Pl. 5-11. Most traditional desert architecture is made of sun-dried mud. Sand and clay are mixed with water and a binder of dung and/or straw. Usually shaped into bricks by hand or with a mold, the mud is baked by the sun.

MUD STANDS UP: CONSTRUCTION TECHNIQUES

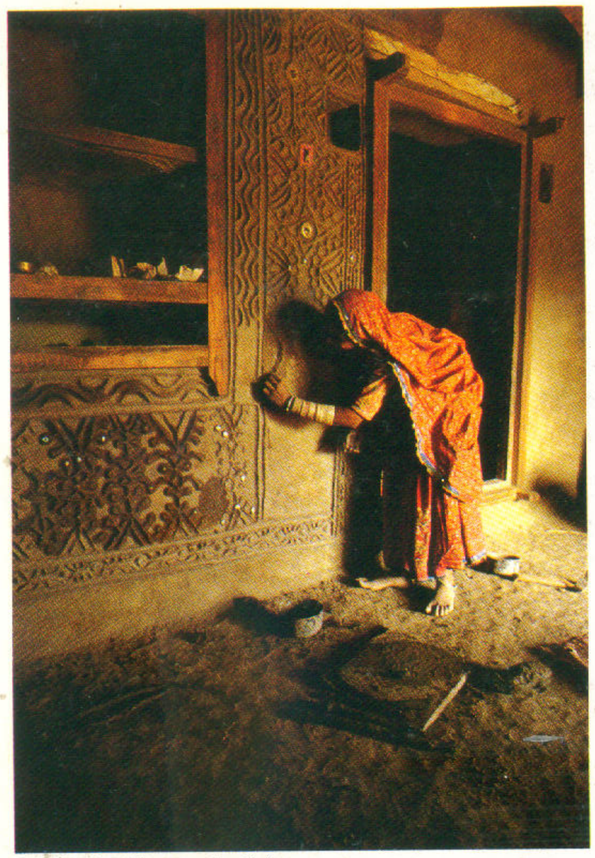
It is rare in the desert or savannah to find an isolated dwelling. Traditional houses tend to cluster. The fields, where farmers grow such grains as millet and wheat, and the grazing ranges for herders' camels, goats, or cattle lie outside the settlement. In villages and some cities, households tend to live in extended-family compounds, with separate sleeping, kitchen, and leisure structures facing a common open area. In towns and other cities, a courtyard house may share windowless walls with its neighbor.[1] Generally, dwellings turn inward (fig. 3).

In traditional desert architecture, buildings tend to be designed, built, decorated, and maintained by ordinary people—men, women, and children—not full-time specialists. In some areas, it is true, master masons plan and supervise the erection of major structures such as mosques.[2] But even where trained builders work constructing a house, the entire family works too, often with relatives and neighbors. Generally, the men are

Pl. 5

Pl. 5. Making mud bricks with a double mold.

Pl. 8



Pl. 8. Applying mud relief.

responsible for raising walls and roof, the women for finishing interior surfaces (plates 5, 8, 10).

A single rainy season, though mild, will soften a mud structure's finer detail. Untended after several such seasons, a mud building may begin to "melt." But mud architecture in the desert may last an extremely long time provided it enjoys regular, minimal maintenance. This maintenance consists largely of replastering. Women or men, depending on the culture, keep the house's exterior in good repair. Acknowledging rather than defying time, upkeep is as cyclical as the harvest. It is a dry season activity during which swirling hands, applying new mud like balm on weathered skin, heal the erosion of annual rains (plate 11). Some architecture in mud is now more than four hundred years old.

Desert architecture is the product of a relatively simple yet highly effective technology.[3] Sand and clay are dug from the ground and mixed with water and, usually, chopped straw. The sand is an inert filler; the clay provides cohesion; the straw, by helping the mass to dry evenly, minimizes cracking. Local recipes vary widely depending on the soils available and may include organic materials such as sap, animal milk, blood, or dung.[4]

There are three general methods of building in mud. In some areas, the mixture is tamped in place using a large wooden form, or *coffer*. The block is allowed to dry, the coffer is removed and lifted on top of it, and the process is repeated. This is *pisé*, or *rammed earth*, construction[5] (plate 7).

A second method, used in northern Sudan, is called *coursing* or *puddling*.[6] A thin layer of mud is shaped by hand. After it dries, another is added, and the wall rises. Indians in the southwestern United States customarily used coursing until the seventeenth century, when the Spanish introduced the cast, sun-dried brick.[7]

Brick is the third technique. Dating from before recorded history,[8] it is the method in widest use today. Sometimes, hand molded bricks dry in the wall; more frequently, cast ones are left on the ground to bake in the sun (plates 5, 6). Set in place, the bricks are usually joined by mud mortar and covered with mud plaster. This technique is called *adobe*, a word borrowed from Spanish. Still earlier, Spanish borrowed it from Arabic, in which *al-tob* is the type of earth from which sun-dried bricks are made.[9]

One of mud's great advantages is thermal. Usually up to two feet thick, mud walls have a high heat-retaining capacity. During the day, acting as passive-solar collectors, they insulate well against high temperatures, and at night the heat they have absorbed is slowly released. While outside temperatures may soar or fall dramatically, indoor ones stay remarkably constant.

Pl. 1-4. Ranging from high mountains to low

the coffer is removed and
it, and the process is
is *pisé*, or *rammed earth*,
plate 7).

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Pl. 1

Pl. 1-4. Ranging from high mountains to low-lying plains, the desert is characterized by extreme heat and cold, intense glare, and, often, stinging dust.

Pl. 3

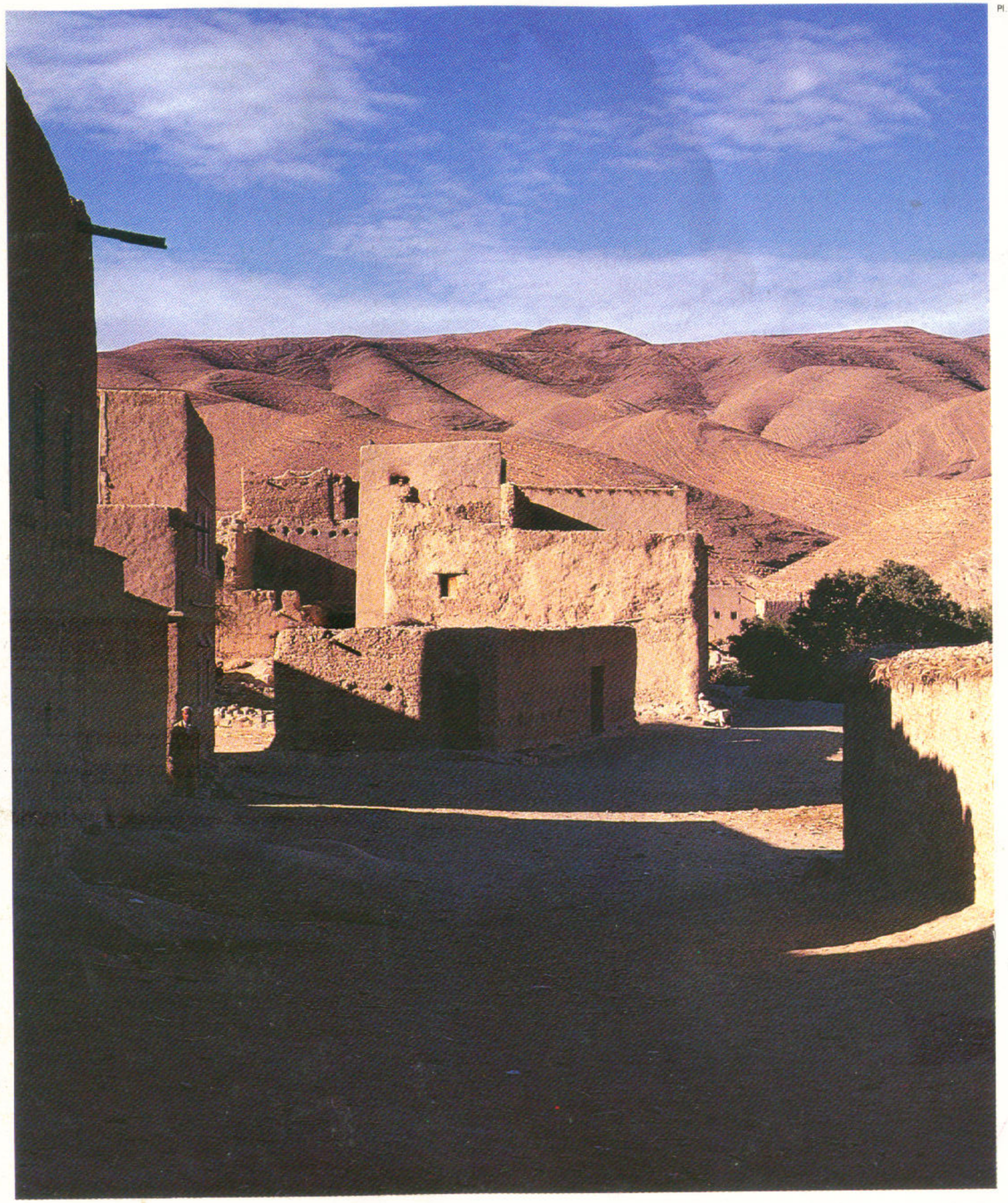
Pl. 6

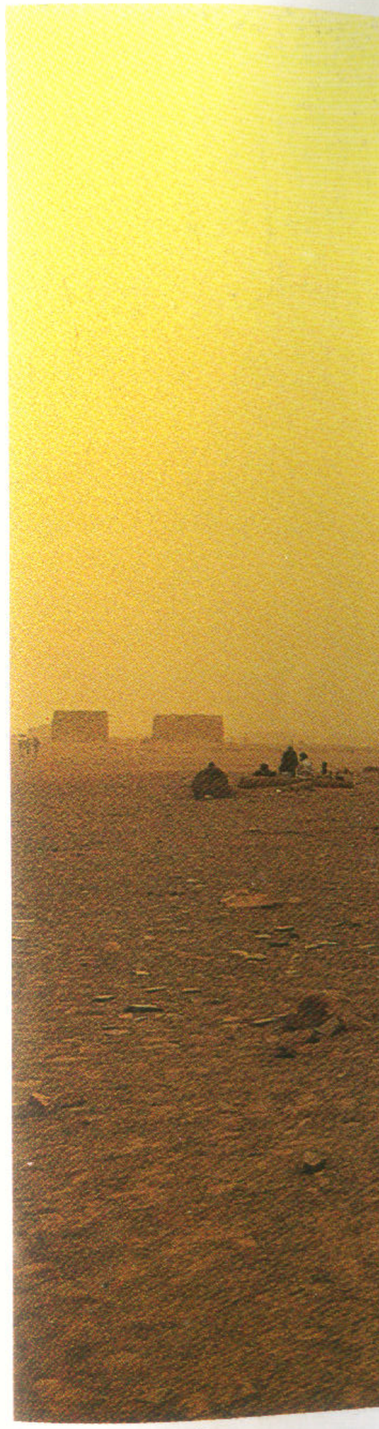
Pl. 7

Pl. 6. Mud bricks drying in the sun.

Pl. 7. The "rammed earth" or pisé technique.

Pl. 2





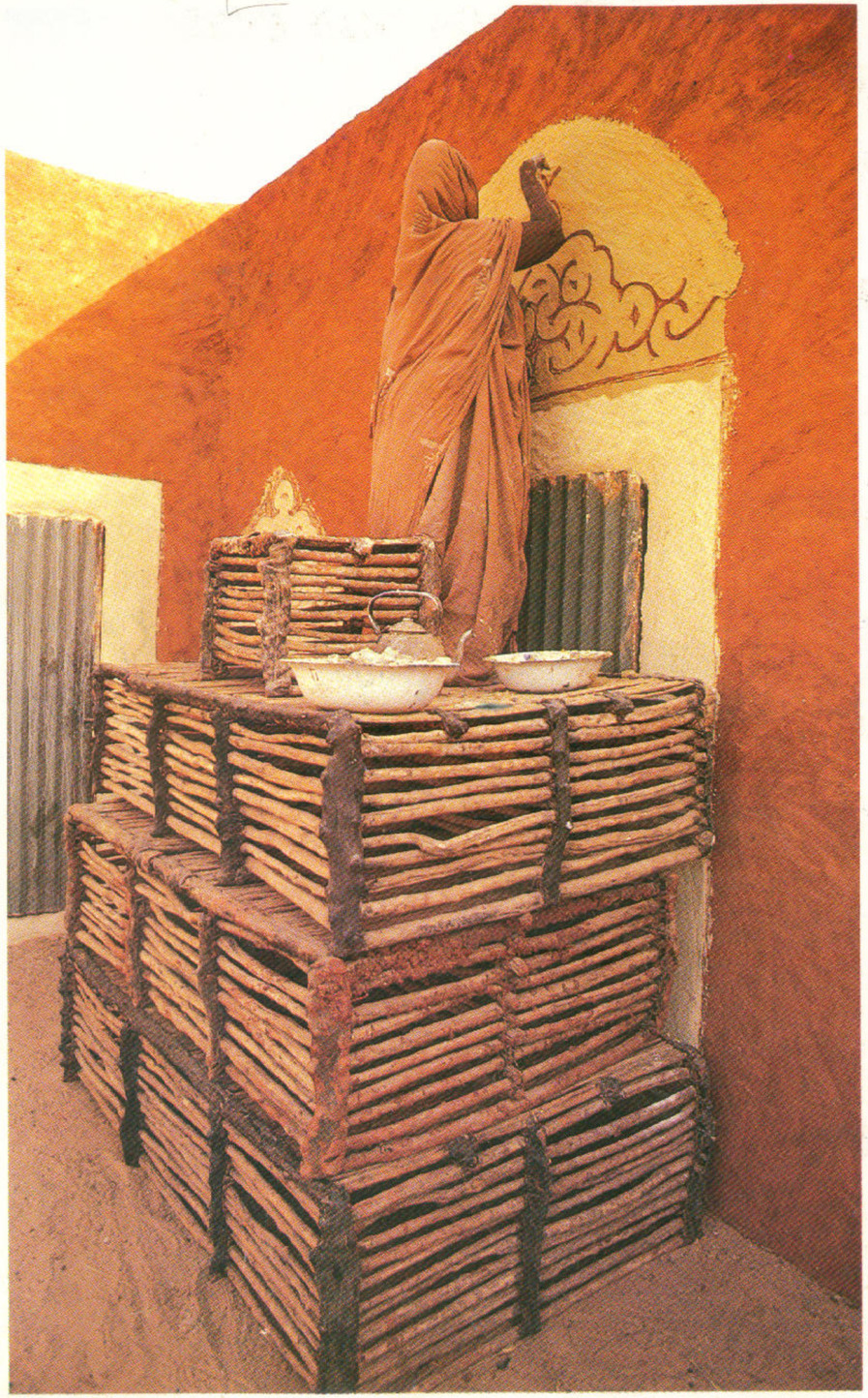
Pl. 4. A mild sandstorm.

Pl. 2

Pl. 4

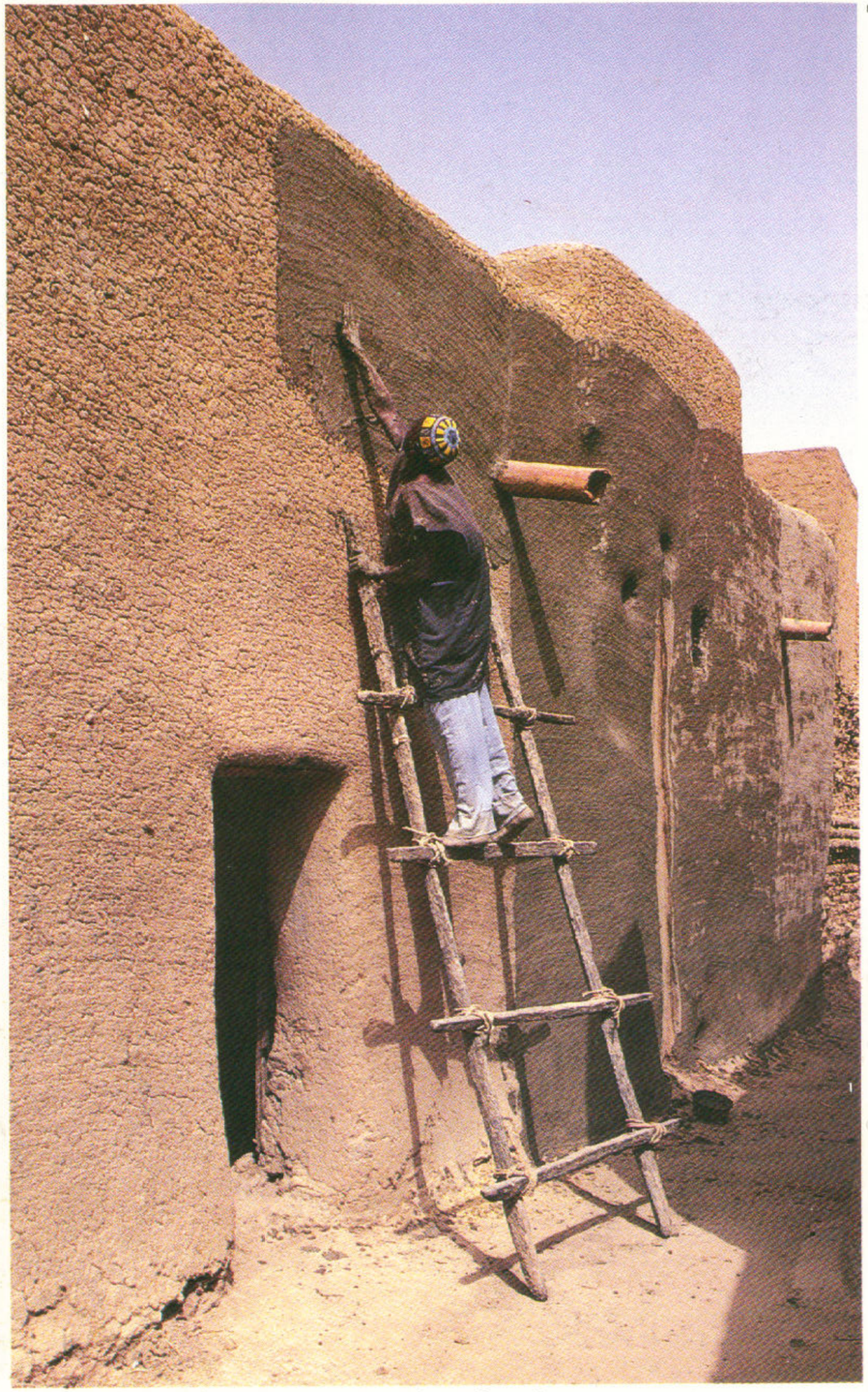
Pl. 4. A mild sandstorm.

Pl. 10



Pl. 10. After a wall is plastered, decoration may be applied. Standing on a stack of beds, a woman incises a pattern.

Pl. 11



Pl. 11. After the rainy season, the wall is often replastered.

Vernacular desert architectur
True, the tradition of buildin
dried mud is older than reco
But the tradition for the first
prompting a growing interest
"foreigners." People in the t
climate, industrialized world
aesthetic, practical, and theor
in the traditional architecture
desert.[1]

Important parallels and contr
histories of Western interest i
art and vernacular architectu
1904, artists such as Matisse
were struck by the expressive
African sculpture beyond trib
In art, the primitive and the
not antithetical; rather, the op
were immediate allies, both a
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ethical and aesthetic hallmark
modernism was "purity," pri
qualified and primitive archite

nowledgment that strategies and
f dwelling can affect the observer
y as the observed revives
y as a legitimate, even necessary,
of discussion. Applied to
ar it focuses the insights of
geography not only outward, but
toward the depth and complexity
bserver's own ethnic, climatic, and
c attitudes and the radical way
hape architectural expectation and
ion.[24] This procedure clarifies our
e, till now largely mute, in specific
form and design. Examination of
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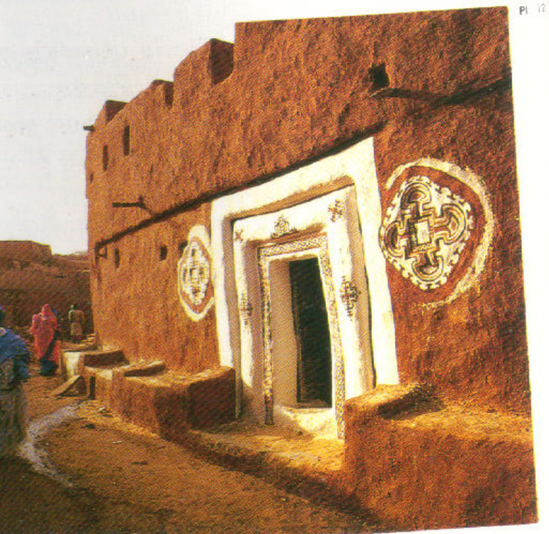


12. On either side of many exterior doors, slates are into the wall. Muslims preparing to pray touch the nes to cleanse themselves ritually when water is not ailable.

Pl. 12-19. In eastern Mauritania, West Africa, the town of Oualata long outshone Timbuctoo, its sister caravan-port ten days by camel to the east. Today Oualata is an extremely isolated community with a population of about a thousand.

WALLS AND ROOFS

In traditional desert architecture, the exterior wall is usually undecorated. Resisting the climate's harshness and expressing the importance of family privacy, structures tend to look in, not out. Foreign travelers may find monotonous the impassive public faces of village and city walls. But invited in, visitors are often delighted by the visual exuberance of bedding, carpets, and wall-hangings.

The wall, however, is not always plain. Its decoration can assume astonishing variety. Plates 12-21 and figures 4-41 illustrate examples in a progression of walls from flat through highly sculptural.

The Painted and Incised Wall

(plates 10, 12-19)

Deep in the West African desert, the town of Oualata is small, isolated, and extremely difficult to reach. Its name means "the shore of eternity." The settlement's splendor is its bold, sumptuous decoration, which women

Pl. 14

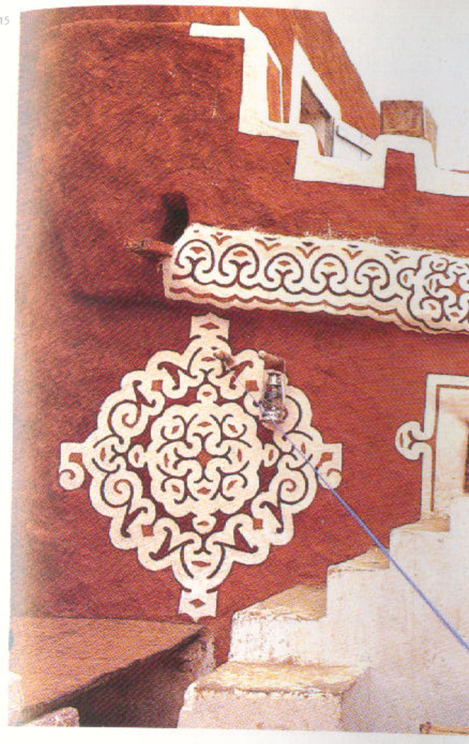
Pl. 14. A door opening on an interior court. The decoration here is painted on a slightly raised, incised ground.

apply and then annually renew after the brief rainy season. On some surfaces white lime is painted directly on the mud-plastered wall. In interior courts, a slightly raised ground is prepared for most designs; then a pattern is incised and painted. Some authorities trace visual elements to Morocco[1] and even Iraq.[2] It seems that the designs may be aids to fertility and maternity.[3]

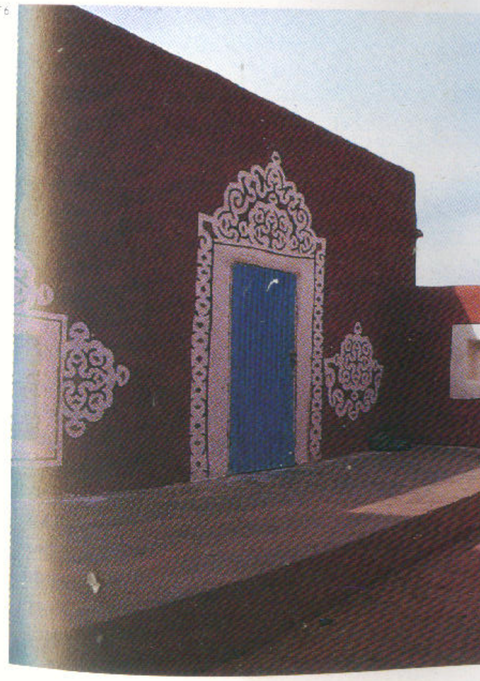
The decoration's impact springs from the contrast between two complimentary motifs, one simple, the other complex. The first consists of broad white bands which frame many doors, windows, and flights of steps. Occurring largely at edges which interrupt the massive wall, these wide stripes help turn small openings and narrow stairs, otherwise overwhelmed, into dramatic visual events.

The second motif is the arabesque, whose intricacy is heightened by the straightforward band. First seen as brilliant forms bursting on dark-red fields, the arabesques suggest the radiance of fireworks. Studied more closely, the patterns play figure-ground games. At times the thin brown lines come forward, as if drawn on white. At times the white comes forward, often dividing into discrete, vaguely human figures, often sweeping on through as a curling, plunging, continuous path of enormous energy.

Pl. 13



Pl. 15

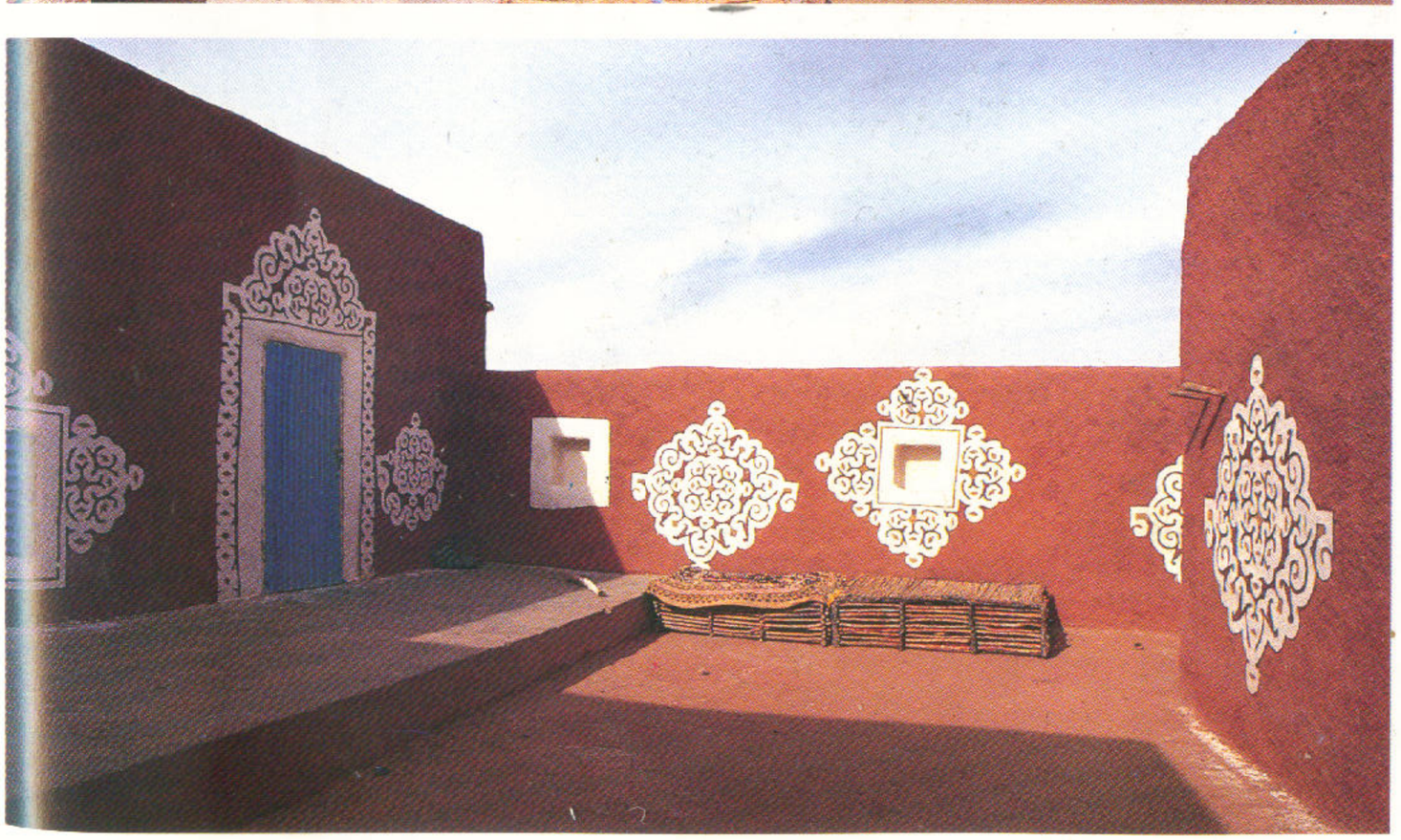


Pl. 16

Fl 15

The arabesques display rigorous order—they are almost symmetrical around one, frequently two, axes. Their meticulous delicacy seems almost crystalline. But an underlying informality remains. For all their immaculate precision, they often float, or crown a door or window, not quite horizontally. The patterns avoid geometry's cool perfection. They retain the immediacy and freshness of freehand drawing.

P 16

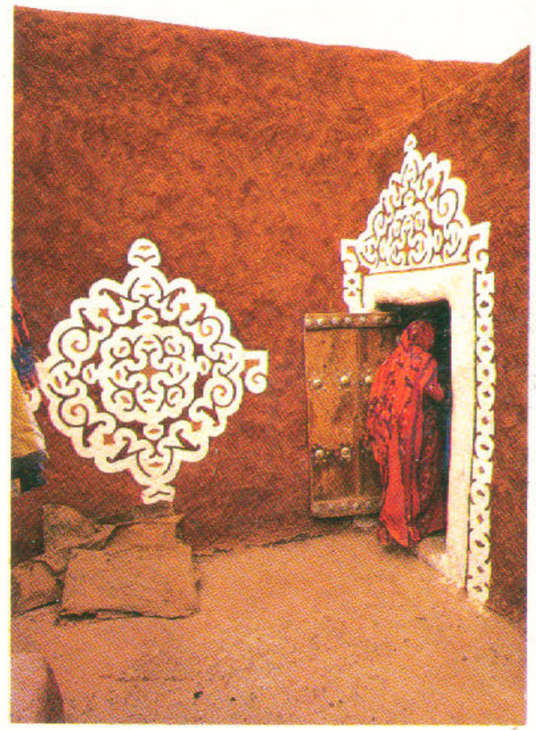


Pl. 16. Arabesques appear in many courtyards in Oualata. They may well be a symbol of fertility.

Pl. 18

Pl. 18. The Prefet, or Mayor, of Oualata, with his family.

Pl. 17



Pl. 19

The Embossed Wall

(plates 8, 20, 21; figs. 4-7)

In the Kachchh region of northwest India, the glory of many houses is the interior. Punctuated by small decorative mirrors—which also festoon the women's dresses—wall after wall, sometimes whole rooms, wear intricate ribbed reliefs of zig-zags, stars, grids, waves, rosettes. Occasionally figures appear: women balancing waterpots on their heads, someone riding a camel, someone else a horse. The most frequent image is the peacock, native to the region and a symbol of good luck. Deftness, care, and whitewash transform mud into lace. The mud virtuosos are Harijan (Untouchable) and Rabari caste women. Mud in their hands—they use no molds—has a wide range, from low benches strong enough to bear the weight of thirty heavy blankets to delicately faced shelves for brass utensils.[4]

Pl. 20

Pl. 21

Pl. 20, 21, figs. 4-7. In Gujarat state, India, interior walls are delicately embossed with mud tracery. The artists are women of the Harijan and Rabari castes. Using no molds, they work the mud by hand into a wide variety of forms, from benches strong enough to support thirty heavy blankets to delicately faced shelves for brass utensils.

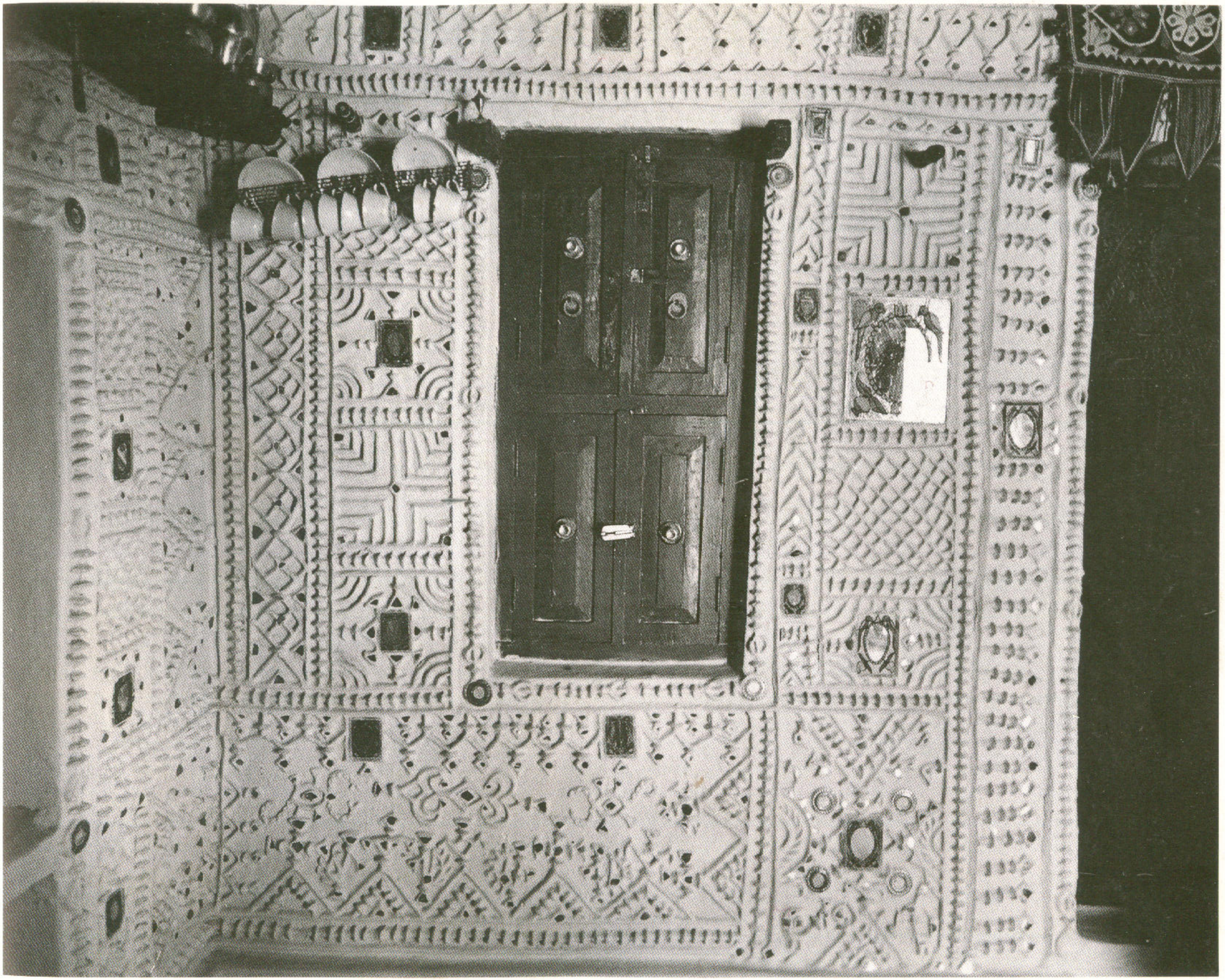


Fig. 7

High Relief (figs. 8-27)

A striking example of a functional wall providing visual drama occurs in the pigeon tower (figs. 8, 9), common in the area around Isfahan, Iran, for over four hundred years.[5] These massive structures, often thirty to fifty feet high and up to thirty feet in diameter,[6] provided housing for pigeons in exchange for droppings used as fertilizer. Each hole had a perch. The dung was collected at the base of the wall.

The average large tower sheltered a thousand birds and produced six thousand pounds of fertilizer a years for the surrounding melon fields and fruit trees[7]. The basic design problem was to provide the maximum number of pigeon holes possible with the minimum amount of building material. Since timber was scarce and rarely used, there were no spanning elements, such as beams, that would be under tension. Instead, because only vaults were used the entires structure was under compression[8]. At the beginning of the eighteenth century there were some three thousand pigeon towers in the Isfahan area. As late as 1939, it was possible to see nearly fifty from one place[9]. But they have long been steadily decreasing in number.

In central Mali, facades display an extraordinary variety of high-relief (figs. 10-27). Though most buildings are a single story, they suggest monumentality by incorporating the wall of the roof-terrace above.[10] The line where roof meets wall is

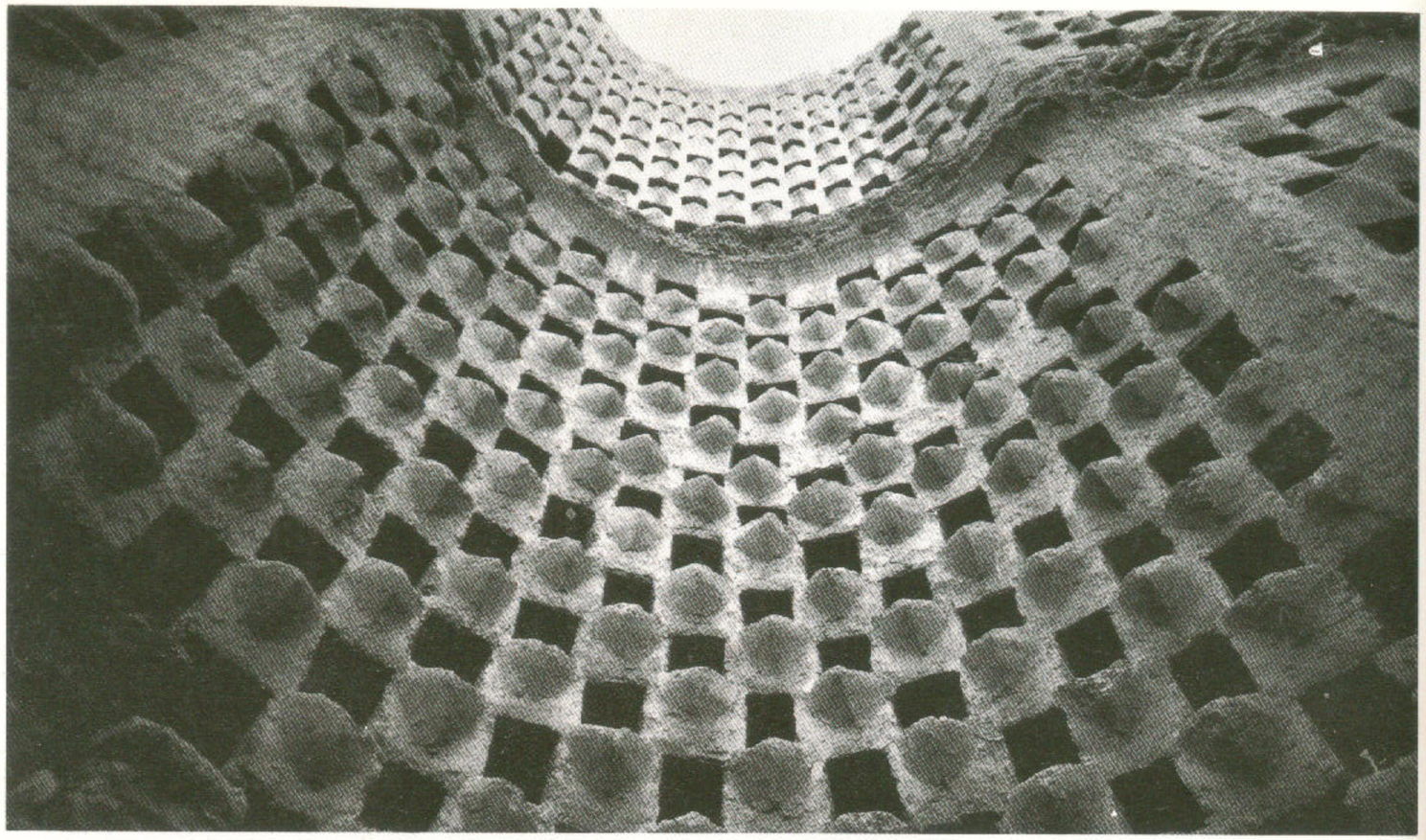


Fig. 9

Fig. 8

Figs. 8, 9. Iranian pigeon towers were built to collect pigeon droppings for fertilizer. Each pigeon-hole is furnished with its own perch.

rarely articulated, and this ambiguity generally allows integrity of design from ground to skyline.

Figures 10-15 show examples of what might be called the "missing brick" style. In some cases (figs. 10, 11), design elements seem abruptly "punched" through a smooth, taut surface. Carefully spaced but totally isolated, missing bricks and deep windows seem to float.

By contrast, diagonals built of bricks in series express visual weight (figs. 12, 13). Wry ambiguities occur. Are the diagonals created by bricks applied or bricks removed? Which is primary, molding or carving? On one wall (fig. 13), this uncertainty is delightfully compounded by a serrated diamond which seems to hang like a pendant from the most stressful point of a mock beam. Or is the diamond's "toe" actually touching the ground, thereby making it a graceful applied column? In other buildings, a complex, single-layered lattice of bricks seems slipped over the wall like meshwork (fig. 15).

The wall acquires still other subtleties by incorporating three-dimensional themes. Casting shadows which may keep over half the wall's area in cooling shade, what might be termed the "stepped recession" motif (figs. 16-18) introduces a number of rectilinear planes.[11] As rounded, applied columns (fig. 20) rise through a roofline, they become fully freestanding. And a short, engaged column appears in both

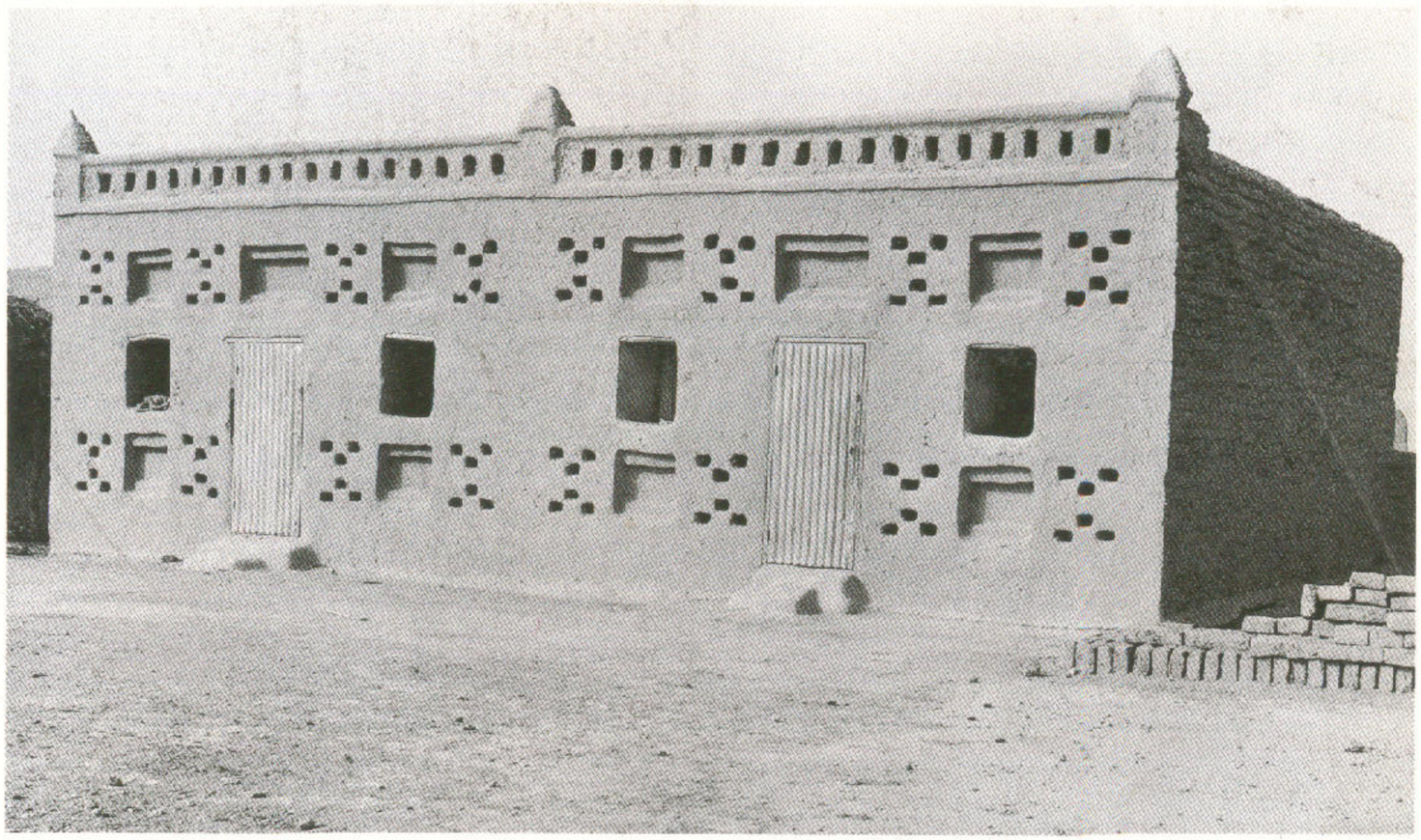


Fig. 11

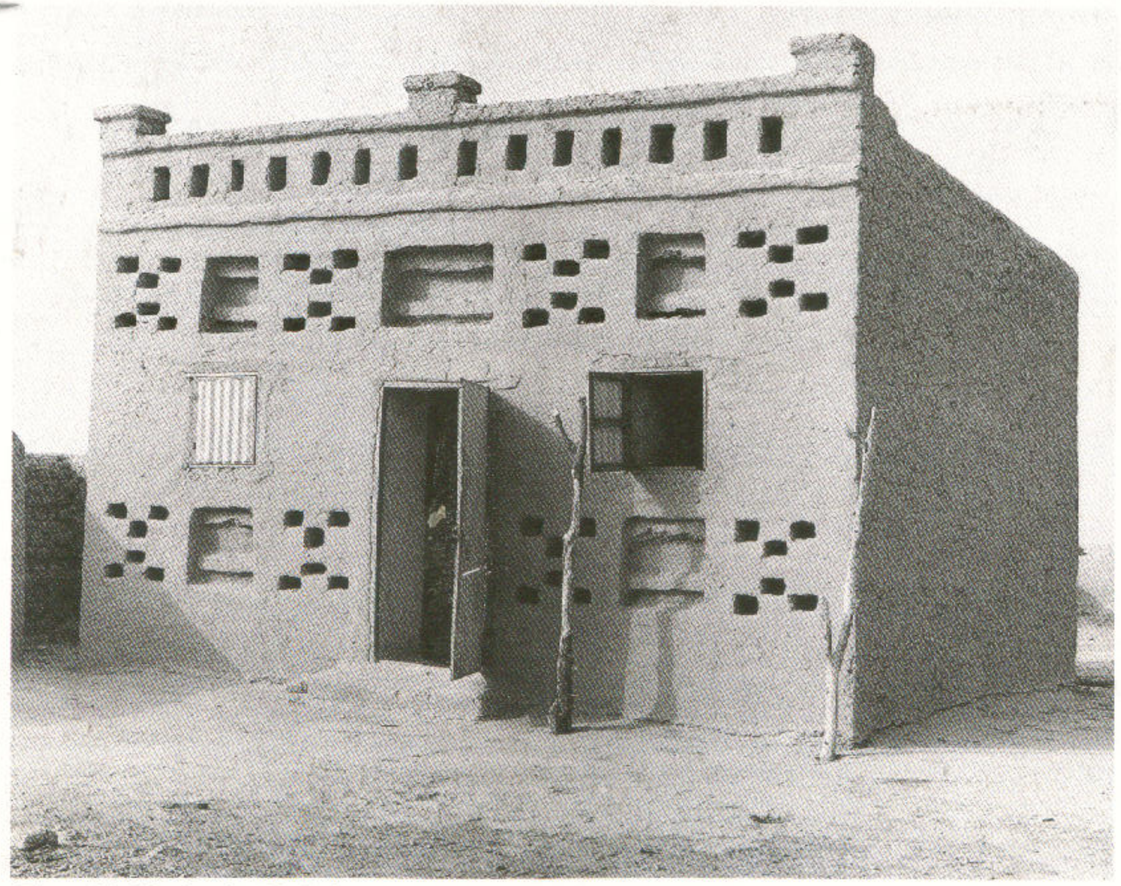


Fig. 10

Figs. 10-15. In the "missing brick" style, bricks are omitted for visual reasons. The spaces do not actually pierce the wall.

Fig. 12

raised and recessed versions on the same facade (fig. 21).

Village buildings in Mali often show the influence of the region's architectural capital, the city of Djenné. For example, on a rural entry house (fig. 22) and a Young Men's House (fig. 23), points against the sky are grouped over a central doorway. Just below them, small thin openings alternate with rudimentary applied pillars. These features are probably borrowed from the classic Djenné house facade (fig. 26) most of whose elements still grace many Djenné buildings[12] (figs. 24-26). In the Djenné area phallic projections top many corners; on the house of a marabout, or Muslim leader, they stand in a row above a whole facade (fig. 27).

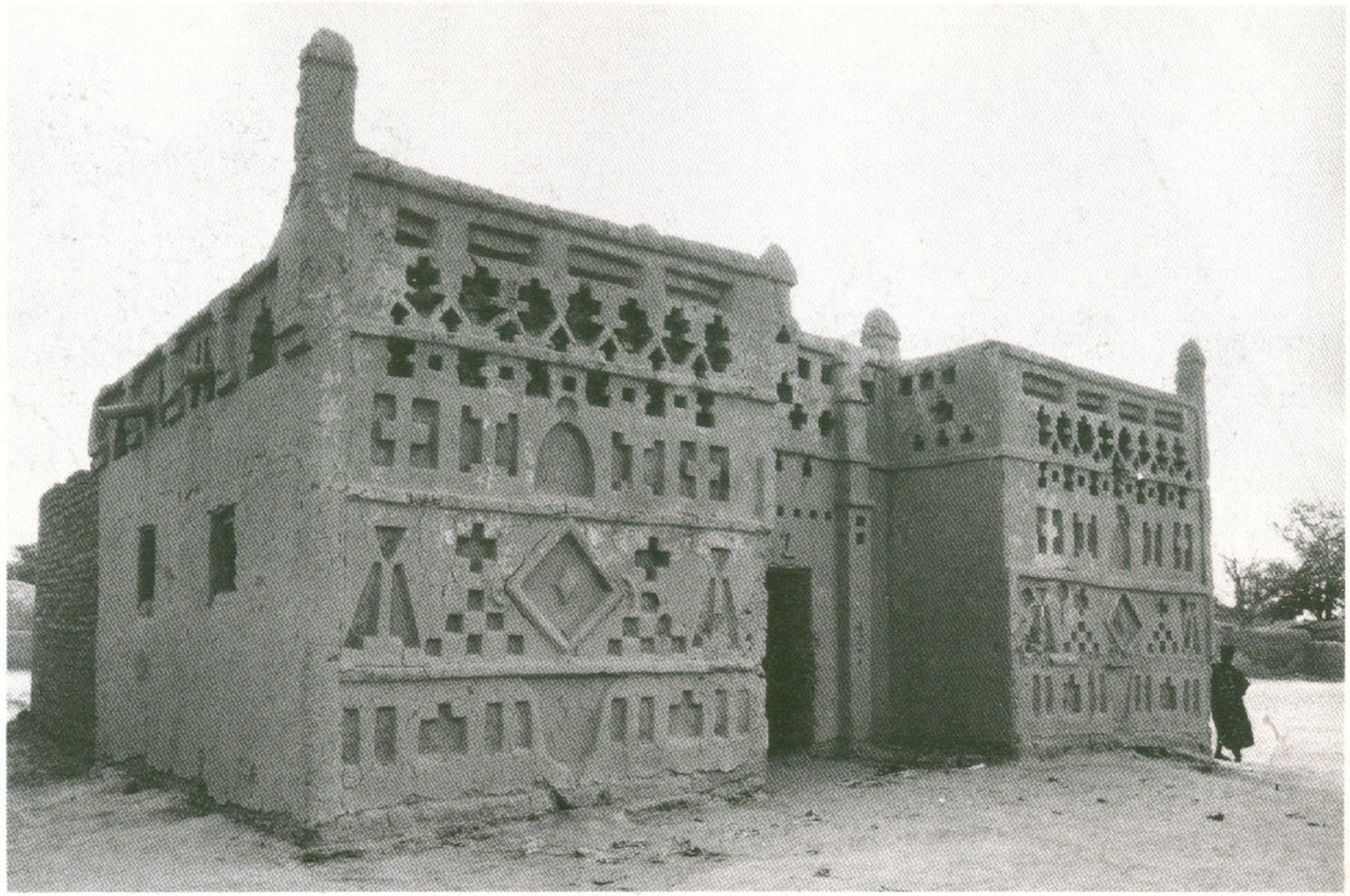
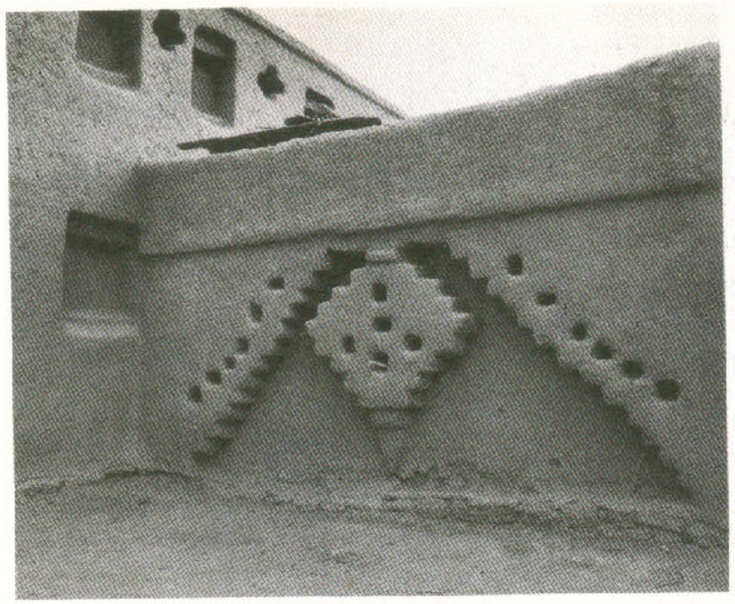
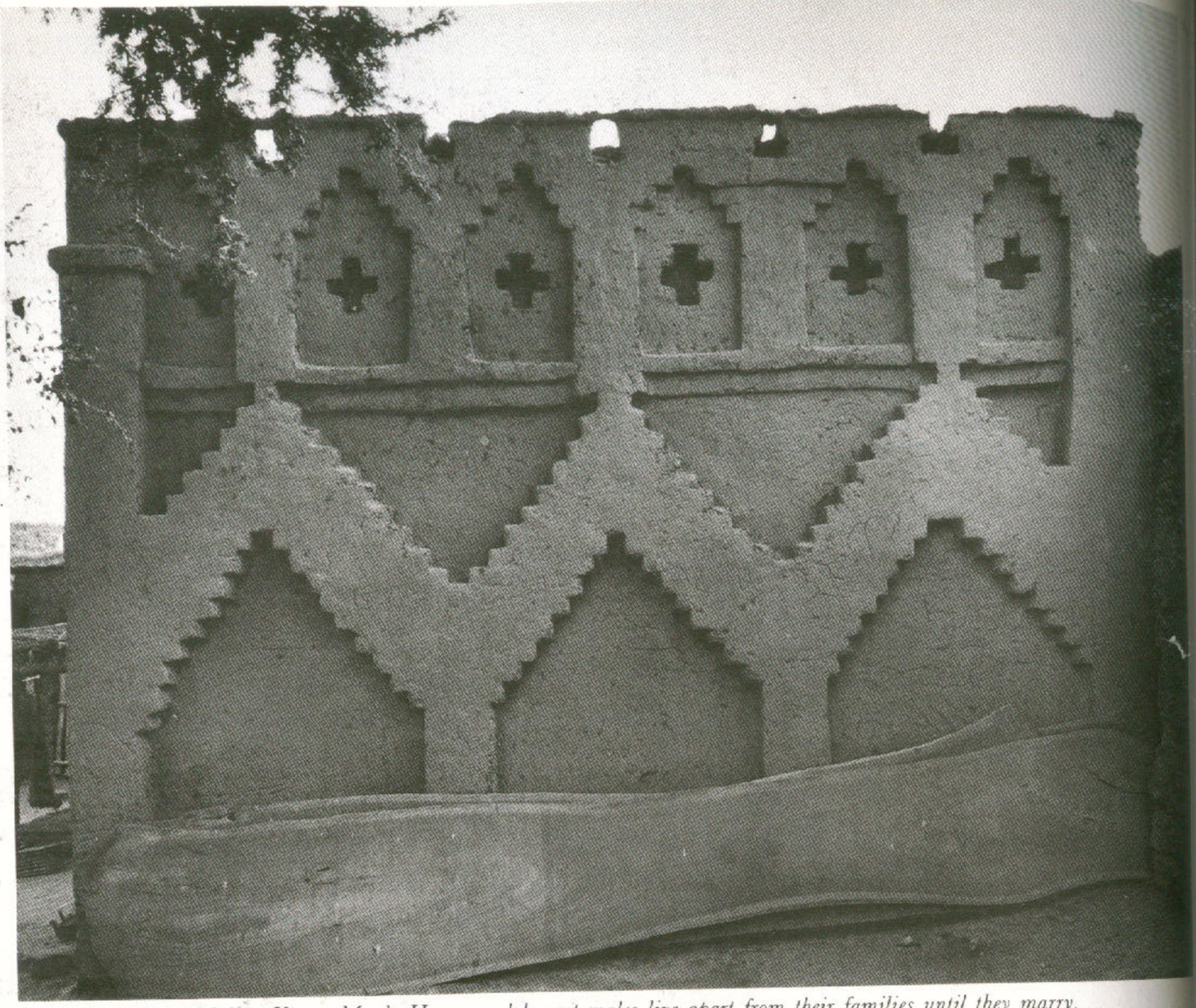


Fig. 13

Fig. 14





Figs. 14, 15. In Malian Young Men's Houses, adolescent males live apart from their families until they marry.

Fig. 16

Figs. 16-18. The "stepped recession" motif divides a wall into a subtle composition of framed and framing surfaces. Simple elements generate a rich play of shadows.

Fig. 17

Fig. 17. A two-family house.

Fig. 18. Row-houses.

Fig. 24

Figs. 24-26. Djenné has long been the architectural capital of Mali. The carefully orchestrated high relief of the Djenné style features phallic projections above the facade and multi-storied applied columns flanking the doorway. The projections are adaptations of ancestral pillars that guarded gravesites and family compounds.

Columns and Arcades

(figs 28-41)

In this last, fully sculptural aspect of the wall, we see some of traditional desert architecture's most stunning decorative and structural effects. Some seem fanciful: a tiny colonnade (fig. 28); a twisted column wriggling from base to capital (fig. 29); a fluted shaft, double molding at each end, rising from a pot (fig. 30).

On a larger scale, five porches (figs. 31-35) play simple, elegant variations on the theme of the arch—flat, gothic, round, horseshoe, and halved. Preoccupied, a pair of small columns have eyes only for each other (fig. 31 upper-left).

Two full stories of arcades ring the lee half of a Young Men's House in Mali (fig. 36). Because such fine detail could not withstand the weathering of annual rains, the other two facades, which face the rain's quarter, are blank. Open, the lower arcades permit sociability; screened, the upper ones provide privacy and shade. Direct yet delicate, phalluses are at once powerful and decorative. Intricate, sculpted decoration has a thermal as well as a visual function. It both casts shade on a wall and provides increased surface for heat loss.[13]

Fig. 28. Figure/ground games. Do we see columns or openings? Free-form teases symmetry in a charming house in Senegal.

This progression of walls climaxes with three houses' abacus-like colonnades in Senegal (figs. 37-41). In this rare and vanishing style, the most ornate elements are not applied, but weight-bearing. Though slight and apparently frail, each supports an enormous load. The contrast between visual delicacy and structural strength seems at times whimsical, at others awesome.

Fig. 29

Fig. 30

Fig. 31

Figs. 31-35. Covered arcades admit air and light yet protect families from rain and direct sun.

Fig. 32

Fig. 34

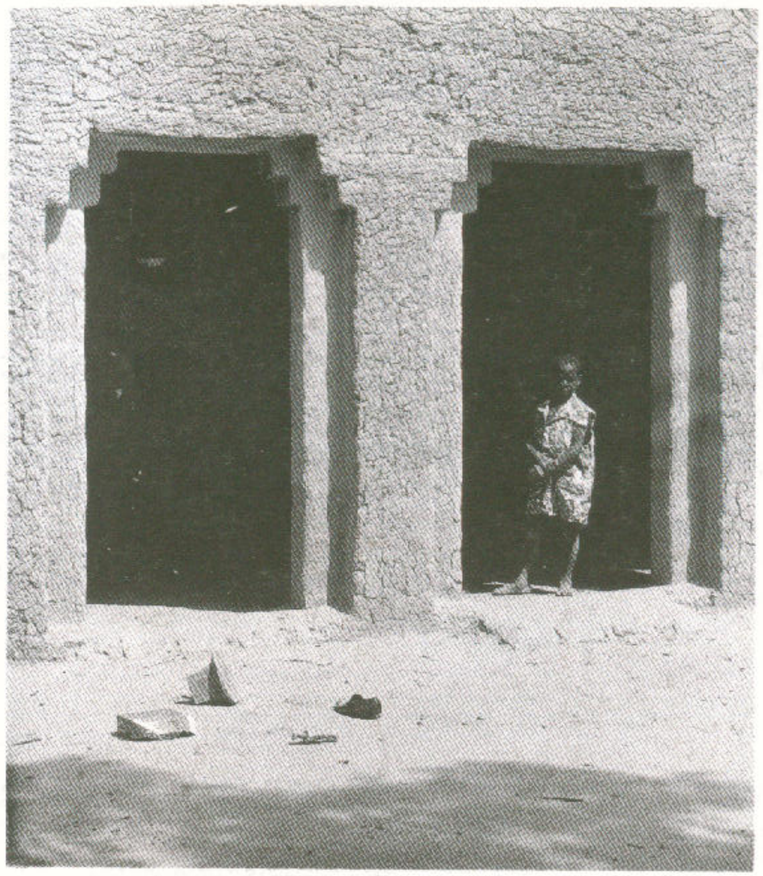


Fig. 33

Fig. 35

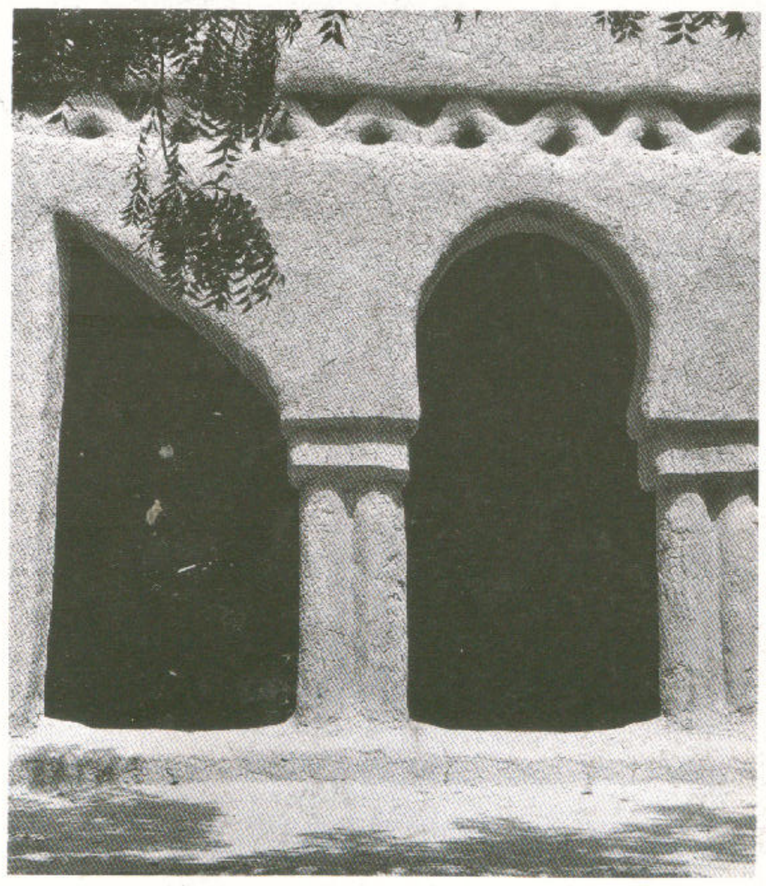


Fig. 37

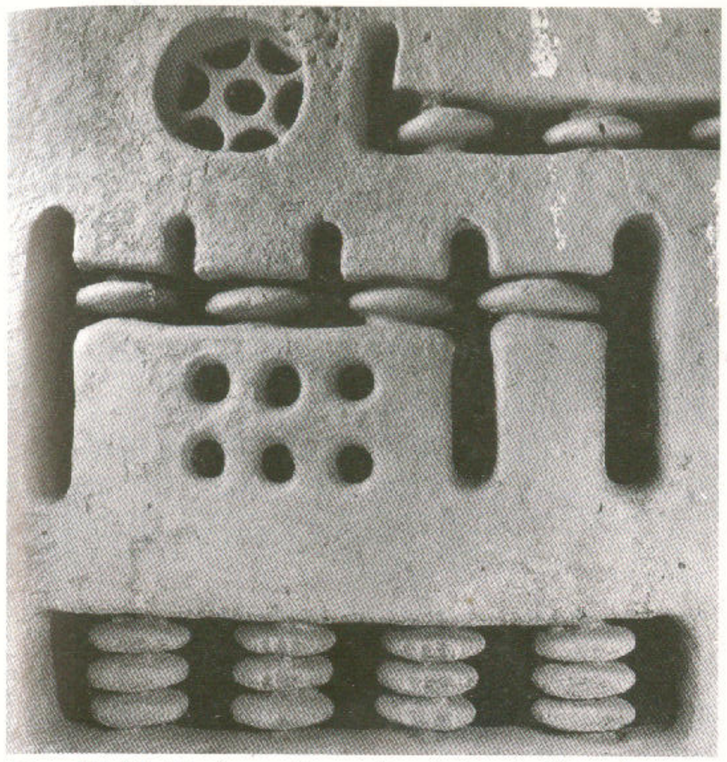
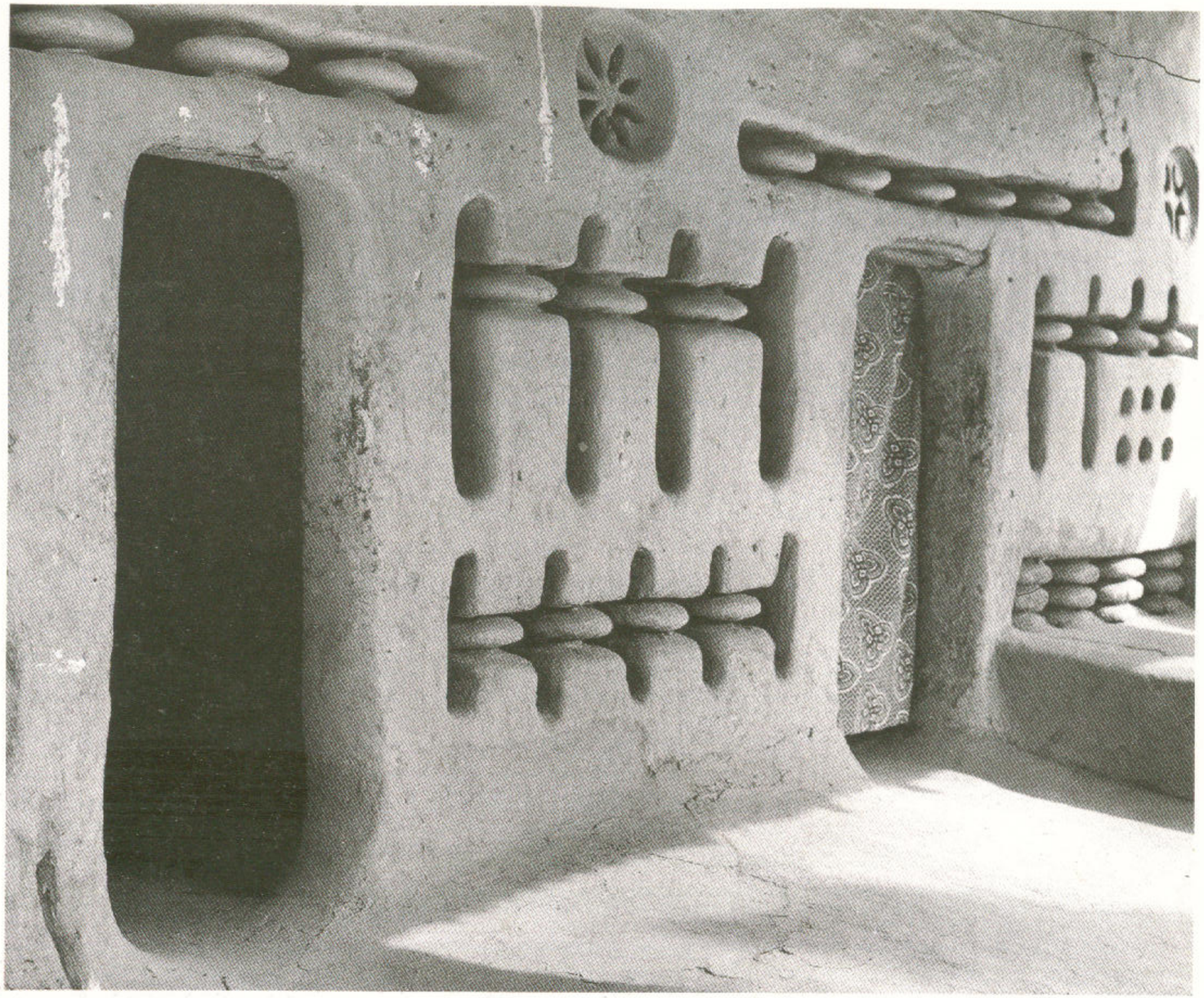


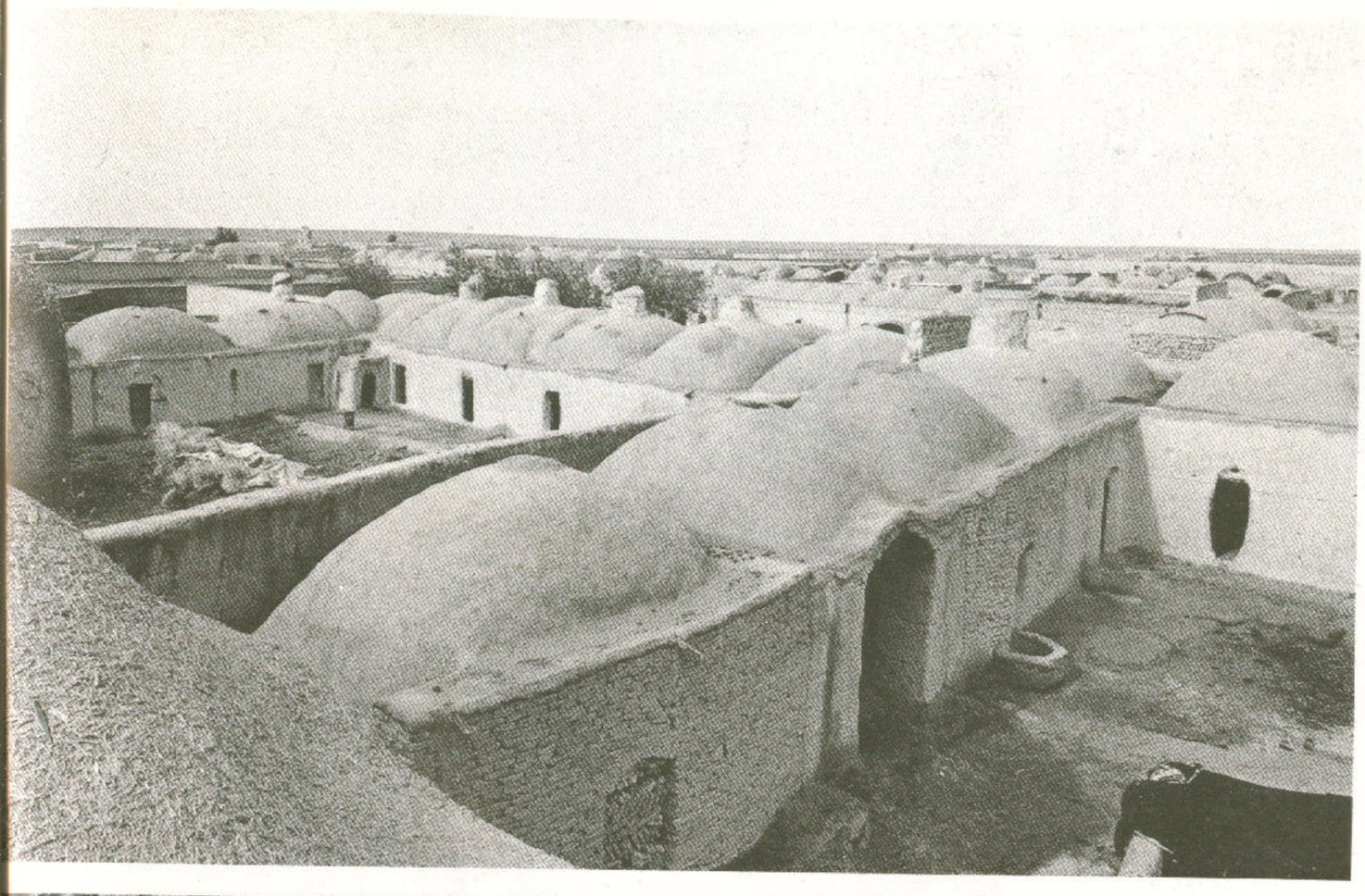
Fig. 38



Figs. 37-41. Porch arcades on three houses in Senegal. Brilliantly articulated walls show both visual elegance and structural daring.

Fig. 42

Figs. 42-44. In areas where there are few trees to provide long beams, interior space is spanned by many methods. In a small mosque in Niger, a set of columns supports the central lantern roof. An entry house's single central pillar is made of solid mud. And another entry house has a "Hausa dome" with saplings for ribs, a system adapted from the tents used years ago, when the Hausas were nomads.



Roofs (figs. 42-46)

In areas where there are few trees to provide long beams, interior space may be spanned by a variety of methods. These range from maximum internal support (fig. 42) to none (fig. 45).

Four columns support the lantern-roof of a small mosque (fig. 42). An entry-house's single column is made of solid mud (fig. 43). Another entry-house has a "Hausa dome" which uses grouped saplings for ribs[14] (fig. 44). Ribless vaults and domes made of sun-dried brick and built without scaffolding are found throughout the Middle East[15] (figs. 45, 46).

Figs. 45, 46. Ribless vaults and domes are found throughout the Middle East.

Fig. 47

Figs. 47, 48. Built to grind grain, an Afghan windmill with horizontally rotating sails recalls the world's earliest, invented in the region more than one thousand years ago.

WIND AND VENTILATION

Desert winds vary from violent to absent. Different regions have developed highly ingenious strategies tailored to harvest or counteract local wind conditions. Devices range from those that can convert the wind's fury into power to others that shrewdly coax a cooling breeze from stifling calm.

The Horizontal Windmill

(figs. 47, 48)

The wind blows hard in western Afghanistan. Sweeping south from the Kyzyl-Kum steppes of inner Asia, a torrid gale known locally as the "wind of 120 days" and the "wind that kills bulls" howls almost daily from June through September. Often reaching one hundred miles per hour, this wind blows hardest in Sistan, a dry, hot region extending across Afghanistan's southwestern border into Iran.

Sistanis turned their meteorological scourge into a benefit. They were the first people to harness the wind, to focus the

Fig. 48

air's wild energy into work.[1] Before or during the ninth century, Sistanis invented the windmill.[2] They were perhaps inspired by horizontal, wind-driven prayer wheels which whirled in Tibet and Mongolia as recently as a hundred years ago. The sails of the first Sistani mills almost certainly rotated horizontally[3] like the millstone, thus bypassing the need for a gear to translate vertical into horizontal torque. Mills ground grain and pumped water.

Not until the twelfth century did windmills—with the familiar, vertically rotating sails—appear in Europe. And not until the late sixteenth century did they reach La Mancha in Spain. It was probably because Cervantes found their whirling sails new and strange that windmills outraged the gallant Don Quixote.[4]

Early windmills prompted not only comical pique but admiration and even wonder. Of Sistan, "the land of wind and sand," a tenth century chronicler writes, "there is no place on earth where people make more use of the wind."[5] A thirteenth century commentator even compares the Sistanis' power over the wind to that of early wind-master Solomon, the first person in legend to travel—with his entire court—on a flying carpet.[6] As late as 1963, fifty mills were still active in Neh, a town in Iranian Sistan.[7] But today working horizontal windmills have almost disappeared, superceded by mills powered by diesel motors.

In the nineteenth century, a local ruler in central Iran tried to import the horizontal windmill. At considerable expense, he built a huge mill to raise water. But the mill never pumped a quart. Local winds were far too light to turn its sails.[8] Such a mismatch of regional wind and vernacular wind-device is rare if not unique. The rule is an exquisite pairing, well shown in traditional structures using the wind, not for energy, but to cool.

To Catch a Cooling Breeze

(figs. 49-53; drawings A, B)

The strength and direction of a region's wind govern the form and size of openings designed both to receive the wind and to vent it. Near the Afghanistan-Iran border, because a powerful wind blows from a single quarter, windscoops are small[9] (fig. 46), and small ventilators are needed only over kitchens. On the other hand, Egypt's prevailing summer wind is mild, so ventilators—which help draw the breeze through a building—yawn at least as large as the quite large wind-catchers. In fact, in Egypt,[10] Algeria,[11] and northwest India,[12] free-standing porches actually face away from the wind, their back walls pierced by relatively small openings. The flow of air over and around these porches creates a low pressure within that pulls air through the openings. The reverse orientation would not allow sufficient venting to prevent the air inside from going stale.

In southern Pakistan, wind-catchers can be seen studding a distant horizon or looming over a street or roof (figs. 49-51). Depending on the light, they suggest a host of associations: periscopes, sails, huge kites, mushrooms, or elves with hats. Singly, in small groups, or as skyline legions, they have the lovely power of evoking moods like abstract sculpture.

Their design is elegantly simple. Most consist of three flat planes and a post. Two vertical surfaces at right angles form a base. A third, one of its corners tucked into the angle, tilts forward at about forty-five degrees and deflects the wind down into the house. A post anchors the deflecting plane.

Across the Sind region's flat desert, a southwest wind blows from April through June. Steady and cool, it is a blessing. Its arrival coincides with the area's most brutal heat, when the day's highest temperature averages 107 degrees F. The wind is moderate, so wind openings are large and ventilators infrequent. In a typical village hundreds of wind-catchers reach high into the sky to clear the "wind shadows" of neighboring rooflines. They turn their backs to the winter wind, which blows from the opposite quarter and is not needed indoors in cool weather.

Like that of most indigenous architecture, the history of Pakistan's wind-catchers is obscure. Local tradition states only that their use is "very old." The first Western reference to them seems to have been by an English traveler who, visiting the city of Hyderabad in 1815, observed that

Figs. 49-
to channel

Fig. 49

Figs. 49-53. Taking advantage of a cool summer wind, Sindis in southern Pakistan build wind-catchers to channel the breeze down into their houses.

Fig. 50

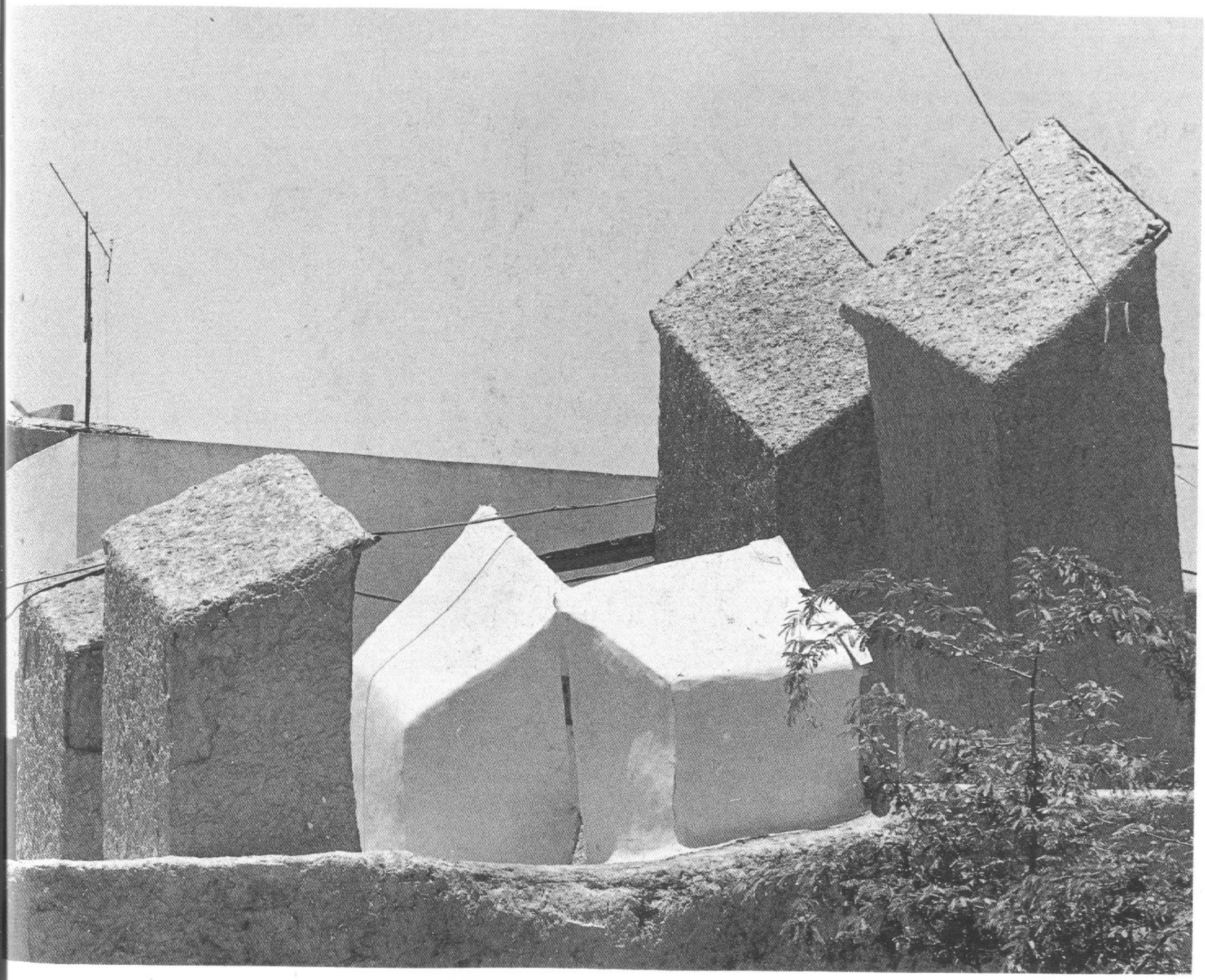


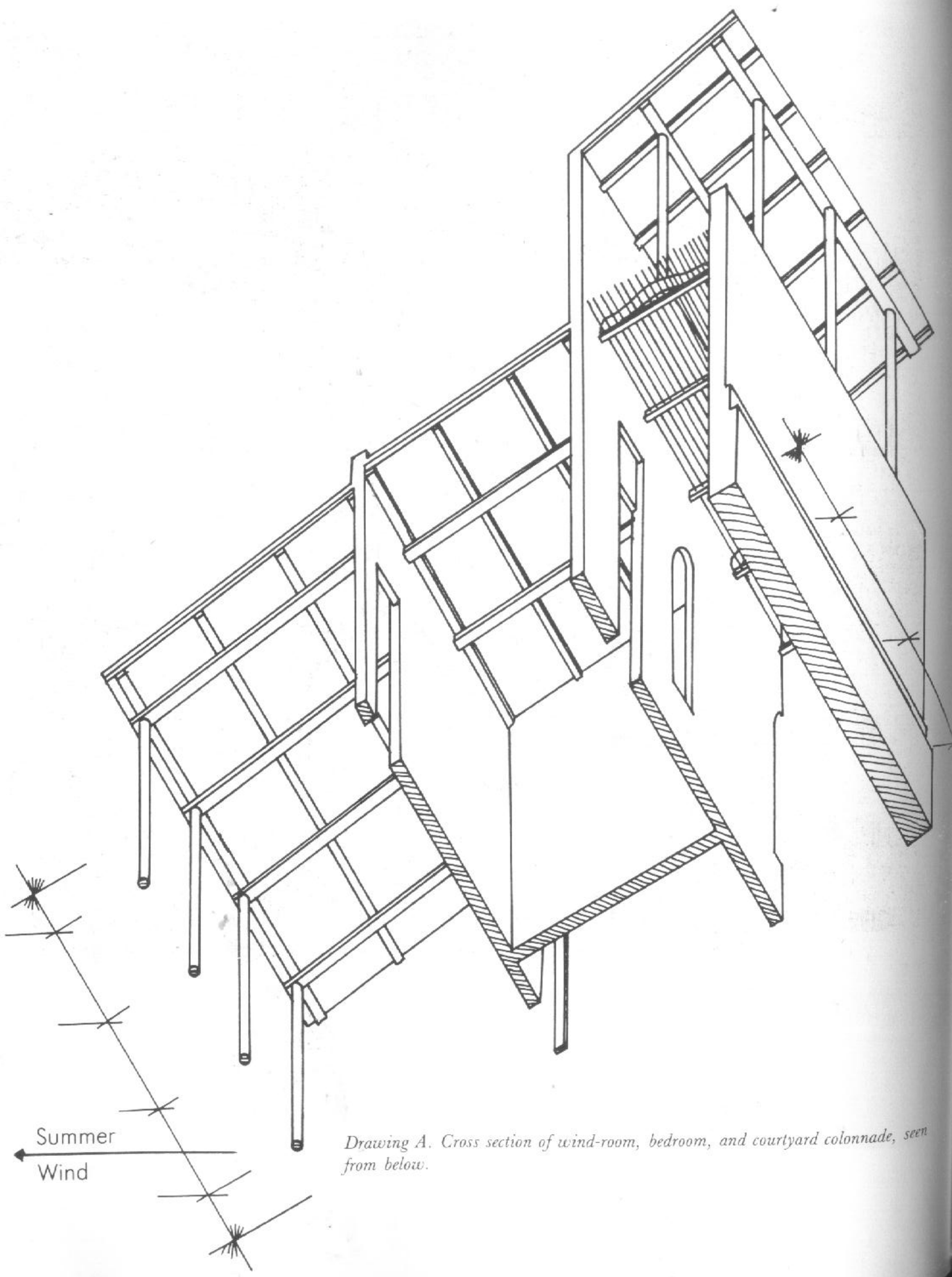
Fig. 57

wind-catchers occurred on every house "from the governor's palace to the lowest hovel."[13]

Southwest of Hyderabad, the large town of Tatta boasts wind-catchers on most of its houses. There are interesting variants from the standard plan. Sometimes, wind-catchers do not rise from the roof but are incorporated into a building's highest story[14]. In many, the east-west axis is two or four times the north-south axis (fig. 50). In a few cases, the ratio can be as much as seven to one. Below this type extends a long, narrow "wind-room" whose entire ceiling is a wind-catcher.

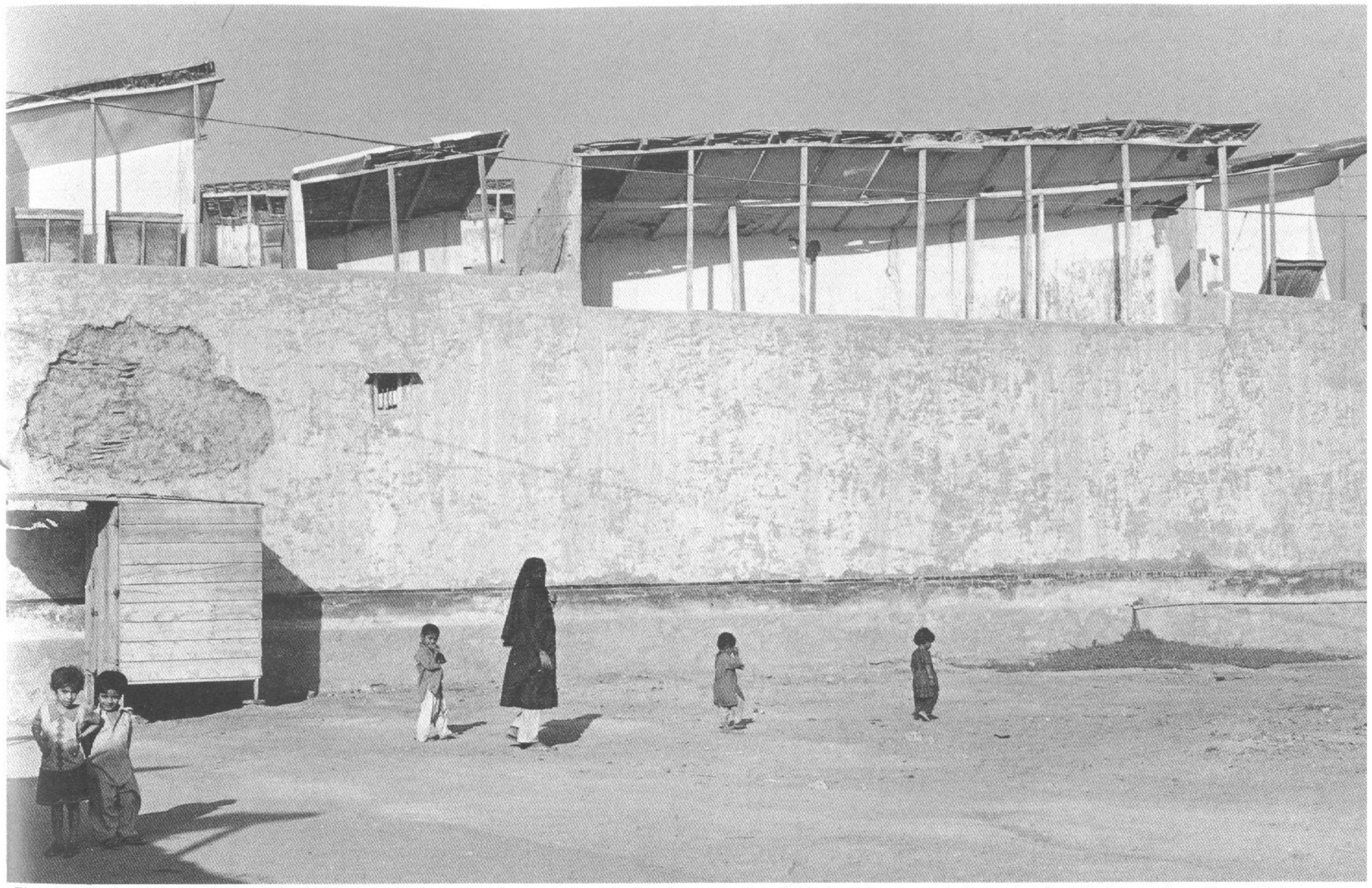
An elegant, twenty-year-old house in Tatta boasts a wind-room twenty-eight feet long (figs. 52, 53; drawings A, B). On its lee wall, four windows and two doors can be opened in any combination to regulate the flow of air into two bedrooms, then through them out to an open court and its wide colonnade. In the colonnade's four walls are twenty-one doors with transoms. Eleven wind-catchers and two ventilators cool the entire house. Kitchen and toilets—and their odors—are to the lee of all bedrooms.

All wind-catchers have a metal grate to prevent entry into the house from the roof. Except for the very large ones above wind-rooms, all also have trap doors. Propping these doors at different angles governs the amount of air admitted. In winter they are shut. In multistoried houses, a shaft conveys the breeze to rooms on the lower floors.[15]

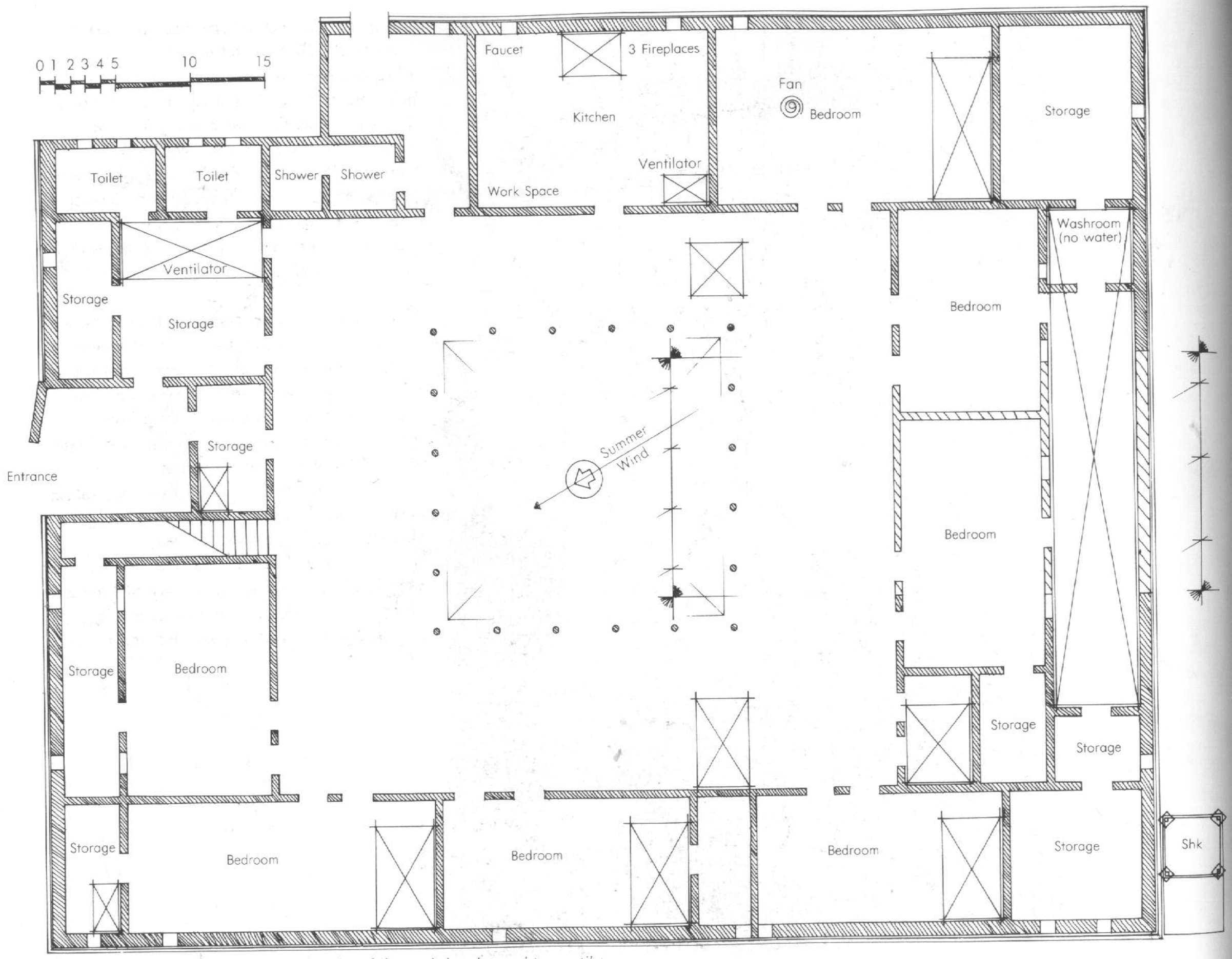


Drawing A. Cross section of wind-room, bedroom, and courtyard colonnade, seen from below.

Fig. 52

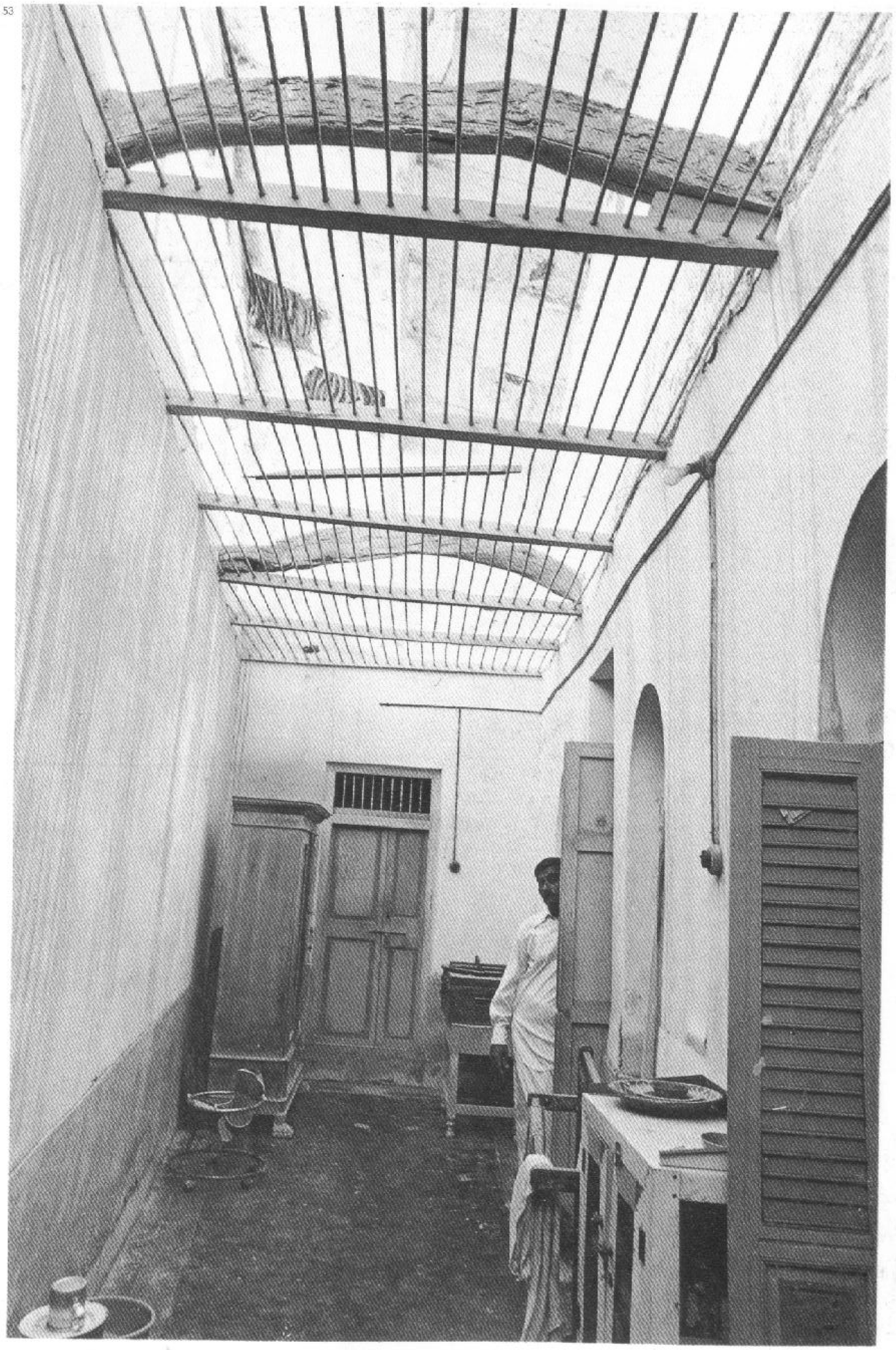


Figs. 52,53, drawings A, B. A twenty-year-old house in the town of Tatta boasts a wind-catcher twenty-eight feet long. Below it, a wind-room has four windows and two doors which can be opened in any combination to regulate air flow.



Drawing B. Floor plan of house, showing postion of eleven wind-catchers and two ventilators

Fig. 53



Wind-catcher technology runs the gamut from traditional to industrial. In many wind-catchers, a base of sun-dried mud brick supports a deflecting plane of wood, the whole sheathed with a layer of mud mixed with dung and straw. More "modern" ones have a base of kiln-dried bricks, a plaster sheath, and a deflecting plane of corrugated steel supported by a wooden frame. The most recent ones are entirely concrete.

Though not rare, concrete wind-catchers are by no means common. They adorn virtually no recent affluent Sindi homes, whose long, low lines, it is claimed, are ruined by the wind-catcher's upright thrust. This argument skirts the real issue, which is that fashion now backs consumerism, in the form of ceiling, table, and frequently enormous free-standing electric fans. The wind-catcher, conspicuous symbol of a slower, supposedly more backward way of life, is on the wane. The rising cost of energy may soon force fashion around again.

The Stack Effect

On Iran's central plateau and along the Persian Gulf, torrid temperatures and light breezes have inspired thermal ingenuity. Wind-towers—tall to reduce the admission of dust—are topped by slender openings up to thirty-five feet high. The giant slots, connected to individual passages within the tower's shaft, function alternately as intake and outlet.[16] Facing all four quarters, they can reap the slightest, most fickle breeze. After sundown, the heat stored in the tower's mud-bricks warms the air, which—being less dense than the cooler surrounding night air—rises. This process, known as the *stack* effect, creates a draft that pulls a refreshing breeze through doorways and windows.[17]

In southern Morocco, houses tend to huddle in common defense against the sky. As in many traditional desert communities, very narrow streets hinder the penetration of hot sun and strong, dust-laden winds (fig. 54). Houses' second stories often bridge the street, creating underneath a network of cool, dark tunnels. These passages, mysterious and refreshingly humid even at harshest midday, are dimly lit by occasional light-wells called—in local translation—"God's lightbulbs" (fig. 55, drawing C).

Maadid is a traditional, walled town of some two thousand. Like many neighboring settlements, it is built entirely of mud. Where the Iranian wind-tower employs the stack effect to cool a single

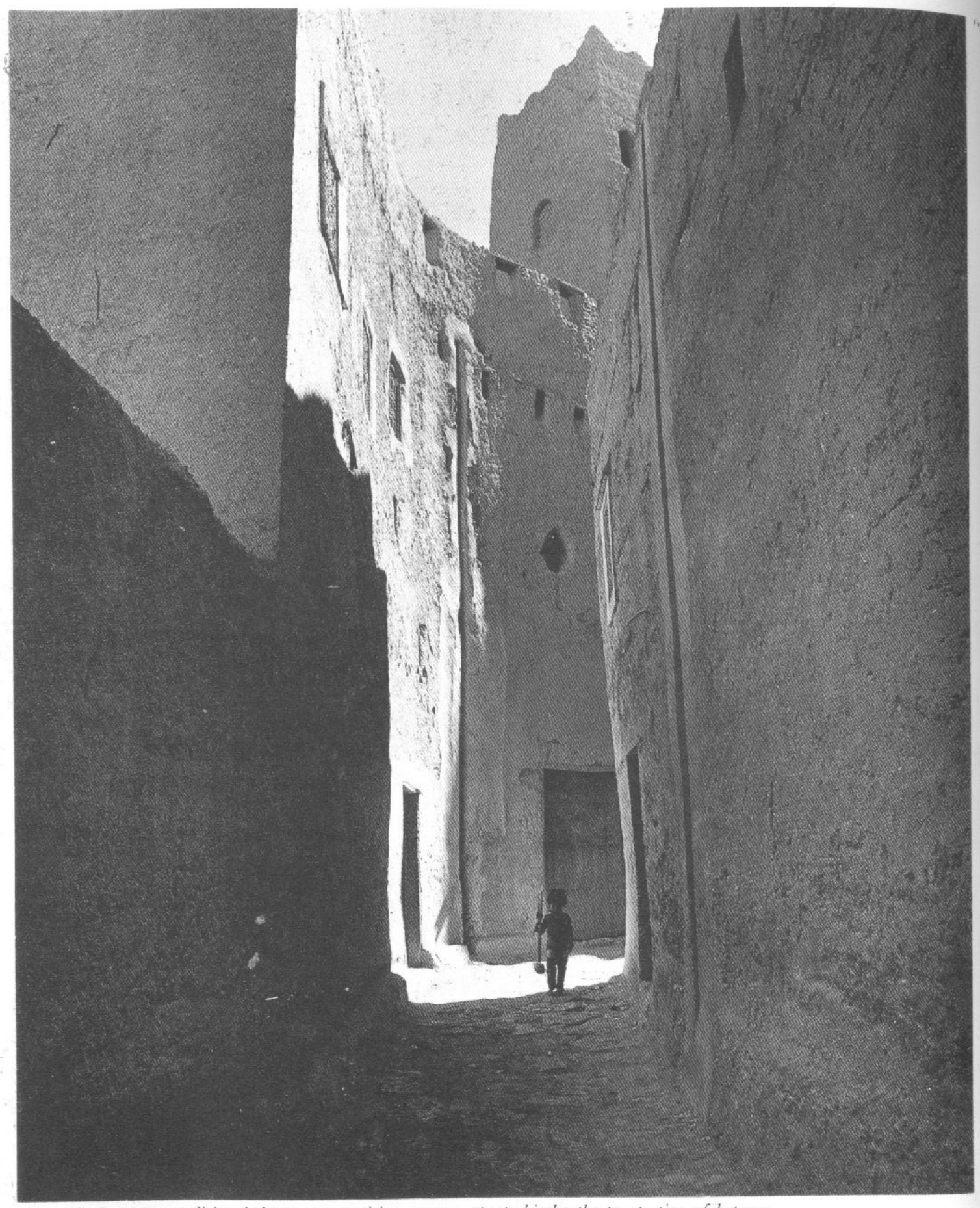
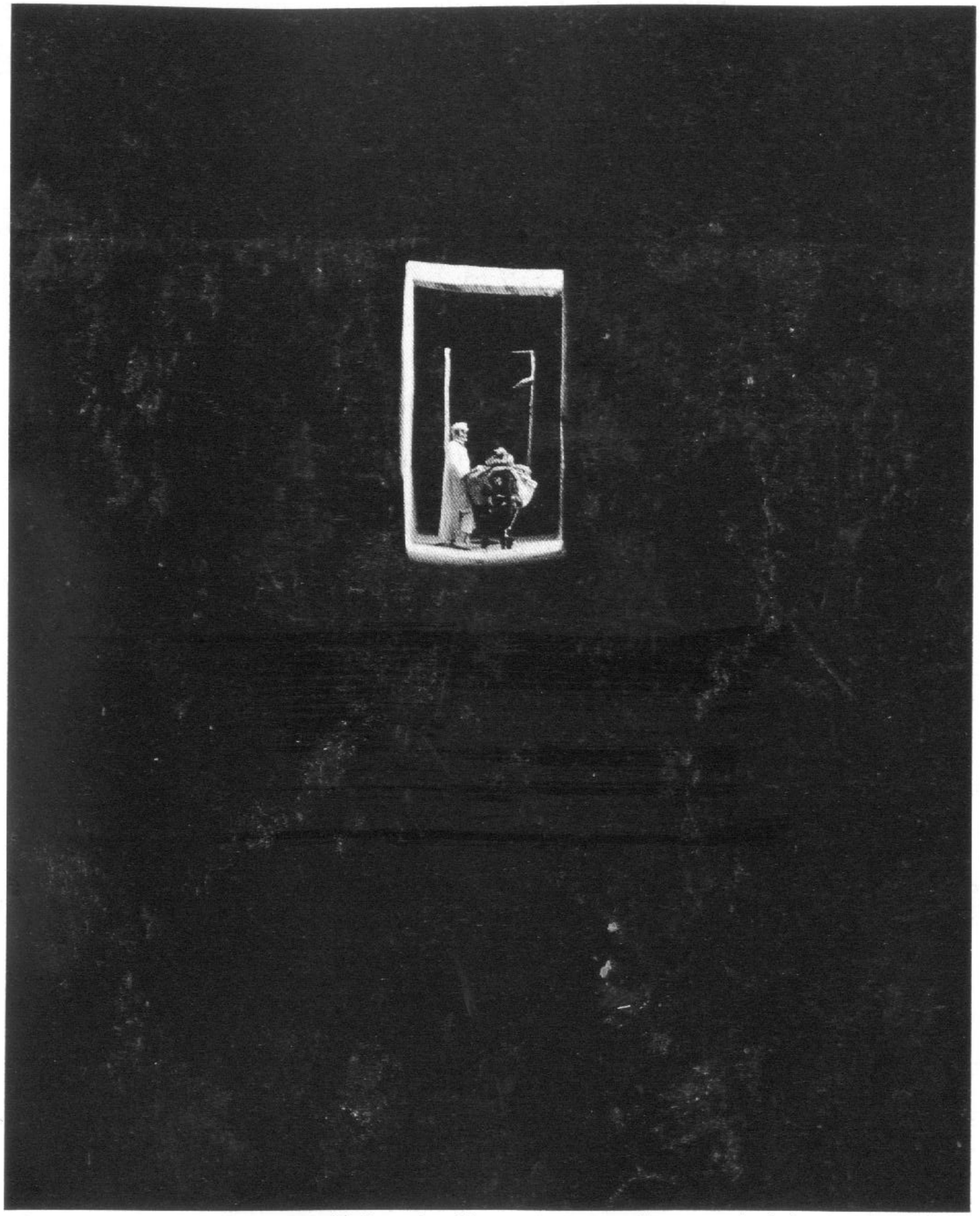


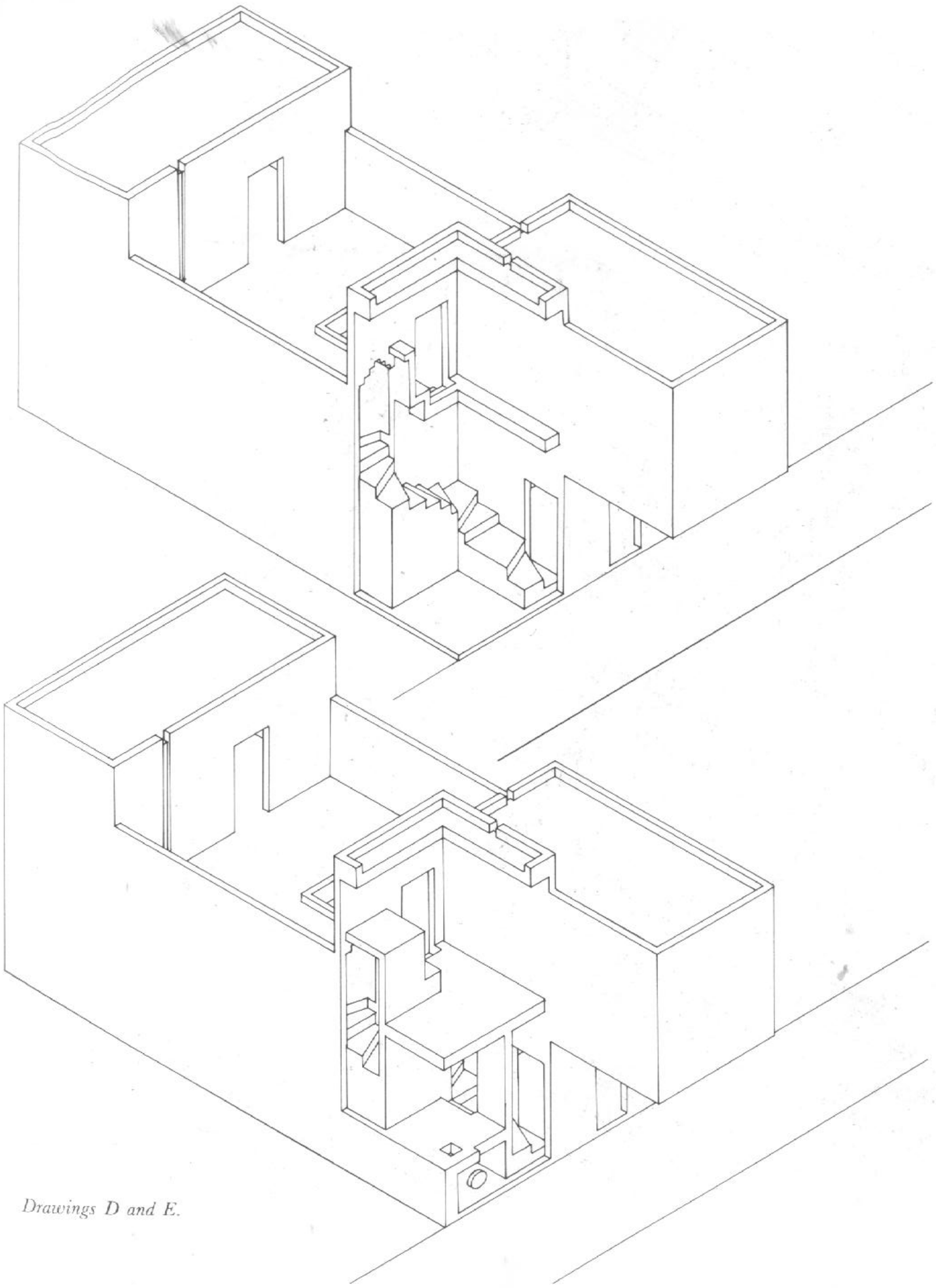
Fig. 54. In many traditional desert communities, narrow streets hinder the penetration of hot sun and fierce, dust-laden winds.

Fig. 55



Figs. 55-57, drawings C, D, E. Maadid, in southern Morocco, is an extraordinary example of clustering. Second stories often bridge streets, creating a network of cool, dark tunnels underneath. These passages, refreshingly humid even at harshest midday, are aired and dimly lit by occasional open **shafts** *locally called, "God's light bulbs." One unit in a megastructure, the standard dwelling is a two-story house with a narrow front and long, common side walls. The "stack" effect, venting warm air out skylight and stairwell, draws cool air in from the covered street.*

Drawing C. Cross section of typical blocks of houses



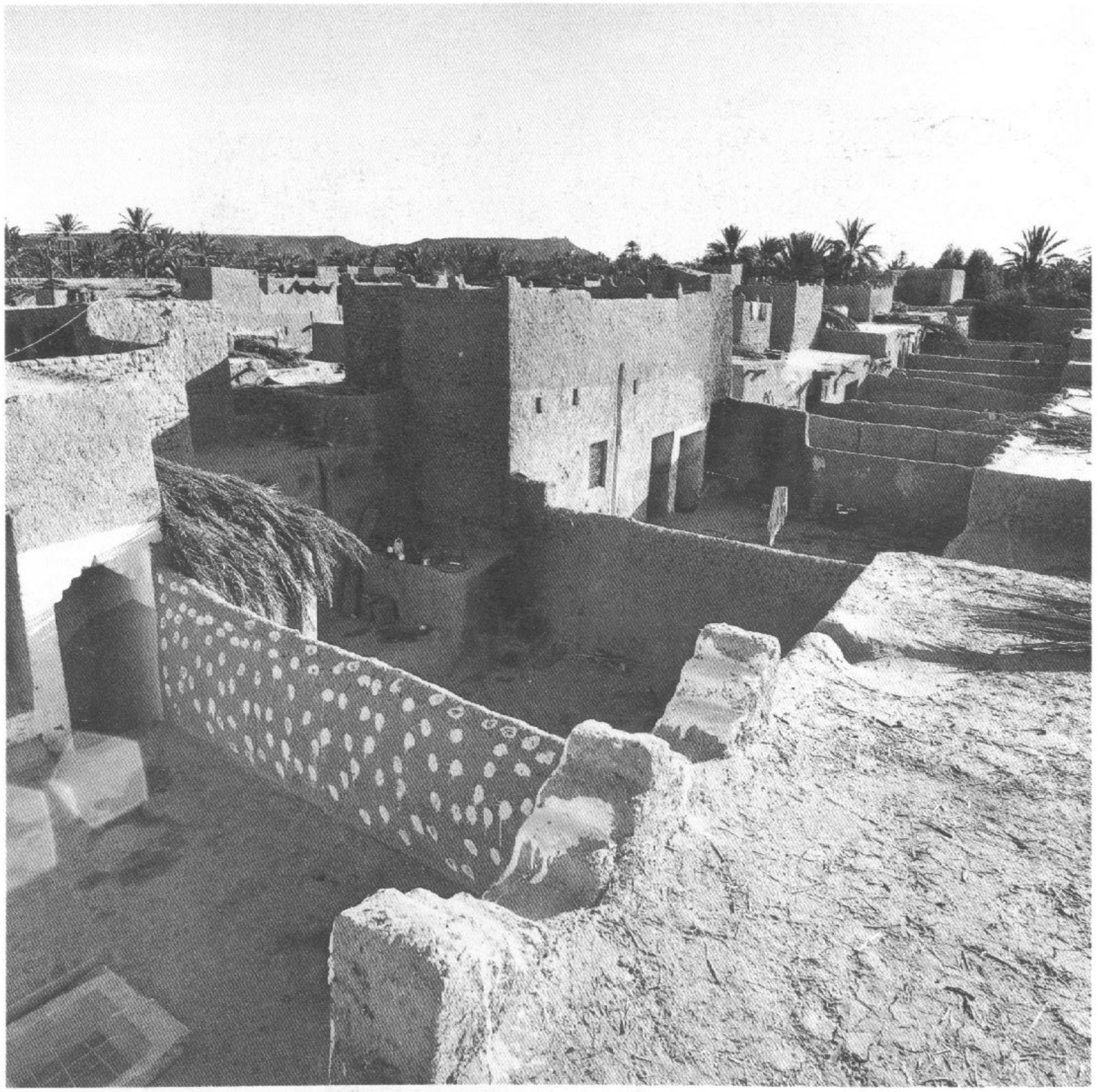
Drawings D and E.

dwelling, Maadid's design uses it to cool many. The basic unit is a two-story row house with a narrow front and long common side walls (figs. 56, 57; drawings D, E). Upon entering, one finds a small antechamber. Ahead, beyond a door and lit only by a small central skylight, is a large livingroom. At its far end stands the door to a small bedroom or storeroom. The ground floor has no external wall-windows. To one side of the antechamber, serpentine stairs turn right, then left, then right again, up past a toilet at mid-story to the second floor. Here, two rooms (or sets of rooms) face each other across a long, walled terrace.

Together, stairs and toilet are a model of functional elegance. They simultaneously allow or prohibit the passage of people, light, air, and waste. The toilet is a small opening with a date-basket lid. Below, waste is dried and deodorized by straw, collecting in a vault emptied periodically directly from the street.[18] The position of the toilet's entrance, being both at the half-story and on a stairwell which operates as a ventilation shaft, provides additional protection against odors reaching the ground floor.

As the stairs descend, the first two right angles prevent light from filtering through the toilet doorway. This is crucial because of the area's flies. Insistent, disease-carrying, and legion (particularly during the date-harvest when roofs and terraces are covered with dates drying in the sun), the flies are exasperating as well as

Fig. 57



noxious. Luckily, they are "stupid." They read dark for night, and wherever light is absent they fall asleep. Proof that design perfectly prohibits the spread of odors and the annoyance of flies is that the toilet needs, and has, no door.

The livingroom skylight provides more than light. At least as important, it allows air near the ceiling, heated by the sun striking the roof, to escape. This stack effect draws air from the covered street through the front door, habitually left open for this purpose. Cool, humid, and fresh, this sweet breeze reveals one of the street's key functions: to be the house's lung.

Maadid's superblocks of houses nestle back-to-back, flank-to-flank, and usually, above the covered street, front to front. None of the ground-floor walls have windows. And only three small openings—skylight, stairwell, and street light-well—pierce the continuous ground-floor ceiling. Finding it more convenient to burrow than to build, many traditional communities, from Spain and Tunisia through Turkey to China,[19] have carved out subterranean dwellings. Maadid's design, however, is remarkable in the degree to which it *simulates* the underground. In doing so, it acquires one of underground living's major advantages—insulation against temperature extremes—while brilliantly solving its major problem: ventilation.

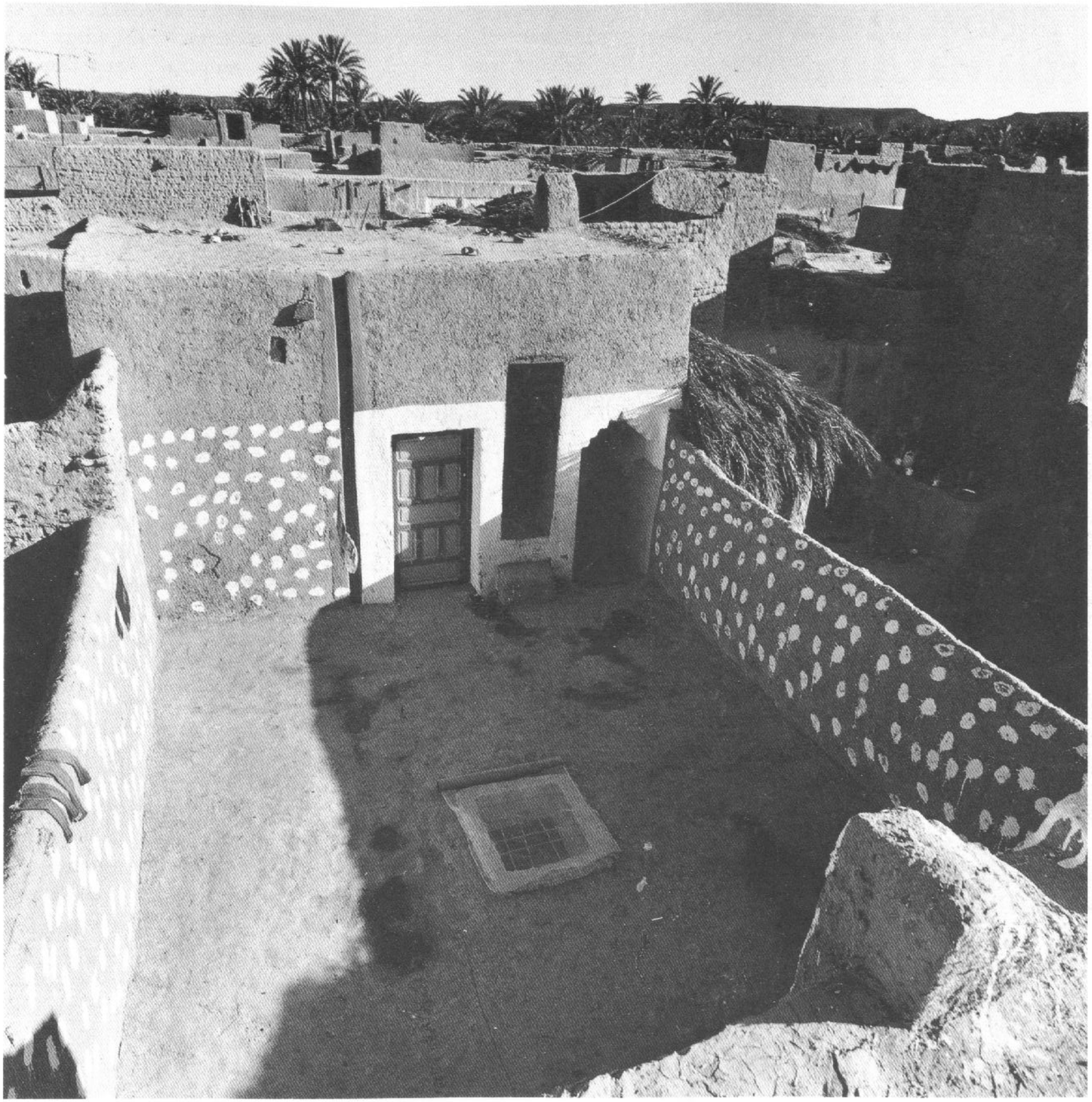


Fig. 56

Evaporative Cooling (fig. 58)

Among many traditional desert devices using evaporation to cool, one is used from northern India through western Afghanistan and also in West Africa.[20] A suitable local bush is woven into a loose, thick mat or packed into a frame, placed outside a window or door, and repeatedly drenched with water. Since the process of vaporization absorbs heat, a breeze evaporating the water can easily cool a room by 15 degrees F.

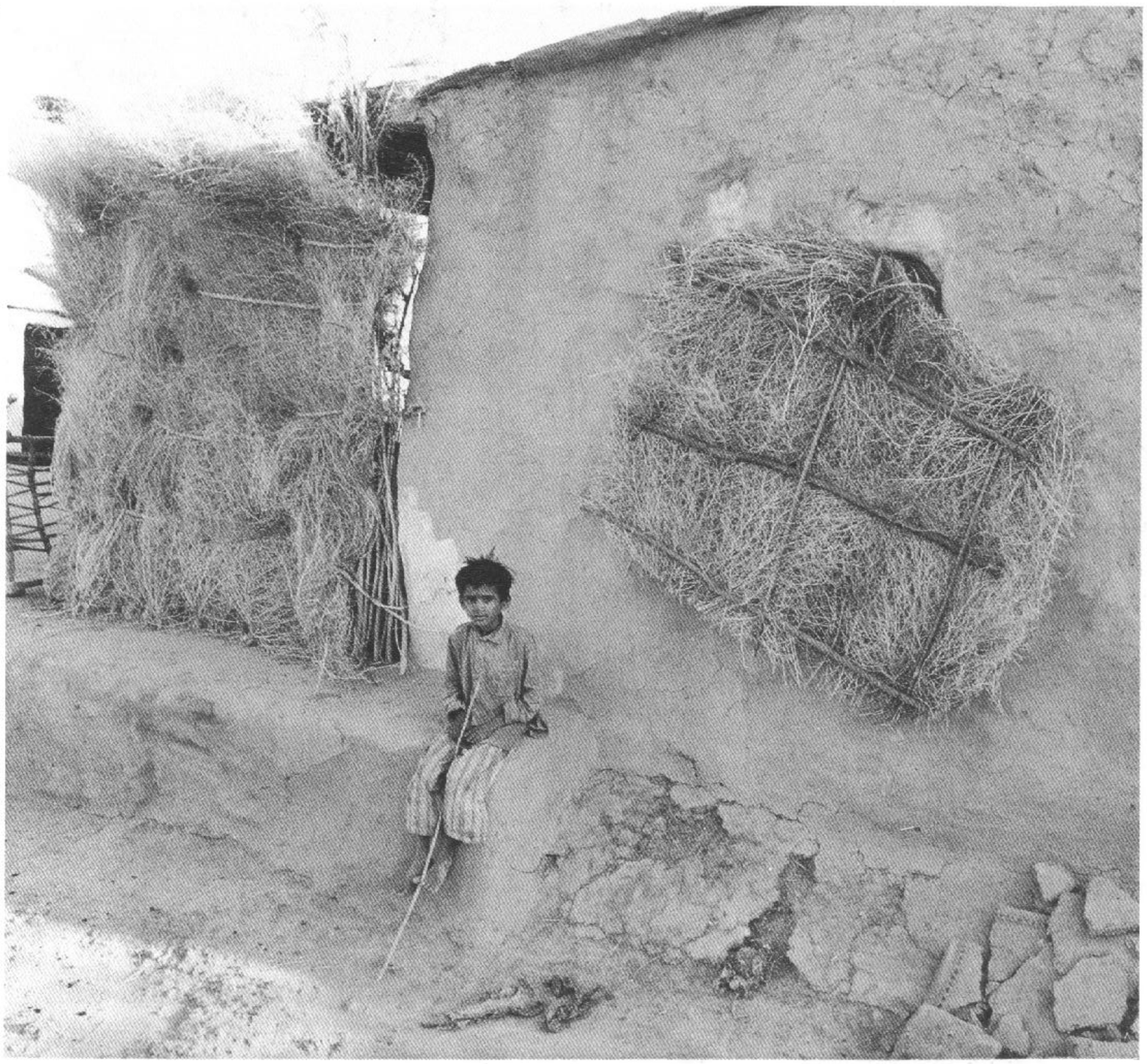
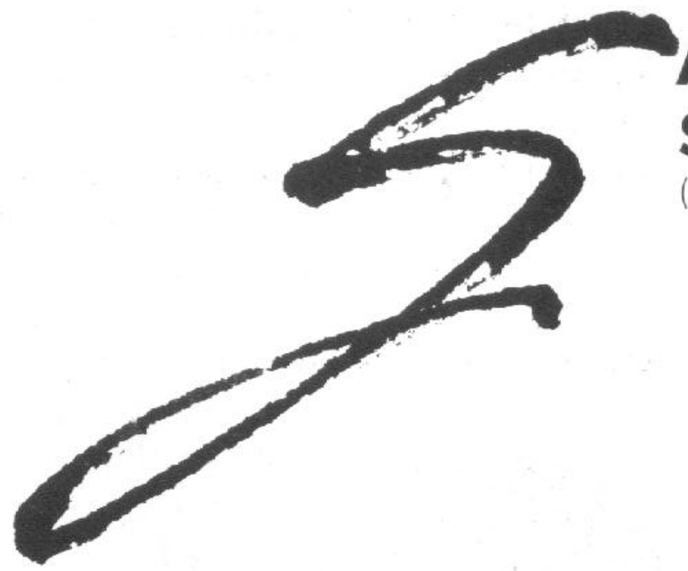


Fig. 58. Evaporative cooling. A traditional form of air conditioning consists of packing a local plant into a frame, placing it outside a window, and repeatedly drenching it with water. Since evaporation absorbs heat, a breeze evaporating the water can cool a room by as much as fifteen degrees.

In cities in India, the system is sometimes aided by a small amount of electricity. Wet mats up to eight feet tall hang before open windows to cool modern offices. Water drips from holes in the pipe from which mats hang. The run-off trickles into a pebbled trough and is recycled by an electric pump.

A more compact device, the *desert-cooler*, is about the size and shape of an air conditioner. A small electric fan draws outside air through mats of wood shavings kept damp by a pump and blows the cool air indoors. Extremely effective in dry, hot regions, the desert-cooler uses much less electricity than an air conditioner. The appliance was once popular in the southwestern United States. It deserves to be again.

Architectural devices to catch or create cooling breezes are very old. Ancient Egyptian houses featured triangular wind devices.[21] At least 1,200 years ago wind scoops caught the sea breeze on buildings in Peru.[22] As rising fuel costs make industrial air conditioning prohibitively expensive, age-old ingenuity may come to the rescue. Different meteorological areas of the world would do well to adopt appropriate wind devices—ecologically sound forms of air conditioning at once cheap, efficient, and often beautiful.[23]



SACRED MUD SAHELIAN MOSQUES

(plates 22-39)

mediately south of the Sahara stretches Sahel, a vast region with little rain, rse vegetation, and a rich, distinctive hitecture. Islam first penetrated the n the eleventh century.[1] Three dred years later, a Sahelian Muslim peror, Mansa Musa, stunned the world he amount of gold he brought with on a pilgrimage to Mecca.[2] Through eighteenth century, Islam in the Sahel chiefly the religion of kings, courtiers, merchants. Then by means of a series egional *jihads*, or holy wars, it changed an elite to a popular faith.[3]

t advanced, Islam came into conflict local animist religions. A ritanian account describes an ancient frontation. In the eighth century, ya El Kamel, a Muslim holy man n Bagdad, was the first Arab to reach town now known as Oualata (where a bara king, absent just then, had a e of gold to which he tied his horse).

ya and his party asked for water. No, Bambara replied, water was sold. But Yahya had none of the shells then used for money. He gave his student three pebbles and instructed him to throw them down the well, one at a time. After the first pebble, the water rose to the top of the well, and the travelers drank. After the second pebble was tossed, the water sank to its original level and turned into blood. After the third, the blood turned to sand. The Bambara exclaimed "Tabre," indicating Yahya was the stronger. Yahya invited them to turn Muslim. They declined, packed their belongings, and left. The Muslims remained.[4]

The form of the Sahelian mosque is unique. Horizontal sticks stud massive towers which face east, toward Mecca. Mud-plastered walls and towers are topped by tapering, often phallic pinnacles.[5] The highest of these are frequently capped by ostrich eggs, symbols of purity and fertility.[6]

The contrast between the Sahelian and the Middle Eastern mosque is striking. In the classic mosque exquisite refinements of mathematics, masonry, space, and tile produce airy jewels. The earth is brilliantly denied. But in the Sahel, since stone is rare and timber too scarce to fuel brick or tile kilns, construction is usually of sun-baked brick finished with mud plaster. The Sahelian mosque is closer to earth. Its color and massiveness echo hers.

Because the rainy season is short, Sahelian buildings need minimal annual repair. Maintenance is one purpose of the sticks that bristle from so many walls. The sticks form permanent ladders. They provide access to exterior surfaces for replastering The ostrich eggs have a practical use, too. Their durability (ostrich eggshells are extremely tough) protects symbolically crucial points particularly vulnerable to the rain.

In addition to their utility, sticks and eggs play important visual roles. Behind and below them, every surface and contour is molded. Though they may reach toward the hard purities of symmetry and geometry, the forms never attain them.

Perched on these relaxed masses, the sticks and their shadows are abrupt and angular. The eggs are dramatic in their smooth perfection. Conspicuously unsculpted and pearl white, they accent by contrast the sensuousness of the gentle buildings they help sustain.

It is customary to apply the term vernacular to the great Sahelian mosques, notably Djenné (pl. 27-30). It is also not accurate, a sign that where a monumental tradition is little known outside Africa, it is easier to classify it as *folk* than to accept its sophistication and grandeur. As the world grows more familiar with the splendor of these mosques, their being called *vernacular* will probably be looked back on as having been naive.

Pl. 22

Pl. 22-39. The dry savannah south of the Sahara features a unique style of mosque. The sculpted look of the older and more rural mosques is not due to weathering; molded contours are part of the original design.

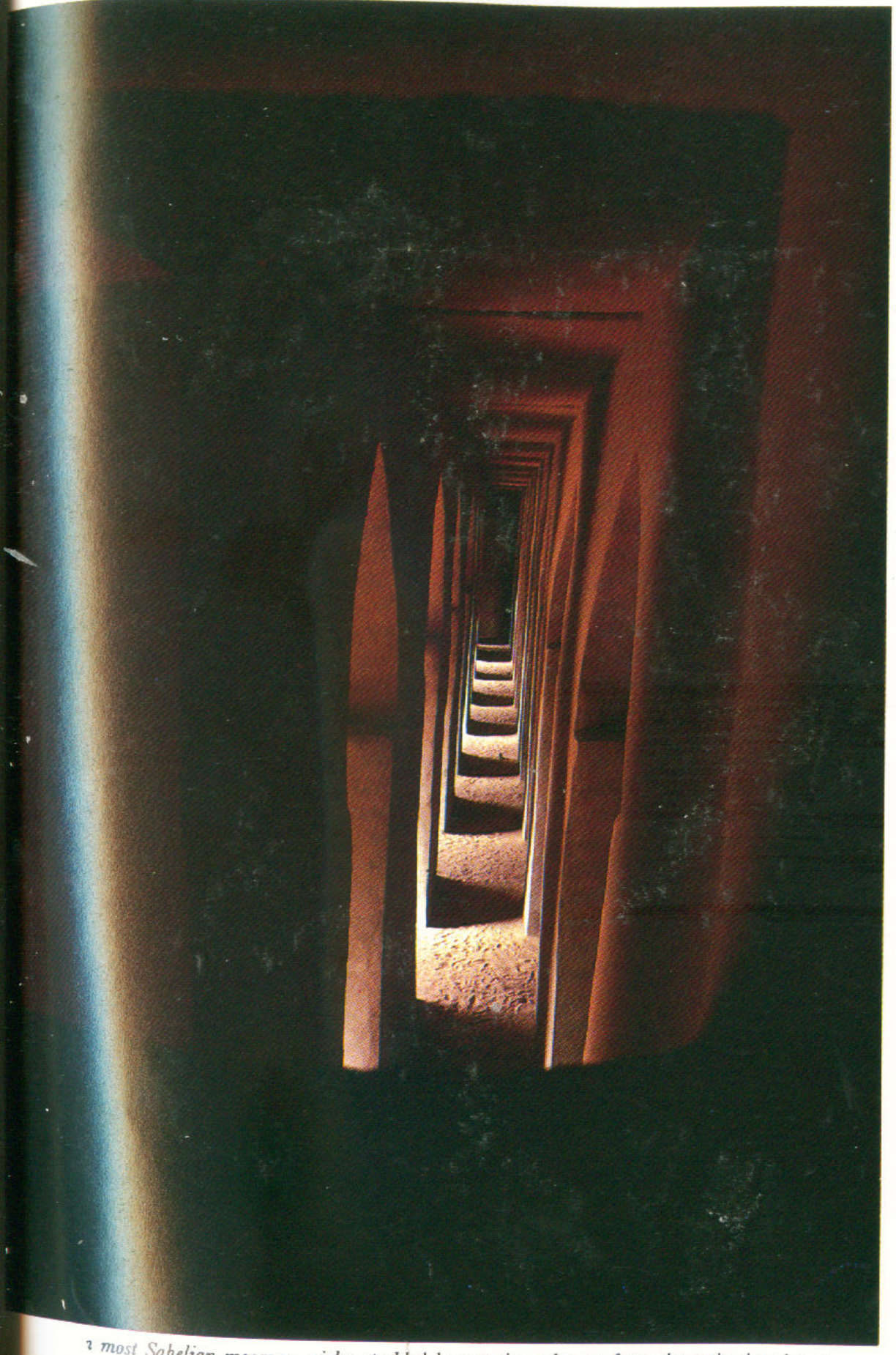
Pl. 23

Pl. 23. Sticks bristle from walls and towers, providing permanent scaffolding for maintenance. Pinnacles are often topped by ostrich eggs, symbols of fertility.

Pl. 24

Pl. 27

Pl. 27-30. The Great Mosque at Djenné, Mali, built in 1907, is the most famous in West Africa. "Guardian pillars" to the right and left mark the graves of marabouts and entrances to the mosque's terrace.



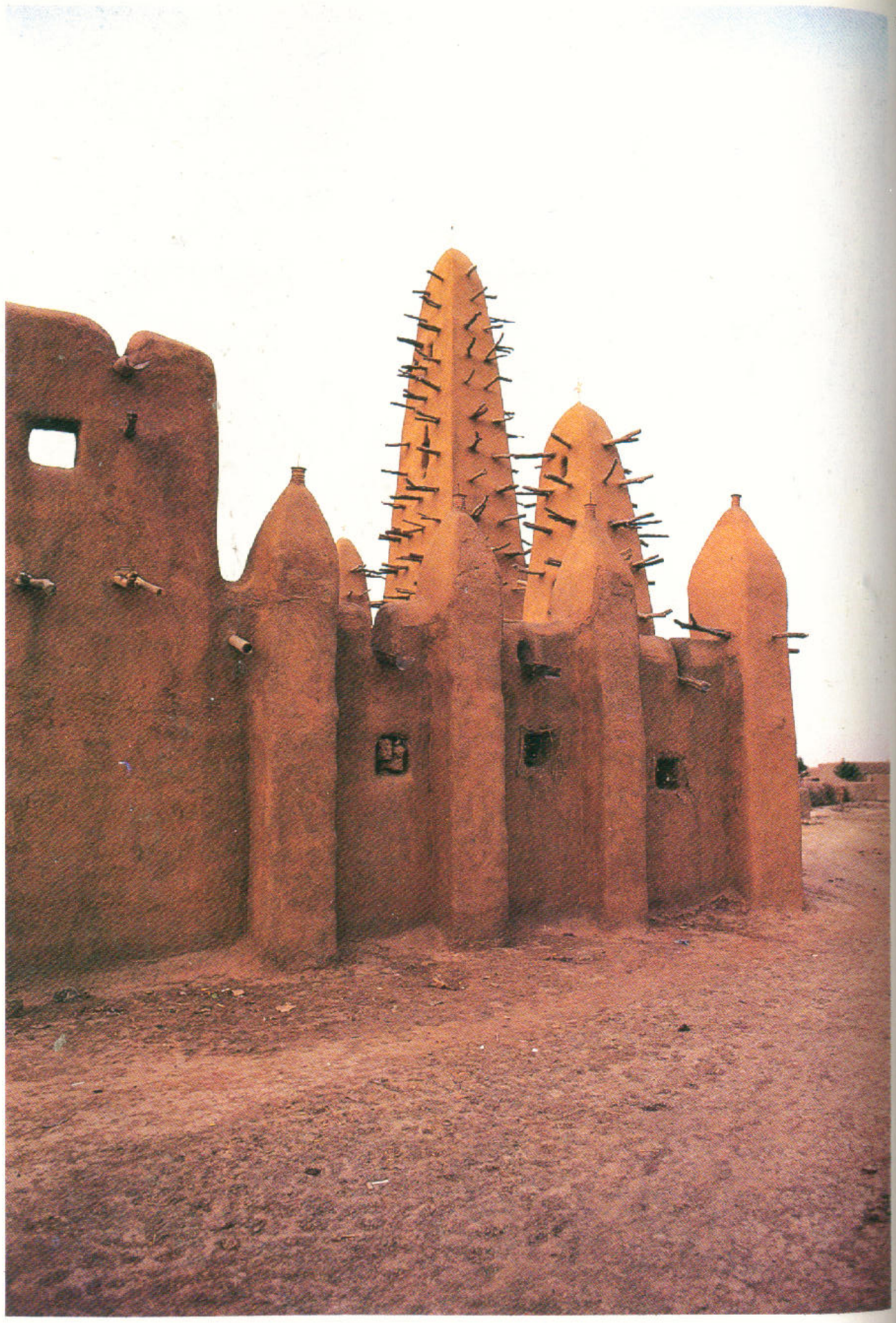
In most Sahelian mosques, aisles studded by massive columns form the entire interior space.

Pl. 30

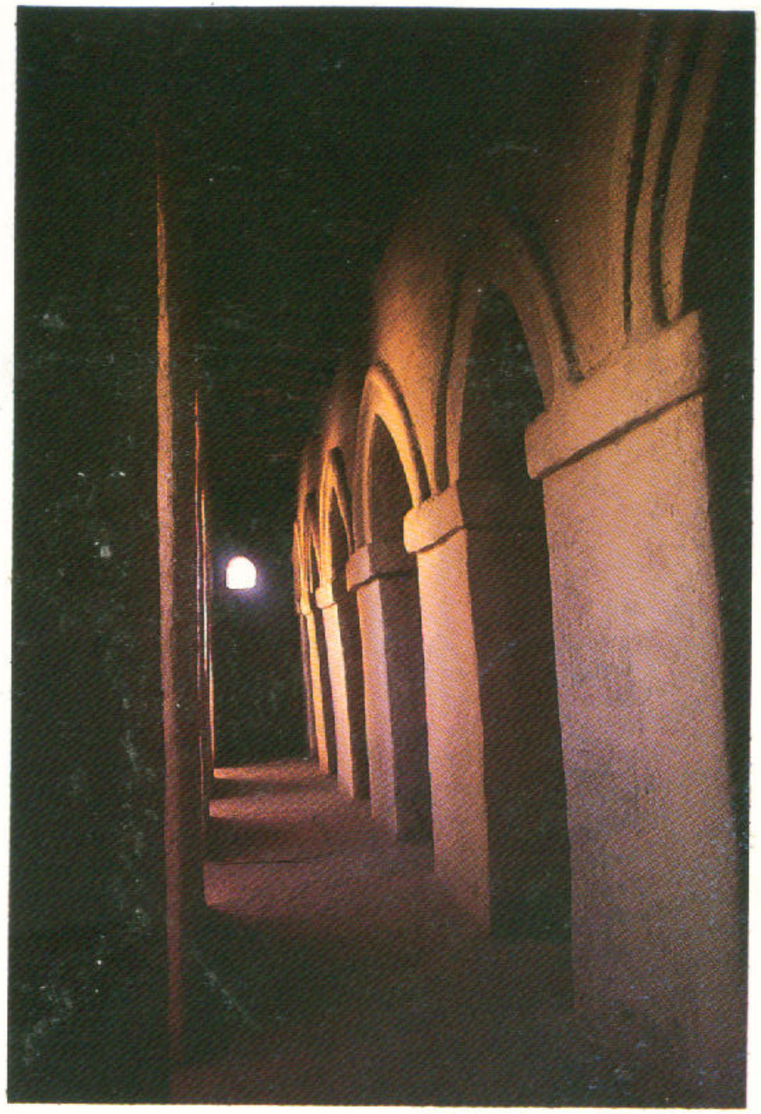
Pl. 30. Market day.

Pl. 29

Pl. 32



Pl. 33

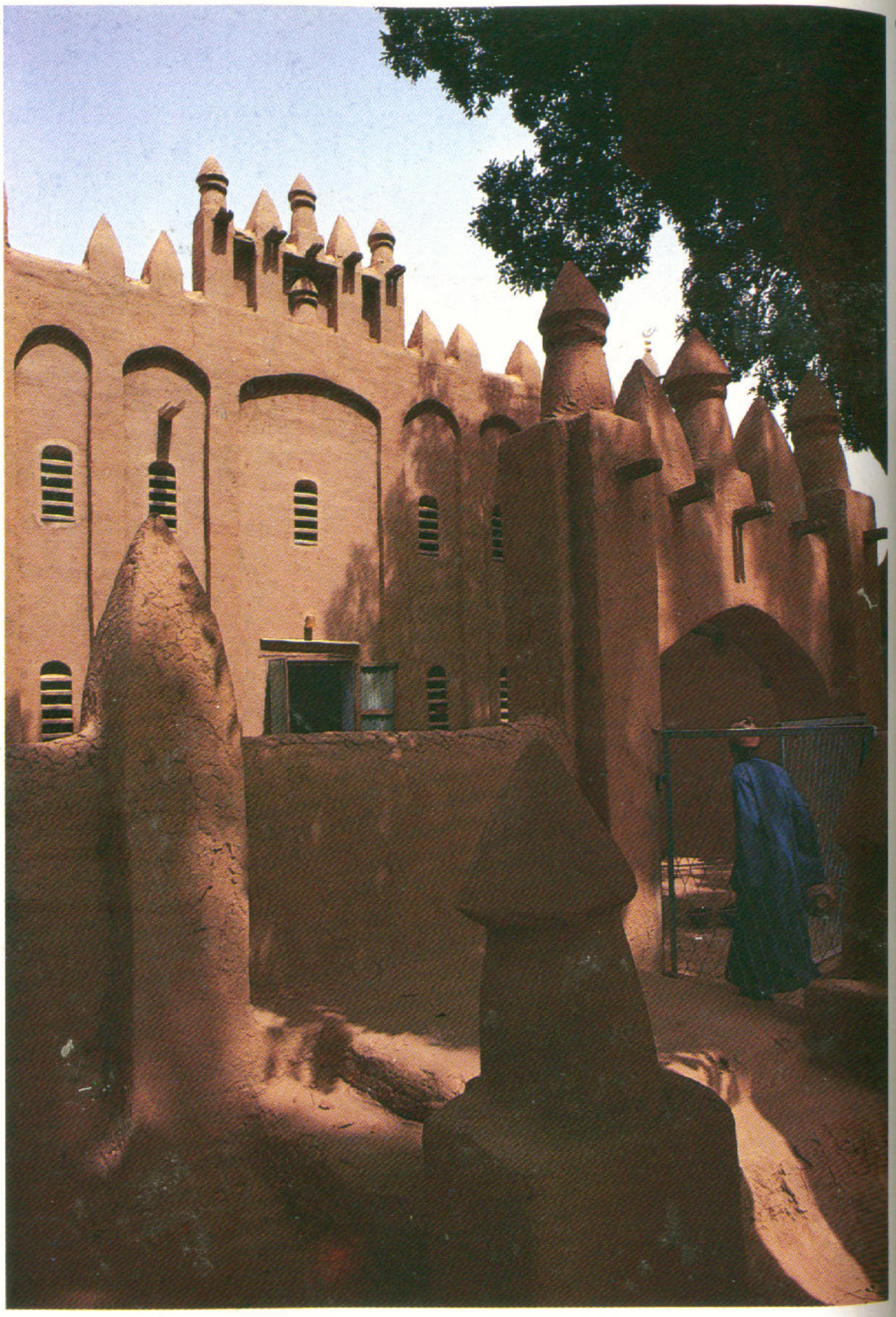


34. *Crowning the corner of a mosque built in 1978, phallus and ostrich egg dramatically suggest generation.*

Pl. 37

Pl. 36

Pl. 35



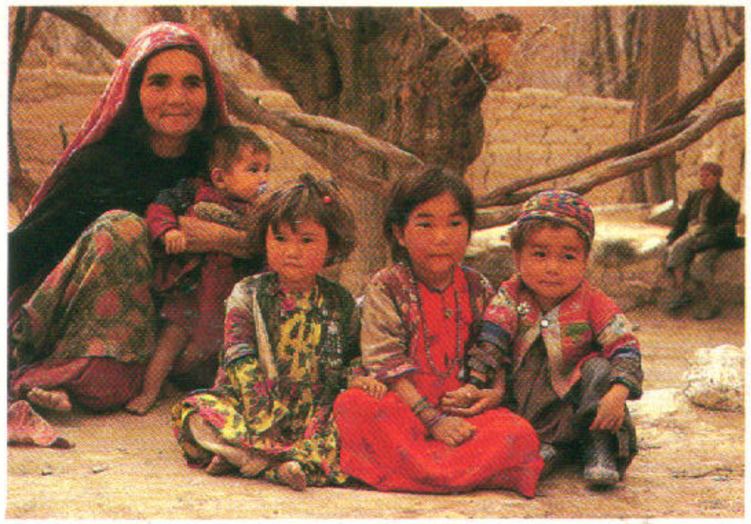
Pl. 37. The eastern facade of the mosque at Niono is 160 feet long.

Pl. 38

Pl. 39

39. In a village not far from Djenné, a recent example of the "Djenné style" is seen at its st severe.

Pl. 42



Pl. 42. Hazara pilgrims at a ziarat.

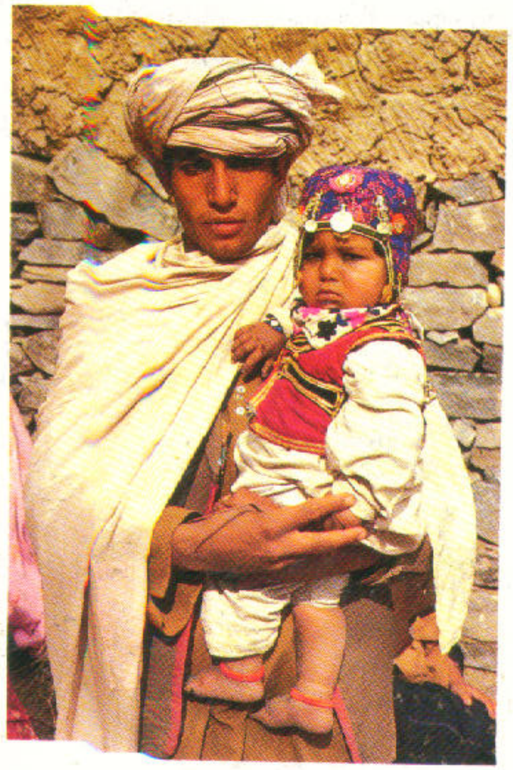
Plates 40-52. In Afghanistan, the Muslim shrine, or ziarat, is as important as the mosque. Often marking the grave of saint, the ziarat commemorates and occasions miracles.

Pl. 43

Pl. 44

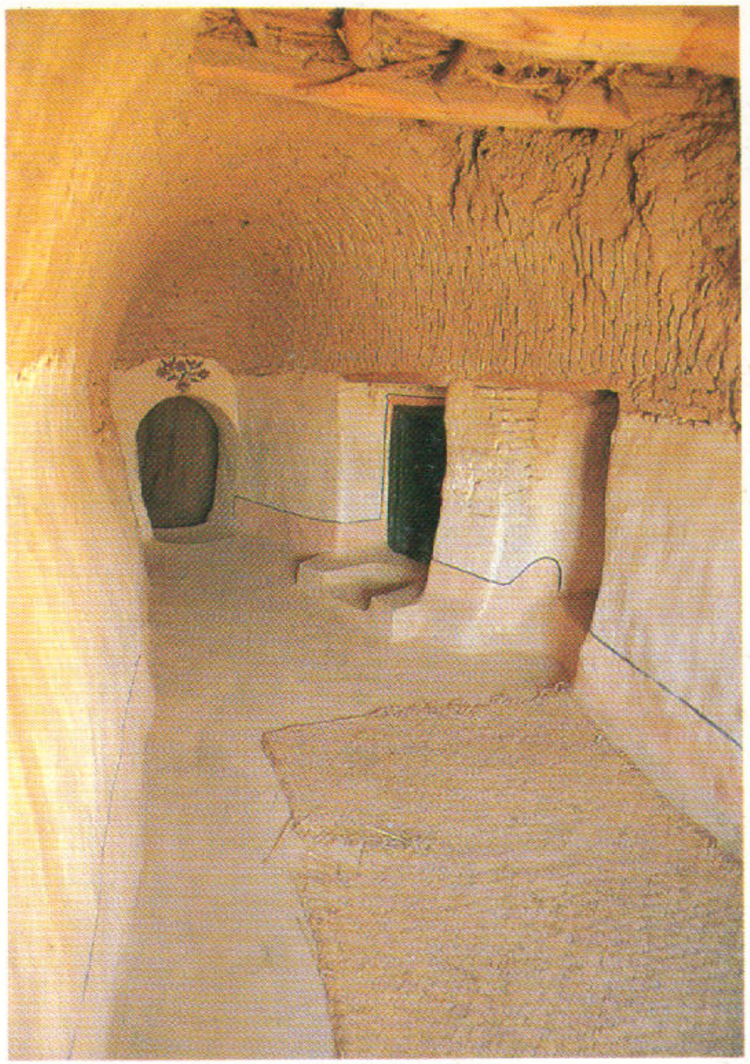
Pl. 44. Pilgrims leave flags to remind the saint to intercede with God on their behalf. A main function of the ziarat is to restore and prolong good health.

Pl. 45

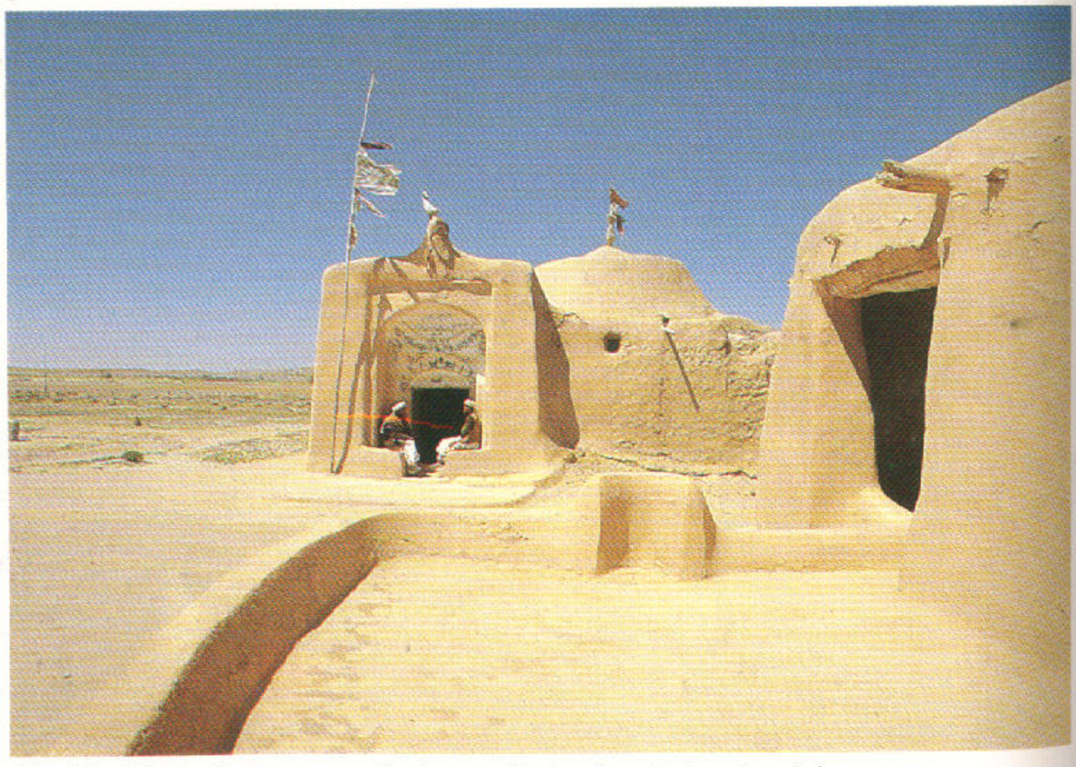


Pl. 46

Pl. 48

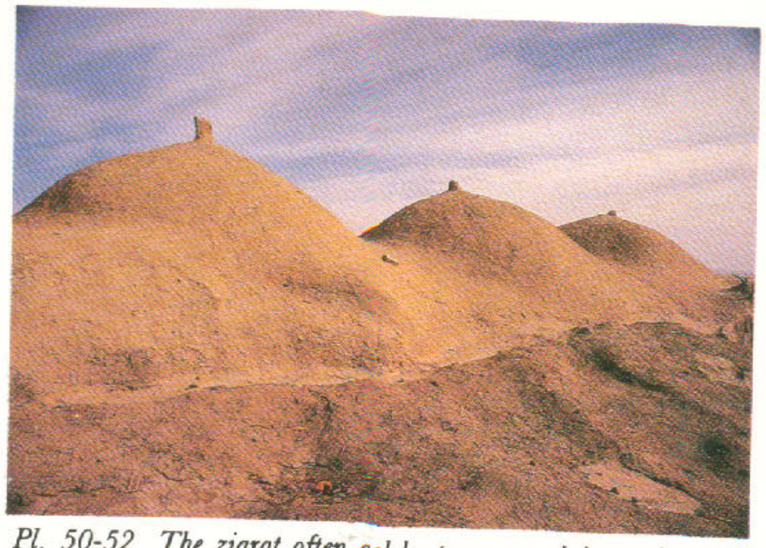


Pl. 49. Two days in the ziarat cures many pilgrims of insanity.



Pl. 47, 48. A ziarat near a city famous for having ninety-nine shrines.

Pl. 51



Pl. 50

Pl. 50-52. The ziarat often celebrates generativity and nurture with forms that mimic phallus and breast. Geometry relaxes into flesh.

Pl. 52

SPECTACULAR VERNACULAR

A NEW APPRECIATION OF TRADITIONAL DESERT ARCHITECTURE

Text by
Jean-Louis Bourgeois
Photographs by
Carollee Pelos

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Salt Lake City
1983

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