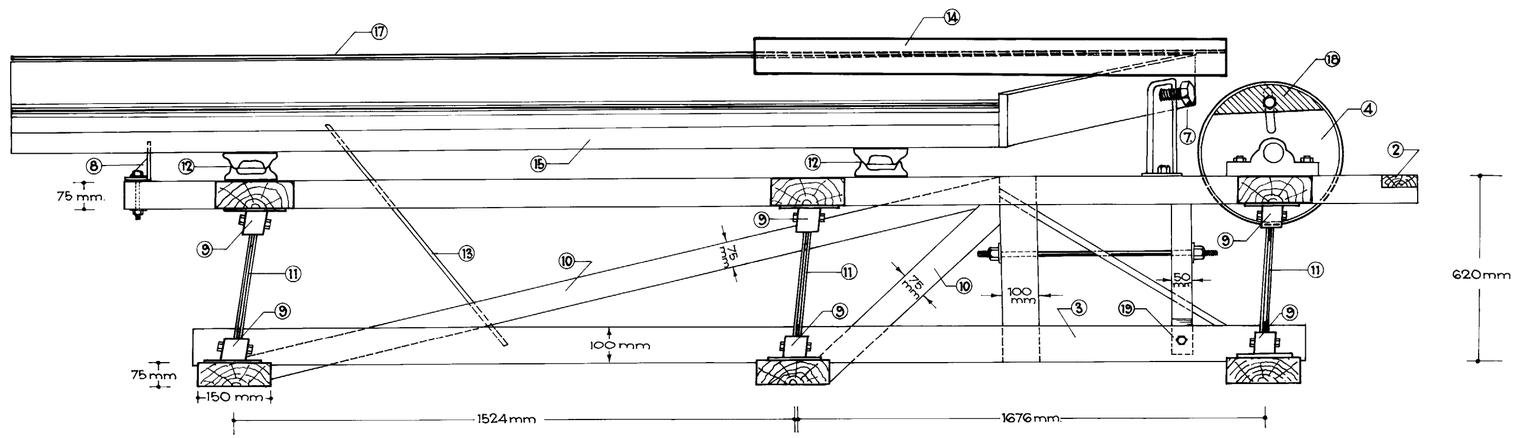


D. SIDE ELEVATION
To show adjustable spring

1.....Table top - deck
2.....Top framing
3.....Bottom frame
4.....Pulley with adjustable weight
5.....Coil spring - adjustable tension
6.....Adjustable bump stop
7.....Adjustable deck clamp
8.....Fixed deck clamp
9.....Leg bracket
10.....Frame brace
11.....Leg
12.....Deck hinge
13.....Stabilising rod
14.....Feed box
15.....Splash plate
16.....Deck frame
17.....Water feed pipe
18.....Adjustable weight
19.....Spring tension hinge



A. PLAN VIEW
Concentrating Table



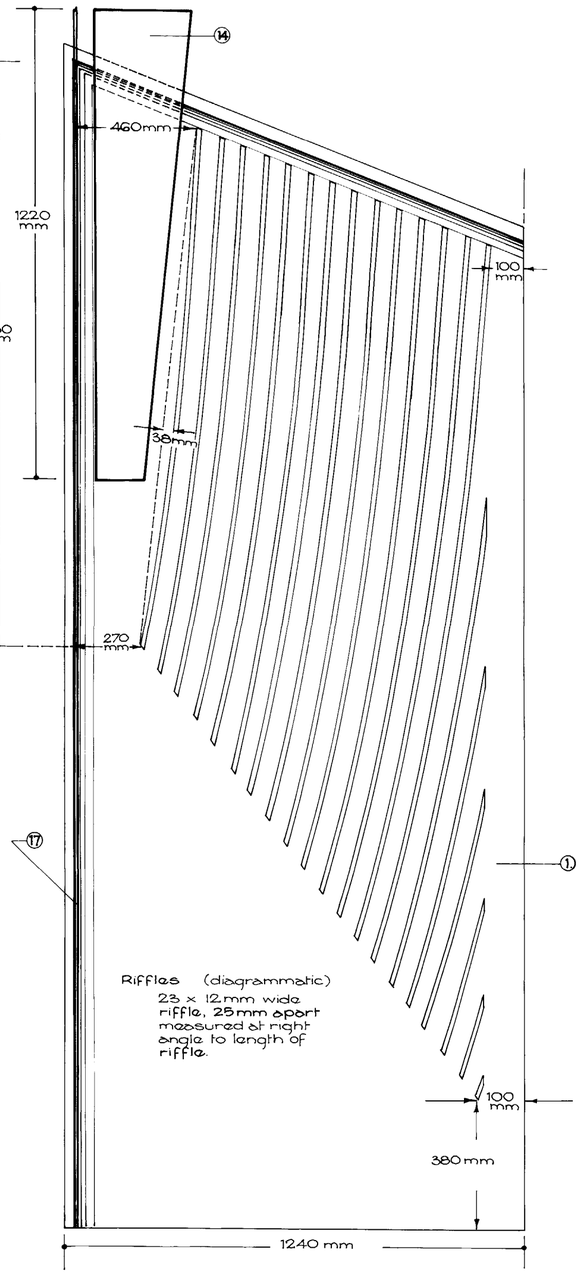
B. SIDE ELEVATION
Adjustable bump stop and
spring not shown.

Note: See also plans; 81-86 and S15296
Diagrams not to scale.

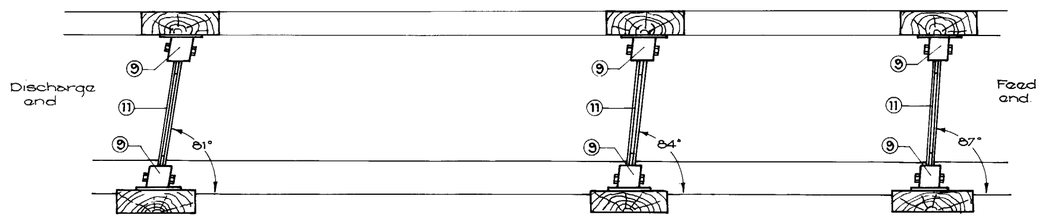
Figure... 1.

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED	30·3·81 C.D.O. DATE
CONCENTRATING TABLE FOR HEAVY MINERAL SEPARATION	DRAWN C.J.W.	SCALE ——
PLAN and SECTIONS	DATE Jan'81.	PLAN NUMBER 81-85
	CHECKED	

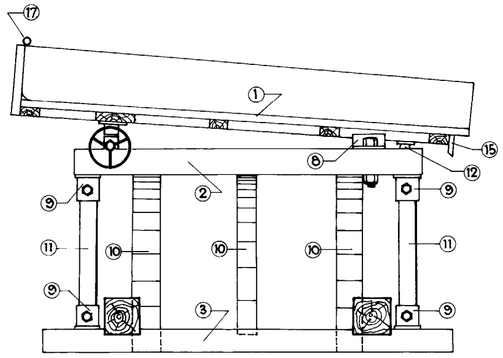
Job No. 2277



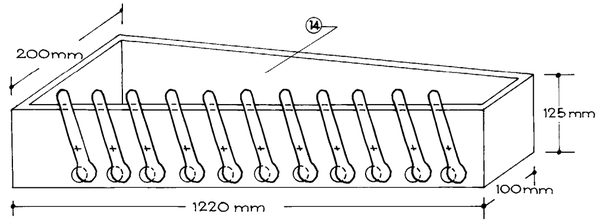
H. **DECK** – showing riffle arrangement



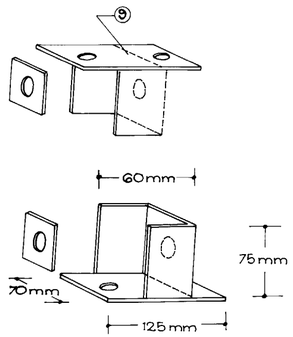
D. **SIDE ELEVATION** – top and bottom frames showing leg angle



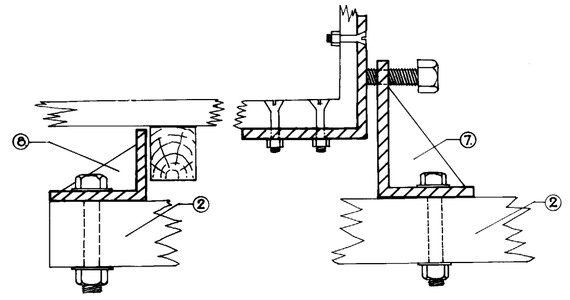
A. **END ELEVATION** – showing deck clamp and tilt adjustment



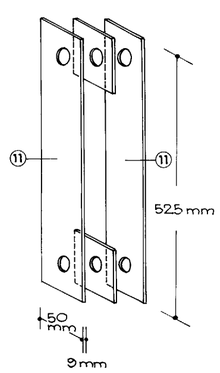
G. **FEED BOX** – showing a possible feed control



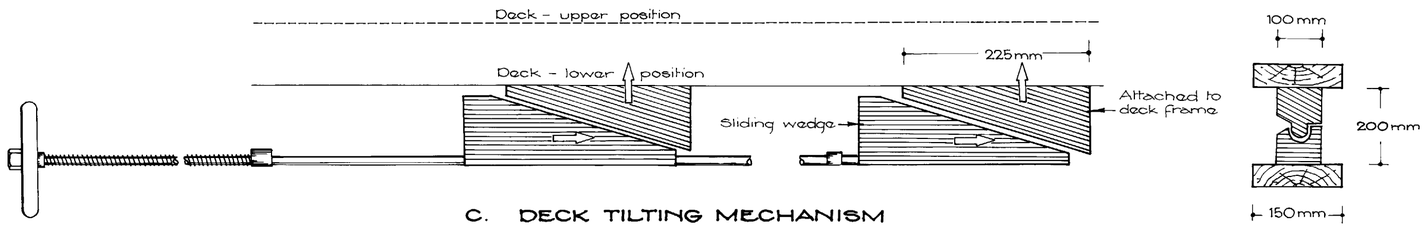
E. **UPPER AND LOWER LEG BRACKETS**
(constructed from 6mm mild steel)



B. **DECK CLAMPS** – adjustable (7) fixed (8) (From 12mm thick mild steel)



F. **LEG** (spotted gum)



C. **DECK TILTING MECHANISM**

1. Deck
2. Top frame (moving)
3. Bottom frame
4. Pulley with adjustable weight
5. Coil spring – adjustable tension
6. Adjustable bump stop.
7. Adjustable deck clamp
8. Fixed deck clamp
9. Leg bracket
10. Frame brace
11. Leg
12. Deck hinge
13. Stabilising rod
14. Feed box
15. Splash plate
16. Deck frame
17. Water feed pipe (13mm galv. water pipe with 5mm holes 100mm apart.)

Note: See also plans; 81-85 and S15296
Diagrams not to scale

Figure... 2

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

CONCENTRATING TABLE FOR HEAVY MINERAL SEPARATION
DETAILED SKETCHES

COMPILED	CDO	30·3·81	DATE
DRAWN	C.J.W.	SCALE	——
DATE	Jan '81.	PLAN NUMBER	81-86
CHECKED			

Job No 2277