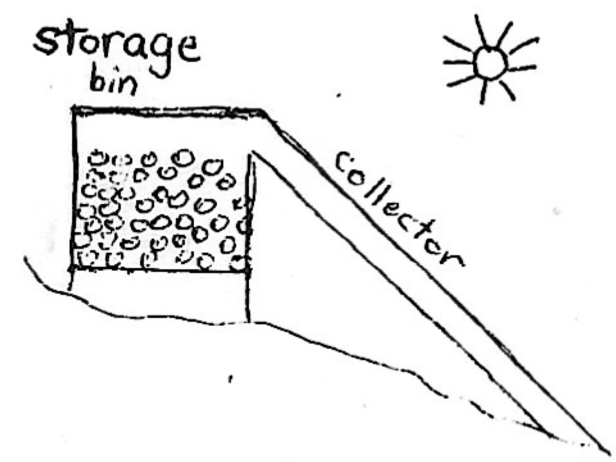
## THE DROP CITY CONVECTIVE ROCK LOOP HEATER

The rocks from the river were placed in an insulated reinforced box - tied together with cross wires to prevent its bursting. The hot air rises in the solar chimney collector and then discharges into an air space above the bin filled with rocks - the pressure of the warm air in the chimney behind it pushes the air down through the rocks. The hotter the rocks get and the deeper in the box they are warmed, the slower the air circulates - for the head of warm air on the storage side of the loop begins to balance the head of warm air in the collector. Of course, as soon as the circulation is slowed the air in the precollector is super heated as it lingers next to the hot metal - which gives it more bouyancy and extends the will of the system to circulate.




In order for the heat to be distributed among the rocks the hot air must enter at the top rather than at the bottom. If the hot air entered at the bottom it would not heat the rocks equally, but would instead burn a chimney through the bin of rocks. This must be qualified: If the box were left alone long enough with hot air entering the bottom all the rocks would be heated since means of heat transfer - convection, conduction and radiation - would finally spread the heat throughout the box. The will of the system is to find the easiest way from the bottom to the top and once it succeeds in warming a path to the top this becomes a warm chimney which the air prefers since it remains warm and bouyant on this path - whereas if it departs and attempts a circuit through the neighboring cold rocks it will be cooled - will become more dense and thus be discouraged from rising through the bin.

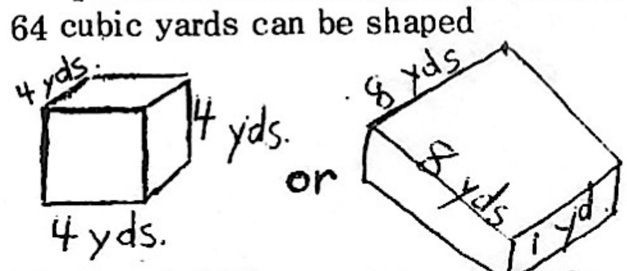
This is a very poor arrangement to take the heat from a stream of air since the system's will is at cross purposes to the designer's. All these problems are solved if the hot air is introduced at the top of the bin and forced down through the rocks. Then the air, instead of following the warmest path through the rocks, follows the coldest path because the cooler the air is the more dense it is and the easier it is to descend through the rocks. Hot air entering at the bottom becomes addicted to a pathway and does not want to depart from it.

Hot air entering at the top fowls its own pathways by warming them and thus continues to hunt about the bin for cool rocks where it may descend more easily.

In the construction of a rock storage bin the rocks should be distributed in a pancake rather than a column - a broad shallow container is far preferable for the transfer of heat to the rocks than a tall thin container. The reason for this is the resistance to flow presented by the rocks. A filter which is tall and narrow. If there is a great deal of resistance the convection loop can't operate efficiently because it moves so slowly that the air overheats and this, as always, reduces the efficiency.

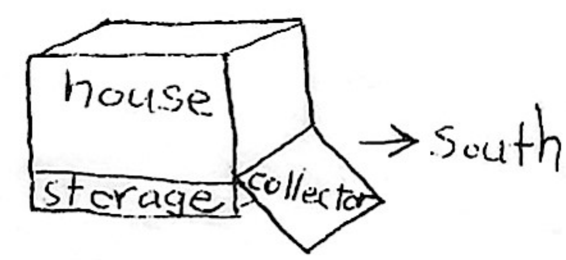
The disadvantage to shallow broad heat storage bins is that they take up more space than a compact deep one and if they are built outside of the house they suffer a great deal more heat loss.

For instance a container of volume 64 cubic yards can be shaped




The broad shallow container is preferable for the flow of air, but is a poor place to hold heat because its large surface area loses heat rapidly.

Luckily the bin of rocks can sometimes be placed within the house itself or directly under it.




One discouraging aspect of the kind of rock storage bins I have been describing is that the air must flow past the rocks even when it has no useful business with them. Our whole reason for running the air through the rocks is to transfer the heat from the air to the rocks. We place a great deal of resistance in the way of the flowing air to accomplish this. It is a shame, then, after the rocks have already received heat from the air, to have to continue pushing air past them - this takes work, for the pathway is tortuous