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Specifications and bill of material for roaster in ore dressing laboratory of Missouri School of Mines

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THESIS

For the degree of

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in

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Specifications
and
Bill of Material
for

ROASTER
in

ORE DRESSING LABORATORY

of

MISSOURI SCHOOL OF MINES

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Approved Boyd Dudley Jr.

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SPECIFICATIONS

POSITION OF ROASTER.

In the North West corner of the East wing of the Metallurgy Building. The space allowed is nineteen feet (19ft) long by fifteen feet (15ft) wide. The floor is of concrete. The walls are of brick.

OBJECT OF ROASTER.

To give either an Oxidizing or a Reducing Roast; to partially roast the ore or to give it a dead roast.

TYPE OF ROASTER.

CYLINDRICAL, with a continuous feed and discharge, the ore travelling from the cold end of the cylimder to the discharge near the flame. The cylinder is revolved by means of a 3" face gear around the cylimder driven by a beveled gear. Two 3" tires around the cylinder revolving upon 6" solid rolls are used to support the cylinder.

FURNACE.

A modification of the coal fired Assay Furnace with a grate area of 2 1/12 sq. feet, (15"wide by 20"long). The furnace is completely lined with fire brick from six (6) to eight(8) inches thick. Outside this are eight inch (8") walls of common red brick. The corners are bound with 2" by 2" angles and the walls are braced against swelling from heat by four 1/2" bars on each wall. The roof of the furnace is so constructed that the flame on leaving the grate will be first directed downward toward the ore just being discharged, thus giving it the benefit of the greatest heat at the last moment of roasting. The fire door and ash door are of the size of those of the Assay Furnace, namely 12 3/4" wide by 11" high. These also are lined with four inches of fire brick.

CYLINDER.

A shell constructed of 1/4" iron, having an outside diameter of 3' and lined with 4" of fire brick. The total length is 8' 6". To prevent the lining becoming loosened four-inch angles are riveted to the plate at a distance apart of 2' on the circumference and 2' 1" on the linear distance, there being fifteen in all. The lining is held at the ends by means of an angle riveted on the outside of the shell and turned over the inside of the lining for 2". The cylinder has a slope of 1/2" to the ft. The tires and gear which encircle the shell may be obtained in one piece or in sections. The better arrangement is to have them made in four sections and have the sections bolted to-gether. A trap door 18" by 18" is provided in the middle of the cylinder for repairing the lining etc.

ORE FEEDER.

A screw conveyor having a 4" diameter and a total shaft length of 8' 2" is used to feed the ore from a hopper into a chute which leads to the upper end of the cylinder. The length of the spiral section is 5' 10". The box enclosing the screw is of 1" lumber. The chute which conveys the ore into the cylinder is of 1/8" steel plate, the upper portion being bricked into the top of the dust chamber. The specifications for the screw conveyor are given in the Bill of Material. The conveyor shaft is driven by a sprocket which is in turn driven by a sprocket on a counter shaft, this being driven by a sprocket on the line shaft (C).

DUST CHAMBER.

The feed end of the cylinder opens into a brick dust chamber in which is a 4" partition with a 3" opening on each side to allow the gases to escape into the flue. The dust will

accumulate in the hopper bottom and may be drawn out through the door at the bottom. The walls of the dust chamber are of 8" common red brick, there being no great amount of heat for the brick to withstand.

ROASTED ORE DISCHARGE.

The roasted ore falls over the edge of the lower end into a brick chamber built next to the furnace partition. It may then be drawn out through the fire door at the bottom of the chamber. The wall of this chamber directly under the cylinder is 4" thick while the two end walls are 8" thick.

ROLLS.

The rolls, 6" in Diam. are placed two on a shaft. The distance between centers of opposite rolls is 1' 10 1/2". The bearings used are of the extra heavy Rigid Pillow Block Type, and are set on heavy timbers which in turn have a foundation of concrete extending to the floor of the building..

CAPACITY.

The speed of the motor will be varied so as to vary the cylinder speed and thus vary the capacity of the roaster. The cylinder will be run at from 5 to 15 R.P.M. An eight foot screw running at the recommended speed of 100 R.P.M. has a maximum capacity of 100 bushels per hour. This amount will be greater than is desired in the laboratory. The speed of the conveyor will be reduced with the speed of the motor.

FEEDING THE CONVEYOR.

The ore will have to be shoveled into the hopper and will then be handled by the screw conveyor.

BILL OF MATERIAL.

Screw Conveyor.

Total shaft length ---------- 8' 2".

Screw section ---------- 5' 10".

Outside diameter ---------- 4".

Shaft diameter ---------- 1"

Recommended speed ---------- 100 R.P.M.

Max. Cap. at above speed ---- 100 bu. per hour.

Price (with one hanger) ----- $1.40 per ft.

Total cost ----------$11.40

Sprockets.

1 for conveyor shaft

Diam. ---------- 13 3/4".

Teeth ---------- 48.

Price(Bored 1" and K.S.) ------- $2.60

1 for counter shaft on wall bracket.

Diam. ---------- 10 3/4".

Teeth ---------- 37.

Price (Bored 1" and K.S.) --------- $2.15

1 for counter shaft on wall bracket.

Diam. ---------- 7 1/2"

Teeth ---------- 26

Price(Bored 1" and K.S.) ---------- $1.80

1 for line shaft (C)

Diam. ---------- 7 1/2"

Teeth ---------- 26.

Price (Bored 1 1/2" and K.S.) ----- $1.80

Gears.

1 band gear.for cylinder.

Inside Diam. ---------- 3'

Face ---------- 3"

Price ----------

1 beveled gear fro line shaft (C)

Greatest Diam. ----------

Least Diam. ----------

Face ---------- 3"

Price ----------

Bearings.

4-Extra Heavy Rigid Pillow Blocks.

Shaft Diam. ---------- 1 1/2"

Price each ----------

Total cost ----------

2-Common Flat Boxes.

Shaft Diam. ---------- 1"

Price each ---------- $1.00

Total cost ---------- 2.00

1-Standard Oiling Rigid Pillow Block

Shaft Diam. ---------- 1 1/2"

Price each ---------- $2.10

2-Common Flat Boxes.

Shaft Diam. ---------- 1.1/2"

Price each ---------- $1.65

Total cost ---------- 3.30

Wall Brackets.

1-for shaft (C)

Extension ---------- 22"

Price ---------- $16.60

Shafting.

2-Pieces for Rolls.

Diam. ---------- 1 1/2"

Length ---------- 5' 6" each

Price @ 31¢ per ft --- $3.41

1-Piece for line shaft.

Diam ---------- 1.1/2"

Length ---------- 10' 8"

Price @ 31¢ per ft --- $3.30

Pulleys. Keys.

1-for line shaft.

Diameter ---------- 24"

Face ---------- 6"

Bore ---------- 1.1/2"

Price (K.S. and Bored- $7.65

Collars.

6-Solid collars for 1 1/2" shaft.

Price each ---------- $1.00

Total cost ---------- 6.00

Angle Iron.

26' of 4" by 4"-- @ per ft. --------

24' of 2" by 4"-- @ per ft. --------

25' of 2" by 2"-- @ c per ft --------

Tires.

2-Double flanged tires.

Diam.(inside) -------- 3'

Thickness ---------- 1"

Flanges 1"high,1"thick

Face ---------- 3"

Total cost ----------

Key Seating.

Total --- 67" ---@ per ft. --------

Furnace.

Equipped as Assay furnace.

Cost ----------

Two extra Assay Furnace Doors--@- -------

Brick.

Common red brick @ per 1000 --------

Fire brick ----------

Rolls.

4-Solid.

Diam ----------

Face ----------

Price-@ each -----

Timber.

1-Piece

3'long by 9" high by 9" wide.

Price ----------

1-Piece

3'long by 9" high by 6" wide.

Price ----------

25'of 4" By 4".

Price ----------

12'of 5" by 5"

Price ----------

2-Planks 16'long by 12" wide by 1" thick.

Price ----------

Trap Door. ----------

Rivets etc ----------

Concrete ----------