

REVOLUTIONARY INVENTION OF JHALI

BY
M.H. PNAHWAR

I joined the Government of Sindh as Agriculture Engineer in Sindh in September, 1953. At the end of March, 1954, the office accountant told me to appoint eight Pankha (Jhali) pullers for six months. Pankha pullers paid from contingencies at Rs.30.00 per month were to work from 1st April to 30th September each year. One puller was needed per Jhali (Pankha) and for Agricultural Engineers staff, accommodated in 8 rooms, Rs.1, 440 were spent each year. The next day, I purchased 8 ceiling fans, had electric lines installed at 80% of this amount, and did not engage any Pankha-pullers. It invited wrath of auditors and accountants of Director of Agriculture Dr. A.M. Shaikh, but he was intelligent and sharp and put a note: "If Government of Sindh comes to know that we have been using Pankha-pulling labor in electrified cities of Hyderabad and Mirpurkhas for past 20 years and each year wasting money, as is proved by our engineer's correct decision which is considered irregular by our accountants and auditors; myself and my predecessors will have to explain. It is better to stop mockery now and let us ask Government to do away with Pankha pullers at every station of ours, where electric power is available."

In the beginning of April, 1954 I went to Bubak on Manchar Lake, where we had sent 14 crawler tractors for ploughing. The operating staff consisting of tractor operators greasers, mechanics, black-smiths and other staff including truck and jeep operators was fifty. We engaged some old go downs for their stay and as wok-place. The staff knowing about what I had done to eight Jhalis at Hyderabad asked for some Jhalis to be fabricated for their comfort. Some of them pointed out that it may be scientifically so designed that it should reflect fully on the efficiency of Agricultural Engineering organization. My first thought was that there is nothing in a Jhali that needs engineering knowledge, but after a few moments thinking, I concluded that there was lot of engineering involved in the development of Jhali if it was to be correctly done. Reaching Hyderabad I selected an office room for the experiments. A number of Jhalies were fabricated in the workshop with various lengths, widths and frills. I had in my personal collection of number of thermometers and two anemometers which were used at various points to find the factors involved in efficiency of a Jhali. With only an hour' trials, I found out the whole project to be very complex and it could only be checked if we had large number of anemometers and thermometers fitted in the ceiling, walls corners, ground, windows, ventilators and floors and took reading simultaneously, i.e., they were all connected with automatic recorders and so was Jhali in its various positions of oscillation.

Unfortunately we lacked adequate equipment and the experiment if performed to my full satisfaction, would have no application as no one using Jhali would have it fabricated, according to length, breadth and height the room, as well as position of doors, windows and ventilators. Besides the various fittings, furnishings, and furnitures as well as their spacing would affecting the performance of Jhali. After three days tests, were obtained

interesting data to properly design a Jhali. We fabricated two Jhalis, which were seen to Bubak.

(a) My findings were that:

Roof gets heated up and reaches the maximum temperature at 30.30°C. In the first fortnight of April it showed a temperature different of 7°C between the outside surface of the roof and the air in the room. Heat was transmitted from the roof to the ceiling, where from it was transmitted to the air by conduction. This air had higher temperature than air down below and being lighter was trapped near the ceiling, within about 12 to 20 inches height. If there were ventilators or if air circulation was provided artificially by means of a fan or Jhali this trapped air circulates inside the room and the temperature of the whole room not only goes up but keeps rising. The best plan therefore would be to allow this hot air to remain to where it is. This may be achieved by suspending Jhalis or electric fans sufficiently blow the ceiling.

(b) The movement of air caused by Jhali takes a shape, as if air is passing over the surface of a blade of gas-turbine. Assuming that Jhali is pulled towards the right wall while it was stationary at the centre of the room. While the plank of Jhali would move towards the right-wall, the frill would bunk towards the left of wall. Once the Jhali reaches the end of its oscillation towards the right-wall the frill will reverse the position immediately and move towards the right-wall. This due to NEWTON'S Second Law of motion. At this point starts the reverse action i.e., Jhali moves to the left wall while frill is bent towards the right wall. During this process the air pushed forward by the plank moves down over the frill and is discharged at an angle. Simultaneously with this, some air escapes from the sides as well as top of the plank.

(c) Escaping of the air from the sides and top of the plank is a natural process. It could be kept down but not eliminated this escaping of air could be reduced, if the planks are long enough to leave only a small margin at the sides.

(d) Some air invariably passes from top the plank but this cannot be avoided.

(e) Turbulence is produced in air by the movement and shape of frill and plank of Jhali. The best shape is the one in which frill is 1 1/2 times the width of plank. If it is less the Jhali needs more speed to move air. In any case frill width should not be less than the width of plank.

(f) Breeze is maximum at the tip of frill and therefore the height of Jhali has to be adjusted as to be a few inches above the head of the people sitting under it.

(g) On a hot day difference between outside and inside room air temperature is about 5°C or more depending upon thickness of walls, roof-insulation, glaze on the

windows and ventilators? Doors and other openings preferably are being too kept closed, if more comfort is desired inside the room.

- (h) If floor is made of bricks, increasing comfort level could be created by sprinkling sufficient quantity of water on the bricks, which absorb it. Water slowly evaporates reducing temperature inside the room. If there is carpet on the floor this could not be done. This technique of putting the water to lower the temperature does not work in the month of July to September, as humidity during this period is high and extra humidity in the room would cause discomfort.

This article is out-come of my long study of finding means to control weather. Various methods have been used in the past, Jhali being the one of them, but it is not very old. Man in the arid zones has used different devices for comfort and in Sindh Vinjanno or Vinjani and Pakho were popular. Both were fixed to a wooden handle approximately ½ inch diameter and 15 to 18 inches long, with about 4 to 5 inches protruding outside the body for holding it in hand and oscillating it.

The Pakho usually had a handle about one meter to one and half meter long on which was fixed a long and wide and semi circular Pakho, similar in shape of a vinjanno, Pakho besides a protruding handle also had hole mid way between the length of its handle so that the man carrying it can put both of his hands on it and oscillate. To a better type of vinjanno and Pakho, frill of cloth of 2 to 3 inches wide was attached. Handle were made from thin wooden stem with diameter usually varying between 3/8 to 5/8 inches depending upon the overall size. The body of Vinjanno Pakho was made from reeds of a plant.

This reed grows in the hilly tracks of Dadu and Larkana districts and hill tribes collect it for making mats, fans and many other articles of daily use in the rural areas.

The other item utilised by man for his comfort was curdling which was smaller in size for children and of a large size for grown-ups. Even to this day a few well to do middle class villager have at least one crate of peengho or pingora in his house. The better type cradles are lacquered and some cost of a few thousand rupees to-day. Cradle is reverse of Jhali, in a way that a person sitting on it, is oscillated in the air and thereby he is moved across air.

While looking for literature on Jhali I had a look at paintings of the Mughal period and did not find any sign of his device. In 1975-76 I examined large number of paintings at British Museum and India Office Library and found no trace of Jhali any where. I therefore concluded that it must be a later invention Reading some letters of the British wives in India written back home, I got a clue that Pankha may have been invented after 1780.

Hickey in 1785 (quoted by Dewar Douglas in "By-gone day in India", John Lane, London, 1922 p. 104 111. "In the day of Warm Hastings (1772-1784), boys with fans and flippers were used in office and house to bring comfort in sweating heat of summer". It

was around this time that first Jhali was developed. The boys mentioned above were not Pankha pullers of the later days, but were Pankha Burdar or Pakho-carriers.

EVOLUTION OF PANKH

- 1) Initially it consisted of solid frame 4 to 10 feet wide and 6 feet deep, hanging close to ceiling. A servant standing in room swung it back and forth by means of ropes attached to the two ends of the board. This was an invention of an Anglo-Indian Clerk around 1780.
- 2) Up to 1810 AD, the Jhali was used in the dining rooms only. Then it came to be used in drawing rooms and bed rooms.
- 3) An important and revolutionary development in its evolution was to pass the pulling rope or cord through a hole in the wall so that the Pankha burdar (a word used in early days for Pankha puller) could pull it, while sitting veranda. The very word Pankha burdar denotes that the state of carrying Pankha in hand was yet in force. They gave privacy to the family and equal convenience.
- 4) Since the blind men could pull it, they were used as such many times.
- 5) An anonymous author calling himself An Anglo-Indian (in his book "Indian outfits and establishments", London 1882, p. 110), mentions that by 1850 AD the Pankha no longer hung close to ceiling but had frill and had its frame suspended by long ropes from the ceiling. The wooden plank had reduced to almost a pole to which frill was attached.
- 6) The wooden plank reduced to a shape of a pole, some times polished and at other times lacquered (as in Sindh) and having a long frill is very inefficient as compared to the one with broad flat frame and frill. Two lady writers, (Flora Annie Steel and G. Gardner, "The complete Indian house keeper and Cook", London 1902, p. 201) had already reached this conclusion. They were also sceptical about the height at which Pankha should be fixed. They stated, "It is always too high or too low; in other words either it scrapes your head or leaves you perspiring."
- 7) Jhali seem to have reached its advance stage after 1850. By this time Jhali came to be named as Pankha in India. This name was evolved from Pakho mentioned above and finally men pulling were called Pankha burdar the same title that was given to man oscillating the reed-pakho at this time. "Curry and Rice" originally printed in 1860, a satire on British ways of life in India, has a number of paintings of Jhali or Pankha as it was officially termed.
 - (i) Our Judge. The painting shows a judge imparting justice in a big hall having a double Jhali (Pankha) jointed by ropes. The Pankha puller sitting outside the halls is pulling it. Such double Jhalis were in use in

many district towns of Sindh even after 1947. Today they have been replaced by electric fans.

- (ii) Our Judges Wife. Painting shows judge's wife and male Pankho bearer. The Pakho made from reeds, circular in shape, with cloth frill and a long wooden handle of about the height of the man himself. In actual practice the handle would project less than 12 inches outside the pakho and if longer it becomes widely. This is still in use in almost every village in Sindh as a substituted for Jhali.
- (iii) Our magistrate's wife. She sits on a Murhoor chair made of cane or reeds and is relaxing her feet on a circular cane too. The ceiling type Pankha or Jhali, which has white cloth on frame and frill and red border at the bottom of frill, is being pulled by an attendant sitting outside the room.
- (iv) Our Colonel. The Colonel sits on an office chair (titled backwards with its front legs raised) with his feet on a high stool, while Khansama dressed in a uniform is serving him a cup of tea. A bare footed, shirless man, only in under wear and turban pulls Jhali, which has white cloth on its frame. Frill too is white with brown border. The frame on its edge too has same border. It may be a leather strip.
- (v) Our bedroom. An official in white parts and white shrit, with sleeves roiled up, returned from duties, appearing very tired is just stretching him self on a lacquered cot with nawar. A servant, who has already removed his black long-shoes, is busy removing his white stockings. A Pankha with white frill is being pulled by another bare-footed servant, sitting outside the room in veranda. Bare footed servant has only a dhoti on.
- (vi) Our Travelers Bungalow. The hall in the bungalow has a Pankha, pulled by some one sitting outside, heat seems to have tired the official who has just arrived and is in posture of about to sit on a chair. For him bottles (probably of bear or soda) are being brought by another servant. The Jhali has white drill and white cloth on its frame.
- (vii) Our Cloth merchants. Four cloth merchants have brought bundles of cloth for a European lady, who is sitting on a rocking chair, while a Jhali with white frill and red trimming on the border, is being pulled by an attendant sitting outside the room. The cords attached to Jhali are red in color and made of cotton.
- (viii) Our ball Rooms. The ball room of a club has a number of English men and women sitting around a table in a Jhali has white cloth for

trimmings and frame. The hanging and pulling cords are red in color, probably of cotton rope.

- (ix) Our Munshi. An Indian Munshi in white pants, white shoes, and rolled sleeves is lying on a folding armchair. Jhali is over his head, but is not being pulled as his domestic servant, who probably is also Pankha puller, is opening cork of a bottle to serve him with bear or soda. The Munshi's Jhali has white cloth for frill, brown cloth on frame but no colored border on the frill.
- 8) In 1902 AD, Pankha was being fixed on the roof of houses. It was usual to have two columns of bricks raised over the roof and a wooden beam placed over them, was to have hooks for fixing Jhali. (Steel and Gardner, p. 201-202).
- 9) Fixing of a pulley over which the Jhali rope or cord after emerging from a hole in the wall or frame of a door or window passed, was also in general use, by about 1850 (Dewar, p. 110). To reduce noise pulley was greased and cord was made from a strap of leather.
- 10) Pankha wheel, which came in use on large scale in 30's of this century, consisted of a shaft on which 2 or 4 Jhalis were rigidly mounted at 180 or 90. It was turned by belt drive from a small diesel engine. Some rural hotels used it. It was very noisy and soon got unpopular. Another version of it which also had horizontal axis and belting and had cob-wheel gears similar to that of a Persian wheel, was also in use. Pankha itself replaced rotating wheel, was also in use. Pankha itself replaced rotating wheel of Nar (Persian wheel) and below it slept the beneficiaries. Since it was very light, donkey instead of diesel engines drove it. It also helped to keep mosquitoes away. It was originally invented before 1850 AD (as reported by Dewar, p. 110), but is still being used in some villages in Upper Sindh.
- 11) Best arrangement is to hang Pankha from the ceiling by means of ropes rather than hooked iron bars, which make noise. Such Pankhas make soft, slow swish and meaning-full sound as reported by Steel and Gardner (page 202). Noisy sounds are also produced by Cradles or Hindoras and Penghas having iron hooks.
- 12) For the Jhali to be effective, the room should not be too wide and too long. Height also should be reasonably medium. 10-12 feet height is ideal. Mid 19th Century Government buildings were 20 feet high, with spacious halls (2,000 square feet area as reported by Mrs. Fanny Parkes in "Wanderings of a Pilgrim", London, 1850 p. 120). Jhali cannot function well in such housing.
- 13) It was so even in last century. Mrs. Lillian Luker Ashly in her book ("My India", Boston, 1937, p. 28-29), writes that her family in Bihar in 1880's

maintained 13 servants, of whom four were Pankha pullers and expenditure on Pankha pullers was Rs.32 out of monthly servants salary of Rs.104.

- 14) By mid Nineteenth century the wooden plank of Jhali was replaced by a frame on which thick cloth like canvass was nailed, to make it lighter. The frill was almost as wide as the plank and it had a colored border at the bottom. In houses, where ladies participated the colors usually were bright, especially of border and cord.

EVOLUTION OF DESERT COOLERS

Even the predecessor of present day desert cooler was developed by Dr. George Spalsbury in India, soon after his arrival in 1923 AD. The desert coolers were in general use in hot and dry Southern California in early fifties of this century. I had seen them in use there and built an experimental one in Hyderabad in 1954 to cool my office. For nearly 15 years it did not become popular. Now they are being fabricated on a large scale. An indigenous desert cooler, a modification of Dr. Spalsbury's model was fitted in a corner of Government inspection Bungalow at Bahawalpur which I saw in 1955. The device consisted of a small room or closed space in the veranda having bricks staggered in the fashion of a series of corbelled arches. On these staggered bricks, water trickled from a tank above them. The inside dimensions of his room were 6'x4'x4'. The bricks have also small space left in the joints for air to and water to pass through. There was one large opening in this structure which opened to the bed room and had a blower fitted on it. In fact it was a desert cooler, in principle similar to the one I had built, but large, monstrous and with a noisy blower, its cost was 20 times that of mine.

Mrs. Parkers mentions Dr. Spalsbury's Thermantiodote. It was 7 feet high, 5 feet wide and 10 feet long cabin, mounted on iron wheels. The steel cabin had four feet circular holes on three sides to suck air in had it also had a funnel on the forth side projecting into the house. On the outside of the circular openings, were fitted Khastaties (A reed grown in Upper Pardesh) and on them water was sprayed. On the inside of this cabin four fans blades in the shape of turbine wheels were fixed to a rotating axle, which was continuously turned by one or more men by means of an external handle. Aitkinson author of "Curry and Rice" jokingly states: "Inside the room, your hat is likely to be blown off into a corner by a general hurricane produced by Thermantidote." It needed 12 or 14 servants to run this air-cooler if it was to work round the clock (as reported by Mrs. Parkers p. 210).

After these studies I felt that for five thousand years since Mohenjo Daro times, the people of the South Asia did not have initiative to device something like Jhali and it needed the Western Empire builders to do so. This was done at a time when English revolution had already started in 1760, steam engine had been invented in 1775, the British Empire had without any doubts came to stay in India, the Americans had won the war of independence and the French revolution had started. At this time in Sindh Talpurs and Kalhoras were involved in a civil war and the establishment of a harsh feudal society

hitherto unknown in Sindh. At that time machinery minded English man developed a simple device from local materials at virtually throw-away prices, to introduce Jhali.

Article from: **Journal Sindh Quarterly, Vol. XXI, 1993, No. 1, pp. 52-61.**