

THE EXCAVATION AND REPAIR OF BETATAKIN

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INTRODUCTION

The Indian appropriation act approved May 18, 1916, included the following:

For preservation and repair of prehistoric pueblo ruins and cliff-dwellings, under the supervision of the Smithsonian Institution, Navajo National Monument, Arizona, \$3,000.

To carry out the provisions of this item the present writer was rather unexpectedly designated, early in March, 1917, representative of the Smithsonian Institution and special disbursing officer, Bureau of Indian Affairs. Availability of the appropriation was limited to the then current fiscal year, ending June 30.

Entraining at Washington March 16 I proceeded to Flagstaff, Ariz., engaged four laborers, and left with them by automobile on March 20 for Tuba; thence by 4-mule team to Kayenta; thence by saddle horses and pack mules to Betatakin ruin. This journey of approximately 200 miles from the railroad was not without its disagreeable features.

Navajo National Monument, at an elevation of 7,000 feet, is none too inviting in early springtime when sandstorms crowd the heels of retreating winter. We turned northward from Tuba into the face of wind-driven snow, camped about 6 miles short of Red Lake at some deserted Navajo hogans whose old timbers offered fuel and partial protection, spent the next night under frost-covered blankets in the open desert, and arrived at Kayenta March 24, just as a setting sun was painting the neighboring sandstone buttes with brilliant crimson.

My diary recalls the succession of discouragements under which our special task was pursued. Both economic and climatic obstacles intervened. We broke trail through snow 2 feet deep to establish

camp at Betatakin, March 27; once there, each night brought freezing temperatures until May 1 and occasionally thereafter; rain, hail, and snow fell with annoying frequency. All this, so our irregular Navajo boarder insisted, was owing to the fact that our work in the ruin disturbed the spirits of the ancient people. But I am reminded that our last snowstorm occurred May 31; that ice covered our water pails on the morning of June 2. I am reminded, too, of our meager rations.

Foodstuffs were at a premium; trading-post stores were practically exhausted. Wool continued in demand and the Navajo, childishly prodigal in time of plenty, had bought freely. Having received twice the customary price for their last clip, the Indians still had credit to draw upon; native jewelry to pawn. None cared to work; winter lingered. Lacking forage, Indian ponies were poor; roads were ribbons of knee-deep mud; the wet-weather rate of \$2.50 for each hundredweight from Gallup to Kayenta did not tempt freighters. In consequence, even the usual modest fare of desert travelers was unprocurable. If we had flour there were no beans; if beans, no flour. For days at a time, and repeatedly, rice formed our sole diet. The Navajo would willingly sell neither sheep nor goats. We substituted "Brigham tea" when coffee could not be had. At times, and in their own convincing way, my workmen expressed a measure of discontent.

Then, late in April, came news of United States entry into the World War. My three remaining assistants, impatient to be in the fray, promptly registered in their respective States. And just as promptly they were ordered into service by the too-zealous local draft board. Regulations governing distribution of foodstuffs had been imposed; reservation traders could not replenish their empty shelves. Nevertheless, there remained the chance of forcing our assignment to conclusion.

Snow and lack of forage made it impossible to keep a saddle horse at camp; hence, on three separate occasions, it was necessary to walk the 20 miles to Kayenta seeking supplies. I happened to be there April 29 and joined the trader in going to the relief of two Indian freighters, then stuck in the mud 10 miles out, who had been on the road from Flagstaff since late December. The few sacks of flour received at Kayenta on May 20 immediately sold at \$10 a 100; the next lot arrived June 10, on 20 burros driven by Indians from near Farmington, N. Mex. Navajo National Monument seemed altogether isolated in the spring of 1917.

This recital is offered not as an apology for a task left unfinished but rather as evidence that factors quite beyond one's control sometimes arise to handicap the field worker. Those unforeseen condi-

tions we experienced might easily have forced early abandonment of our undertaking except for the cordial cooperation of Mr. and Mrs. John Wetherill and Mr. Clyde Colville, of Kayenta. To these good friends I make public acknowledgment of my appreciation, however tardily. As with other transients before and since, Mr. and Mrs. Wetherill welcomed me whole-heartedly into their hospitable home; drew generously from their family larder at times of urgent need, and persuaded reluctant Navajo into our service when my own efforts failed.

I have said our task was left unfinished. The special appropriation cited in the first paragraph above was intended to cover the major ruins of Navajo National Monument. There are three such—Betatakin, Keet Seel, and Inscription House. We concentrated upon the first of these. The work there accomplished will be apparent from the pages which follow. That left undone includes repair of the southwest house group and adjacent retaining wall; partial reconstruction of missing rooms whose former positions were plainly evidenced in the east half of the cave; basal wall repairs with cement and the placement of steel tie rods in certain dwellings, as originally contemplated. The cement and steel we ordered for this purpose from Gallup on April 2 were not delivered in Kayenta, so impassable were the muddy roads, until June 8—too late to be relayed to Betatakin and positioned.

Since the World War and return from military service I have constantly entertained the hope that additional funds might be provided with which to complete not only the work herein described but also that intended for Keet Seel and Inscription House. It now appears this hope is not soon to be realized. Fairness to those coworkers who have need for certain facts at my disposal urges presentation of our observations in Betatakin without further delay.

Of the sum designated in the act of May 18, 1916, more than one-third was returned to the Treasurer of the United States, as required by law. This refund and the fact that it was not humanly possible in 1917 to conclude the repairs contemplated by Congress, seemingly would justify a new Federal appropriation to insure preservation of the incomparable cliff dwellings of Navajo National Monument. Those ancient villages are not surpassed even by the marvelous ruins of Mesa Verde National Park, Colo., visited by nearly 17,000 persons in 1928; they stand as visible reminders of an enlightened, though primitive, people who played a most important part in the conquest of our arid Southwest centuries before European mariners dreamed of a New World; they merit restoration and protection as an irreplaceable inheritance of our Nation from its prehistoric predecessors.

BETATAKIN AND THE KAYENTA DISTRICT

Betatakin occupies a large cave in the north wall of an unnamed south fork of Laguna Canyon,¹ which latter empties into Tyende Creek at Marsh Pass. (Pl. 2.) About 15 miles northeast of the Pass is Kayenta,² founded by Wetherill and Colville as a trading post late in 1909 and since grown into an oasis of peculiar charm—the home of several white families, chiefly associated with the local Navajo Indian hospital and its related activities.

To archeologists an indefinitely bordered area surrounding this settlement is known as the "Kayenta district." Its rugged canyons were anciently inhabited by a semisedentary people whose evolving culture has been clearly portrayed by Kidder and Guernsey.³ Following the so-called Basket Makers, first known agriculturists of the Southwest, came three other equally distinct stages of tribal and material development to culminate in those great, communal towns of the Pueblo III⁴ period—Betatakin, Keet Seel, and Inscription House.

Throughout the centuries required for this perfectly obvious sequence of cultures and with a vigor that increased as each generation passed, established villages in the Kayenta district were recurrently attacked by more warlike, nomadic peoples. The identity of these wandering hunters remains undetermined but the fact of their former presence as disturbers of tranquil community life is evidenced here, as in other parts of the Pueblo area.

¹ So named from the ponds that formerly marked its middle course. Gregory (1916, p. 48) says: "At the time the topographic map was made (1883) Laguna Canyon held a number of lakes which have since disappeared in consequence of recent deep trenching of the alluvial fill."

Throughout the Kayenta district in 1908 and 1909, that which Gregory designates "Laguna Canyon" was widely known as the Segi; that which he names "Tyende Creek," running from Marsh Pass to the Rio San Juan, was commonly called Laguna Creek. Fools were then present in the open valley south of Tyende Mesa; Segi Canyon was already deeply trenched, but its arroyo banks clearly showed the stratified deposits formerly laid down in placid ponds. Segi Canyon is the To-wan-aho-che Creek of the General Land Office map of 1887; the To-wan-on-Cheo Creek of the presidential proclamation dated March 20, 1909, and hereinafter mentioned. "Tyende Creek" is obviously an erroneous recording of "Kayenta Creek."

² Individuals will naturally differ in attempting to record, with English characters, the pronunciation of Indian place names. For example, *Kaenti* is the spelling first used by Cummings (1910); *Kayenta*, that subsequently employed by the same writer, by other explorers and by Federal cartographers. *Segi* Canyon (Gregory, 1916) has been published both as *Sagi* (Cummings, 1910; Kidder and Guernsey, 1919, 1921) and *Sagie* (Cummings, 1915; Judd, 1918). *Keet Seel* (Gregory, 1916; presidential proclamation of March 14, 1912) has been printed *Kitsil* (Cummings, 1910), *Kitsiel* (Fewkes, 1911), and *Kietsiel* (Kidder, 1924). Because of these and other possible variants it seems not improbable that the orthography employed by Gregory (1916) in his comprehensive study of the Navajo country will be adopted by most observers henceforth reporting upon the divers interests of this fascinating region.

³ 1921; 1921a. See also Kidder and Guernsey, 1919; Kidder, 1924.

⁴ A designation now accepted by most students of Pueblo archeology. See Kidder, 1927.

In describing the procession of prehistoric civilizations through the Kayenta district, Kidder⁵ writes: “* * * it seems likely from the finds of their typical pottery at Pueblo Bonito and Cliff Palace that the proto-Kayenta villages were inhabited at the same time as the great dwellings of the Mesa Verde and Chaco Canyon; and that the late Kayenta sites were erected after the Mesa Verde and Chaco Canyon had been abandoned. Thus Kitsiel and Betatakin may well have been the last large communities that existed in the San Juan drainage.” Cummings⁶ had previously drawn a similar inference; more recently, his and Kidder’s deductions have been fully confirmed by the as yet unpublished explorations of the National Geographic Society at Pueblo Bonito, under direction of the present writer, and by the related “tree-ring” chronology now being erected by Dr. A. E. Douglass, of the University of Arizona.

But herein we are concerned solely with the excavation and repair of Betatakin. No comparison is to be drawn between it and other ruins of the Kayenta district or elsewhere; no effort will be made to determine the place occupied by Betatakin on the ladder of Pueblo history. The present paper serves merely to present certain observations resulting from our 1917 expedition, as an aid to that more intimate study of the village yet to be written.

Although Betatakin is now a familiar name to most students of Pueblo archeology, few are aware that it was first seen by whites on August 5, 1909, when a Utah University exploring party led by Prof. Byron Cummings and guided by John Wetherill was directed to it by a Navajo Indian, casually met in Segi Canyon. This Indian pointed the way and then sat down beside the trail to await the party’s return. Through inherent fear of all things associated with the dead, he steadfastly refused to advance within sight of the ruin. The Kayenta district was wild and untamed at that time; canyons to the westward sheltered many young Indians who had yet to see their first white man, unbelievable though this may seem.⁷ Archeological explorers looked like prospectors; buttes in Monument Valley bore the names of men killed while seeking minerals on the reservation in open defiance of Navajo wishes. At Oljeto, Wetherill and Colville maintained the only trading post between Bluff and Tuba.

As student assistant to Doctor Cummings I participated in the brief, initial inspection of Betatakin, but I was not present in the

⁵ 1924, p. 73.

⁶ 1915, p. 278.

⁷ In August, 1909, while guiding W. B. Douglass from Rainbow Bridge to Keet Seel and Betatakin, the present writer witnessed inauguration of a 3-day war ceremony, surreptitiously held near the head of Piute Canyon; a few days later, in Oljeto, he was informed by old Hoskinnini, revered chief of the northern Navajos, that the Douglass party were the first whites ever seen by several Indians, in their mid twenties, attending that ceremony.

autumn of 1909 when the professor, following explorations which resulted in his discovery of important cliff dwellings south of Navajo Mountain⁸ and that marvel of erosion, the Rainbow Natural Bridge,⁹ returned to resume, and conclude, his investigation of this remarkable ruin.¹⁰

Government reservation of Betatakin, Keet Seel, and Inscription House came about in this wise: While at Bluff, Utah, in September, 1908, W. B. Douglass, examiner of surveys for the United States General Land Office, learned from Professor Cummings's guide, John Wetherill, and immediately reported to Washington, the existence of certain "fine prehistoric ruins about 90 miles west of Bluff." Douglass asked and received instructions to locate and examine these ruins. It is not to his discredit that he failed in this quest, even when aided by trail maps furnished by Mr. Wetherill and his partner, Clyde Colville. The information so gained enabled the surveyor to submit, March 8, 1909, the data on which was based the all-inclusive presidential proclamation dated 12 days later creating the Navajo National Monument. It was in mid August, 1909, and at Doctor Cummings's direction, that I accompanied Mr. Douglass from Rainbow Natural Bridge to Keet Seel and pointed out, as we passed it, the south fork in which Betatakin is located. As Douglass's earlier and somewhat presumptuous communications to Washington prompted the initial visit and preliminary report of Dr. J. W. Fewkes,¹¹ so did Douglass's surveys of August–November, 1909, supply the awaited details incorporated in the second presidential proclamation of March 14, 1912, which superseded that of March 20, 1909, and reduced the monument to its present area.

Although he merely anticipated Professor Cummings in so doing, to W. B. Douglass is owing such honor as may be for having first apprised the General Land Office of the existence of important prehistoric ruins west of Bluff and for having urged their reservation and protection in the public interest. Likewise to Professor Cummings is due credit for having first recommended a Federal appropriation to insure repair and preservation of the major Segi Canyon ruins. Senator Reed Smoot, of Utah, had introduced such a bill in 1915; secured its passage during the next session of Congress. Under date of July 15, 1916, Special Agent W. J. Lewis reported to the General Land Office highly approving the investigations of Doctor Cummings and earnestly recommending that he be placed in

⁸ Cummings, 1910.

⁹ Cummings, 1910a; Judd, 1927.

¹⁰ Few realize so fully as the present writer that only ceaseless pressure of academic responsibilities has so long, and so unfortunately, delayed publication of Doctor Cummings's archeological observations. As pioneer archeologist of the Kayenta district he has accumulated a fund of information eagerly awaited by his younger coworkers.

¹¹ 1911.

charge of the reconstruction contemplated within the new monument. This recommendation would have been followed gladly since Professor Cummings, the first archeologist to examine the prehistoric villages in question, was logically the one to restore them. But the law required that Federal funds be disbursed only by a Federal employee. Thus it came about that the present writer, a member of the Smithsonian staff, was assigned the task of carrying out the provisions of the act of May 18, 1916.

It was westward bound that I determined to restrict my efforts to Betatakin. Based on personal knowledge of the Kayenta district, this decision seemed wise for three reasons, previously mentioned:¹² (1) More than one ruin could not be excavated and restored in the time available, from the sum appropriated; (2) Betatakin was, perhaps, in greatest need of repair; (3) the site was more accessible than the others and furnished abundant water for camp purposes.

When our animals were unpacked at Betatakin on the afternoon of March 27, 1917, we first cleared away the snow and improvised sleeping quarters under the scrub oaks that border a little flat near the gurgling stream. Firewood was close at hand, but our thin, cotton tents afforded scant protection from the wintry blasts that played almost incessantly up or down the canyon. During the weeks which followed we frequently retired to the old dwellings in the cliff there to seek shelter from the storms.

Our work began with a cursory examination of the talus immediately below the village. Neither house remains nor burials were disclosed there; stratified deposits from which length of occupancy and local changes in the technique of pottery manufacture might be gauged were utterly lacking. The inhabitants of Betatakin amassed no single trash pile—the delight of dirt archeologists—but utilized their household débris in widening the rock terraces of the cave, thus to increase its habitable space.

During the centuries which followed abandonment of the pueblo, walls had collapsed; tons of wind-blown sand had lodged in the empty rooms and the courts between. In such accumulations, watered by seepage, long banks of columbine and intertwining box elders and scrub oaks had taken root. Huge blocks of sandstone had broken from the cave roof to crush the eastern house group. Most of the ancient dwellings had been previously excavated and refilled to protect the fractured masonry. All this vast quantity of sand, rock, and overturned rubbish must necessarily be cleared away before our principal task could properly begin.

This task, let me repeat, was solely one of repair and preservation. Betatakin had been thoroughly explored by Professor Cummings

¹² Judd, 1918.

in 1909; its story, in so far as this could be read from the remains, had been patiently recorded. Ours was the work of mending broken and insecure walls; of patching roofs; of providing ladders to facilitate access by those less agile than primitive folk. In the period between 1909 and 1917 the Kayenta district had become a veritable magnet attracting, in ever increasing numbers, persons who value solitude and weird desert beauty.

While fulfilling our mission at Betatakin we sought also to preserve the prehistoric atmosphere of the place; to so disguise our own handiwork that it would be unobtrusive thereafter. During our clearing operations we noticed that some of the old mud mortar had outlasted the friable sandstone it bound together. After brief experiment we were able to duplicate this mortar with a half-and-half mixture of clean sand and the compact red clay that occurs in relatively thin layers beneath the massive Jurassic sandstone of the cliffs. Stones and timbers from shattered dwellings were salvaged and re-used. In repairing or reconstructing house walls we took pains to eliminate the marks of our tools; at the same time, we deliberately broke joints in our stonework, a precaution with which the ancient masons did not concern themselves. This slight difference in method will, in most instances, serve to identify the walls we built. While nearly every room received some measure of attention, the notes which follow will guide future students to our major repairs.

NOTES ON BETATAKIN ROOMS.

As Plate 10 of his "Preliminary report on a visit to the Navaho National Monument," Doctor Fewkes (1911) publishes a ground plan of Betatakin prepared by W. B. Douglass. This plan I naturally assumed to be correct; it forms the basis of that which appears herein as Plate 3.¹³ House numbers previously assigned are retained in each instance, but since these end with room 96 those additional dwellings disclosed in 1917 have been designated rooms 100-135. Perhaps a dozen others, evidenced by characteristic wall seatings, might have been included had we found opportunity carefully to examine and delineate their respective sites.

The notes which now follow were made during the course of our excavations. Room measurements taken at the same time will be found in the table beginning on page 72.

Room 1, above and west of room 2 in the extreme western end of the cave, was obviously designed for storage. Its floor is the rough,

¹³ Although without instruments of precision, we observed certain minor discrepancies in the Douglass survey. This, it should be borne in mind, was made under pressure of time and before all the house walls were exposed. The principal differences between his plan and ours will be manifested by direct comparison of the two and by our description of the individual rooms.

unworked cliff, slightly filled in at the front. Three ceiling beams, extending from the front wall to a masonry fill at the rear, support short cross poles and a thick layer of willows, covered directly by adobe. Two poles overlain with split cedar so parallel the front wall as to suggest a former hatchway in the north corner. Three pegs for hanging articles protrude from the inner front wall.

A 16 by 25 inch (0.40 by 0.64 m.) door opens through the northeast wall. Its sill, widened outside by a sandstone slab on edge, formerly supported a stone door which fitted into grooves on the outer jambs and was held firmly in place by wooden wedges inserted through feather-cord loops. One such loop occupies a hole at each side of the door; that on the north is held in place by mud. At the outer southeast side a bench 5 by 12 inches (0.13 by 0.31 m.) by 11 inches (0.27 m.) high fills a narrow crack.

Through the lower front wall four roof poles protrude from room 2. This latter structure was obviously built first, for there is a distinct line of separation between the large blocks forming its rear wall and the smaller stones in the front wall of room 1.

We attempted no repairs in rooms 1-8; nor on the masonry of court 10.

Room 2 was probably a storeroom; no smoke stains appear on its walls. Its floor is mostly of fairly level, native rock, but a shallow fill in front concealed several east-west poles horizontally embedded about 6 inches (0.15 m.) above the base of the east wall. These were undoubtedly deemed necessary as supports or anchors, since the masonry stands flush with the cliff edge. Two pegs protrude from the southeast wall; two beams extend through from room 3. Six beams support the ceiling of willows, cedar bark, and adobe mud; in the northeast corner of this is a hatchway, the only entrance.

Five feet six inches above the outer southeast corner of the roof are two holes, drilled through a cliff angle; near by is a similar, single eyelet. From these, various light objects were doubtless suspended by the ancient inhabitants.

Room 3, a dwelling, exhibits the smoke stains of long occupancy. The lower half of its three masonry walls was repeatedly plastered, but the west, or cliff, side was not similarly surfaced. Two small, parallel timbers next the cliff and a larger, central beam support 10 east-west ceiling poles carrying layers of willows, reeds, and mud. A small smoke vent through the middle roof, next the north wall, had been closed with cedar bark and plastered over. In the southeast corner the solid sandstone surface is about a foot lower than the remaining floor, which lies some 8 inches (0.20 m.) higher than that of room 4.

At the floor level an opening 11 inches (0.27 m.) square connects with room 4. Directly in front of this opening, embedded in the floor of room 3, is a willow loop—one of two loom anchors. The second is wanting, but directly above, two loops still hang from a ceiling cross pole. Four wall pegs remain in position; holes for four others may be noted.

A door opens through the north half of the east wall. Just within this door, and formerly protected by a now missing screen, is the fireplace. The retaining wall continuing from court 10 ends against the outer east wall, south of the door. Above its south jamb six shallow holes had been drilled.

On the cliff face above the roof a "sandal" figure had been pecked; pointed and flat implements had been sharpened and white paint crudely spread in several places. Above the southeast roof corner one may note portions of a pair of drilled holes on a broken cliff slab.

Room 4 adjoins room 3 on the north and is apparently of later construction. Its east wall is missing; of the north wall, a section at the northwest corner stands 3 feet (0.91 m.) high against the cliff. Above this fragment and formerly concealed by the wall are several holes, pecked through the cliff corner; two pairs of similar holes on the cliff face had been plastered over. Through the west end of the south wall, 8 inches (0.20 m.) above the floor, a 10 by 18 inch (0.25 by 0.46 m.) opening marks the position of a former room 3 door, the lintels of which still show through three coats of plaster.

In the middle floor is a slab-lined fireplace measuring 16 by 18 inches (0.40 by 0.46 m.); its deflector slab, standing on the east, suggests a former door on that side.

Room 5, beneath room 6, was used for storage. At least the smoke stains which ordinarily identify a dwelling are lacking. Vertical cliff forms its south and west walls, while the other two are of masonry, freely chinked. The floor, of native rock, is slightly higher than the terrace outside.

A single beam, paralleling the cliff, supports the ends of six cross poles; upon and at right angles to these are layers of willows and reeds. On the floor we found a cedar pole, slightly shorter than the room length, which may formerly have been an additional ceiling support, since its butt end fitted in a hole at the north side when the opposite end rested on a protruding rock between the main beam and the cliff. Through the middle east wall is a 15 by 24 inch (0.38 by 0.61 m.) door whose outer jambs are grooved for the usual slab. A loop fastener appears on the north side only. Four sticks support the sandstone lintel; in its stone sill are two grooves where axes were sharpened.

Fire stains on the cliff at the outer southeast corner mark the position of an open fireplace.

Room 6, above room 5, probably served also for storage. Its walls are unsmoked; its floor, smooth and hard. The cliff forms its south and west sides, while the other two are composed of small, irregular stones laid in quantities of adobe mud, chinked with sandstone spalls. The outer east wall, smooth and regular, is superior to most Betatakin masonry; the outer north wall is plastered. (Pl. 7, A.)

Paralleling the south cliff wall is a single large ceiling beam, the west end of which rests on a narrow wedge of masonry, built in a crevice. This south beam supports one end of a timber which parallels the west cliff, and the latter beam, in turn, supports the ends of 14 cross poles. Above these is a thick layer of willows with adobe mud spread directly upon it to complete the roof. Six central cross poles have been broken by rock falling from the overhanging cliff.

A door through the middle north wall measures 18 by 24 inches (0.46 by 0.61 m.). Its lintel includes four sticks and a large sandstone block; its sill is a well-worn slab showing two shallow grooves where axes were sharpened. This sill and both outer jambs are deeply grooved for the door slab characteristic of storerooms; on each side is a willow loop for wooden fasteners. An inset step, $7\frac{1}{2}$ inches (0.19 m.) wide by 3 inches (0.076 m.) high by $2\frac{1}{2}$ inches (0.063 m.) deep, lies in the outer north wall 19 inches (0.48 m.) below the door sill and 17 inches (0.43 m.) above the roof of room 7. A similar step, 4 by $1\frac{3}{4}$ by 2 inches, lies upon the lintel slab, 24 inches below the roof of room 6. The protruding end of the west beam doubtless served as an additional step.

Room 7, adjoining room 5 on the north, is a dwelling whose west wall is formed by the cliff. Its floor is mostly solid rock, but the east third was filled in to a depth of from 6 to 18 inches. Two north-south beams support a ceiling of 18 cross poles overlain with willows and cedar bark. One of the cross poles was spliced, its two portions being tied with yucca strips; three cross poles extend only from the central beam to the east wall. Of equal interest is the fact that the west beam, hewn off on top, was braced in the middle by a post resting on a sandstone block. A former hatchway, 3 feet 3 inches (0.99 m.) from the north wall, is evidenced by the cut ends of several cross poles showing in the broken roof of the southeast quarter.

Abutting the outer northeast corner of room 5 is a section of masonry, 20 inches (0.51 m.) wide, the perpendicular east end of which is slightly convex, carefully chinked with numerous spalls, and plastered over as though to form a door jamb. Similar treatment is noted for the upper south end of the broken east wall. Together,

these finished wall ends suggest for room 7 a southeast corner door extending from floor to ceiling. (Pl. 8, B.) Such an entrance would be most unusual; none like it is observed elsewhere in Betatakin nor, indeed, can I recall having seen one in any other prehistoric Pueblo village.

At the outer northwest corner, just below the roof level, a single step had been pecked in the cliff face.

Room 8 is merely a recessed platform, 20 inches wide by 6 feet long (0.51 by 1.82 m.), formed by a convex wall on a ledge above the northwest corner of room 7. (Pl. 7, A, B.) Externally this wall stands 26 inches high to the solid rock floor; there is no trace of upper wall masonry.

Room 9. The remains of a small storeroom opposite the northeast corner of room 7; outside of and below the retaining wall of court 10. It is shown but not numbered on Douglass's ground plan.

Court 10, long and narrow, lies between rooms 7 and 11; it is formed by the irregular retaining wall which extends from the south corner of room 11 to the east side of room 3. This wall appears not to have stood more than 1 foot above the court floor; the latter consists mostly of native rock, with a débris fill along the east side. Shallow, close-lying steps on the uneven rock surface next the cliff were probably pecked by children at play. Opposite the northeast corner of room 7 and fronting rooms 3 and 4 the retaining wall had largely disappeared prior to 1909; elsewhere it is still well preserved. At the northeast corner of room 4 the walk formed by this wall was extremely narrow.

Against the retaining wall and 5 feet 3 inches (1.6 m.) from room 11 is a fireplace measuring 20 by 34 by 12 inches deep (0.51 by 0.86 by 0.31 m.). In the east corner, with its sill at the court level, a 10 by 11 inch (0.25 by 0.27 m.) vent opens downward into room 11. Nearby, the fragment of a small post stands against the inclosing wall.

At the north end of court 10 a slender pine pole, 30-35 feet long, gave access to the gallery ledge above. (Pl. 26, A.) The ladder leading to the roof of room 11 is one we substituted for steps pecked in the cliff at the north corner.

Room 11 is one of the most interesting chambers in Betatakin, since it obviously is an old dwelling, remodeled for ceremonial purposes. Next the cliff wall is a ceiling beam whose west end rests on a shelf of masonry; two other beams, with butt ends opposite, lie side by side across the middle room. On these timbers are 25 cross poles, overlain by layers of willows, cedar bark, and sand. Where the cross poles were too short to reach from the southeast wall to the cliff two were placed together, butt ends opposite. The lower third of the southwest wall and the lower half of the southeast and northeast walls

were surfaced; traces of plaster also remain on the northwest, or cliff, side.

Incised drawings appear in the smoke-blackened plaster of all four walls. (Fig. 1.) On the north half of the southwest wall 22 parallel and approximately vertical lines varying in length from 1 to 4 inches have been scratched. Other scratches occur below this group, but no geometric design is distinguishable among them. So-called "pottery" or "basket" designs were incised in the plaster of the southeast wall.

A south corner roof opening, 17 by 29 inches (0.43 by 0.73 m.), had been cut through after completion of the ceiling and perhaps after conversion of the room. This hatchway, 8 inches from the southwest wall, was rimmed with slabs on all except the southeast side; its inner jambs, above the cross poles, were plastered with adobe and chinked with small spalls. Two feet from the west corner and 13 inches above the floor a former southwest door, 17 by 29 inches (0.43 by 0.73 m.), had been carefully blocked from the outside, leaving its inner sill exposed to form a shelf 5 inches wide.

In the south corner an opening, 12 inches (0.31 m.) high by 17 inches (0.43 m.) wide, formerly pierced the southeast wall at the floor level; its east jamb sloped to the west. Externally this ventilator was a full third less than its inner dimensions. Apparently it did not prove entirely satisfactory, for it had been closed with masonry from the inside and a second vent, 12 inches (0.31 m.) high by 11 inches (0.27 m.) wide, cut through the southwest wall flush with the south corner and 9 inches above the floor. The slab sill of this second opening slopes upward to the level of court 10. Within the room and directly below this latter vent are the remains of a shallow, basinlike depression, 16 inches (0.41 m.) in diameter by $1\frac{1}{2}$ inches (0.038 m.) deep. Formerly a ladder extended through the hatchway directly above this depression. A slab fire screen, 24 inches (0.61 m.) wide by 25 inches (0.64 m.) high by $1\frac{3}{8}$ inches (0.034 m.) thick, abuts the southeast wall 27 inches (0.69 m.) from the south corner. Eight inches east of this screen and 5 inches (0.13 m.) from the southeast wall is a fireplace whose dimensions average 16 by 18 by 7 inches deep (0.41 by 0.46 by 0.17 m.); it is lined and paved with slabs and its inner corners rounded with adobe. The ceiling willows above this fireplace had been plastered with mud—a simple, protective measure that might have been followed profitably by other prehistoric house builders.

Our repairs were confined largely to the southwest wall. In addition, we propped a cracked ceiling beam with a cedar post set on a sandstone slab; and placed, through the hatchway, a pole ladder fitted with oak rundles.

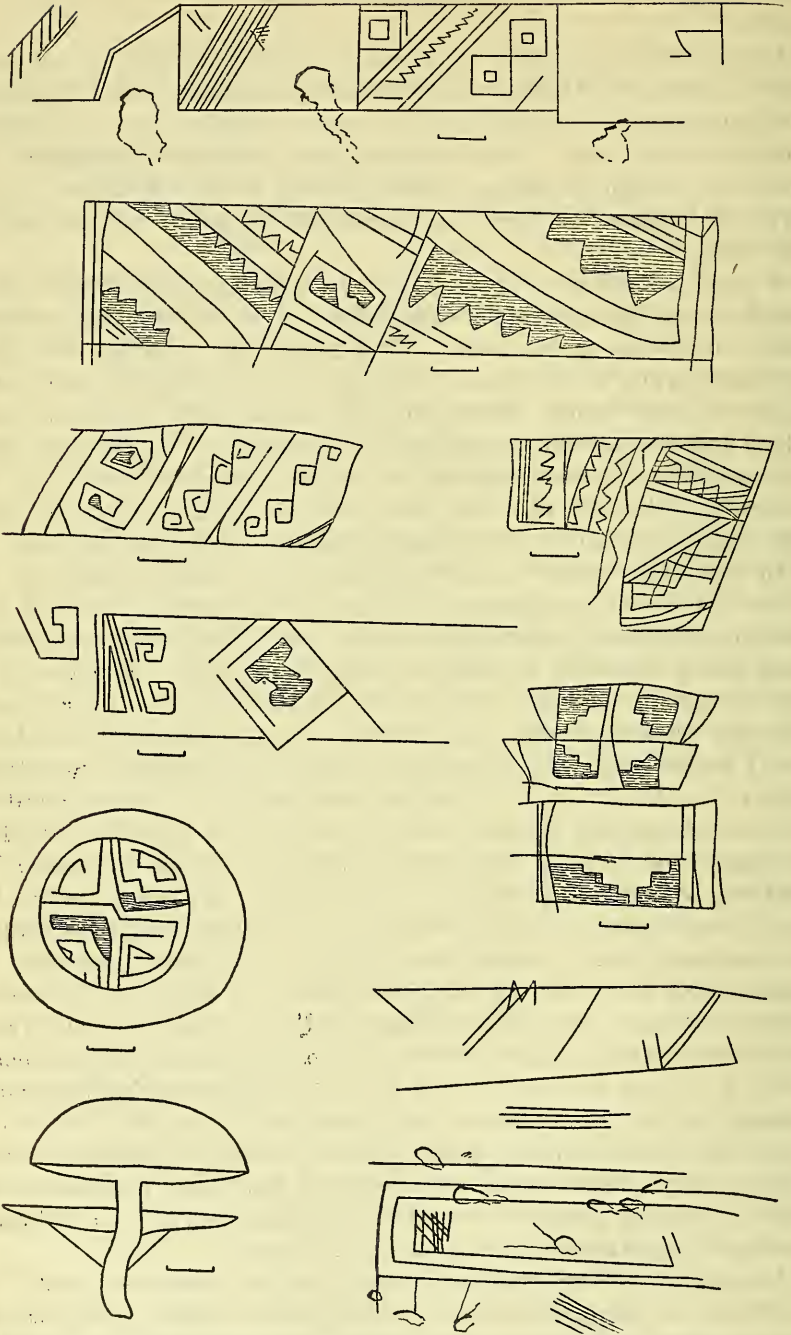


FIGURE 1.—INCISED FIGURES ON THE WALLS OF ROOM 11. (THE BAR REPRESENTS 1 INCH)

On the cliff above room 11 two holes, $1\frac{1}{2}$ inches apart, had been drilled through a thin layer of sandstone.

Room 12 is a storeroom, built against the outer northeast wall of room 11. Its floor is the solid sandstone of the uppermost terrace; its masonry bears no trace of smoke. A single northeast-southwest beam crosses the room slightly nearer the cliff than the southeast wall; four cross poles support a ceiling of willows, cedar bark, and adobe mud. Several potsherds were used as chinking in the northeast wall. One peg protrudes from the upper southeast side, 3 inches from the east corner.

An 18 by 24 inch (0.46 by 0.61 m.) door opens through the middle northeast wall. Its lintel consists of three pieces of split cedar, supporting a large stone; its sill is a thin sandstone slab. Both outer jambs are slightly grooved for the usual door slab; loops for fasteners appear on each side. A mano was incorporated in the masonry under the outer north jamb; in the wall above, two empty holes for wall pegs may be seen.

Court 13 separates room 11 from room 14; on the southeast stands an inclosing wall, now 2 feet high. Room 12 is a later addition, built in the west corner of the court against room 11; sheer cliff forms the northwest side. The rock surface in the north corner had been pecked down to approximate the level of an adobe pavement which covers a deep debris fill against the southeast retaining wall. Open fires and the varied domestic activities pursued in the court have darkened its entire floor and left their mark on some of its surrounding masonry.

A shallow fireplace, rimmed with adobe (now much broken), lies at the base of the cliff 26 inches (0.66 m.) from room 12. Three slab fragments stand on edge back of this fireplace; within it we found a dressed sandstone tablet measuring $10\frac{1}{2}$ by 9 by $\frac{3}{4}$ inches (0.26 by 0.22 by 0.019 m.). Near by a mortar, 11 inches (0.27 m.) in diameter by 14 inches (0.35 m.) deep, had been pecked into the rock floor 9 inches from the cliff and 2 feet 7 inches from the north corner. Its concave bottom and vertical sides are stained by fire and ash. Three grooves on stones of the northeast wall near the north corner show where implements were sharpened. Here also a protruding beam end and three shallow steps pecked in the cliff gave access to the roof of room 14; a fourth pecked step, or handhold, appears a bit higher on the cliff. The roof of room 11 was doubtless formerly reached by a ladder in the alcove south of room 12.

To aid passage to and from court 13 we substituted a notched cedar (pl. 27, A) for the old pecked steps in the north corner and placed a pole ladder in the south corner. Minor wall repairs were made, especially on the southeast.

Room 14, apparently a ceremonial chamber, stands between court 13 and room 15. Its floor is entirely of native rock, partially worked down in the west corner. On the northwest side a ledge slopes from the upper west corner to the floor at the north. The west half of this ledge was built up with masonry, filled with débris and capped with slabs 31 inches (0.78 m.) above the floor to form a shelf 12 inches (0.31 m.) wide at the northwest and 24 inches (0.61 m.) wide at the northeast.

The roof is supported by two central northeast-southwest beams; three others, side by side, lie next the cliff. On these beams fifteen cross poles support a layer of willows, mud covered. Ceiling and walls are heavily smoked. The lower two-thirds of the southeast and northeast walls are plastered while the southwest and northwest sides remain unsurfaced. Several small ovals and circles, made by pressing a pointed instrument into the new plaster, appear on the southeast wall; also, several casually incised lines. Two pegs protrude from the upper northeast side. Apparently after completion of the room, a vent about 4 inches in diameter was cut through the southeast wall, 14 inches (0.35 m.) below the cross poles and 4 feet 6 inches (1.37 m.) from the east corner.

A door opens through the middle southwest wall with its slab sill, slightly grooved where a stone ax was sharpened, at the court 13 level. Just within this door and continuing from its sill a sandstone slab which has settled 2 inches at the north tops a masonry platform 16 inches (0.41 m.) wide and 16 inches high. This platform lies between the wall and a masonry fire screen, 25 inches (0.64 m.) high by 27 inches (0.69 m.) wide by 10 inches (0.25 m.) thick, capped by a single stone. Pecked into the rock floor at the northeast base of this screen is an ovoid fireplace, 25 by 18 by 4½ inches deep (0.64 by 0.46 by 0.114 m.). In the ceiling above the platform an unrimmed smoke vent measures 6 by 10 inches (0.15 by 0.25 m.). Northwest of fireplace and platform the cave floor slopes upward toward the cliff; in this sloping surface four steps were pecked.

Four feet six inches from the north corner and 8 inches (0.20 m.) above the floor a second door opens into room 15. Loops for door fasteners protrude at points 8 inches and 12 inches (0.31 m.), respectively, from its grooved jambs.

Five pairs of pecked eyelets and others, unfinished, appear on the northwest cliff above the roof; here also is a narrow groove where some implement was pointed.

We repaired the walls, recapped them with a single course of stones, and patched several holes in the roof.

Room 15 may be identified as a storeroom from the absence of smoke stains on its inner walls and from the presence of grooves on its outer door jambs. Within the room, solid cliff sandstone slopes rather sharply downward toward the east corner, which was filled to provide a limited floor area. A rock ledge averaging 12 inches (0.31 m.) wide extends along the northwest wall base.

The roof is supported by a single beam seated 8 or 10 inches from the cliff and by three pairs of smaller timbers lying butt ends opposite. Upon these are five pairs of cross poles, covered with layers of willows and cedar bark. One peg protrudes from the southeast wall; five, from the northeast. A 17 by 24 inch (0.43 by 0.61 m.) door opens through the southwest wall 16 inches (0.41 m.) above the floor; two broad pieces of split cedar form its lintel. In the sloping sandstone beneath this door are five pecked steps.

On the northeast side a hole, approximately 20 inches in diameter and obviously of fortuitous origin, was repaired in 1917. In addition, the walls were recapped and holes in the roof mended.

Room 16 lies against the cliff, between room 15 and court 24. Its northeast and southwest walls are of masonry, but its southeast wall, now missing, was undoubtedly of wattle. Although the rock floor next the cliff had been worked down somewhat, it remains slightly higher than the front, filled portion. The east side of a low, narrow ledge at the base of the northwest, or cliff, wall was leveled with masonry to form a shelf. Smoke stains appear on the floor and at the base of all three walls.

The roof had burned, but one charred beam end remains in the northeast wall next the cliff, and three notches, pecked for beam rests, appear in the southwest wall. Above these, charred timbers protrude from room 15; the northeast wall masonry extends 18 inches (0.45 m.) above the roof level of room 16.

Room 17 is a possible storeroom situated between rooms 18 and 41; in front of and below rooms 15 and 16. Cliff forms its lower northwest side; its southeast wall is of wattle—posts supporting upright willows, bound at intervals by horizontal withes either singly or in pairs, and the whole plastered with adobe. (Pl. 9, A.) Smoke stains are not perceptible.

Excepting a small section in the west quarter the floor is artificial and rests upon 19 inches (0.48 m.) of débris covering an earlier surface. No plaster appears on the southeast wall below the upper floor, although its willows and posts extend to the lower. In the north corner a 9 by 12 inch (0.22 by 0.31 m.) shelf was made by leveling a small rock ledge with adobe. Above this shelf, next the northeast wall, is a recess measuring 8 by 12 by 5 inches (0.20 by 0.31 by 0.13 m.) deep. In the west corner pecked steps lead up the slop-

ing sandstone to a ceiling hatchway. Between floor and roof, one additional pecked step appears in the northwest wall; two in the southwest.

The roof is supported by four northeast-southwest beams. Upon these are 12 cross poles, only one of which extends the entire length of the room; then layers of split cedar, reeds (Johnson grass), and sand. In the west corner an 18 by 24 inch (0.46 by 0.61 m.) hatchway is reached by pecked steps. From the north middle beam a loop of knotted yucca leaves hangs 12 inches and is rather sharply curved at the bottom as though it once supported a pole approximately 2 inches in diameter. We recapped the walls and patched the broken edges of the roof.

Room 18 is a kiva, or ceremonial chamber, if one may judge from the character of its furniture. Its floor is mostly of native rock; its walls and ceiling are heavily smoked. The lower half of its northeast and southeast walls is plastered and in this appear miscellaneous scratchings—mostly vertical, parallel lines. Similar incisions may be noted on the northwest, or cliff, side. A sloping ledge along the face of this same wall had been leveled in the north corner to form an 18 by 30 inch (0.46 by 0.76 m.) shelf about 3 feet (0.91 m.) above the floor. During the initial examination of Betatakin in August, 1909, the present writer found two clay pipes and other articles on this shelf. They are now in the University museum at Salt Lake City.

The roof of room 18 includes 3 northeast-southwest beams, 10 pairs of crosspoles and layers, respectively, of willows and cedar bark. As usual, the willows are tied down to the cross poles by split yucca leaves. A door through the middle southwest wall has a slab sill and four oak lintel sticks about 1 inch in diameter; a 2¼-inch post stands against the inner south jamb. (Pl. 8, A.) Within the room, 20 inches (0.51 m.) from the southwest wall and separated from it by a platform lying 6 inches below the door sill, stands a masonry fire screen, 34 inches (0.86 m.) high by 27 inches (0.68 m.) wide by 10 inches (0.25 m.) thick. The platform extends a few inches beyond the south end of the screen; the latter is capped with a single sandstone block, 27 inches (0.68 m.) long by 13 inches (0.33 m.) wide by 3 inches (0.07 m.) thick. At the northeast base of this screen is a now broken, unrimmed fireplace approximately 2 feet (0.60 m.) in diameter; it was formerly lined with irregular stone blocks. In the roof above the platform, and obviously cut after completion of the ceiling, is a 7 by 10 inch (0.17 by 0.25 m.) smoke vent, rimmed with adobe-covered cedar bark. A second ventilator, 9 inches (0.22 m.) wide by 12 inches (0.31 m.) high, appears in the southeast wall 3 feet (0.91 m.) above the floor and 4 feet 5

inches (1.34 m.) from the east corner. Externally, this latter vent is almost round and about 6 inches (0.15 m.) in diameter.

During the snowstorms we experienced in 1917 my crew and I repeatedly sought shelter in this room and built fires in the south corner. Excepting minor patchwork along the roof edges and a new course of capping stones no repairs were necessary.

Court 19. During occupancy of the village this open space may have been leveled with débris. But to-day its sandstone surface, slightly higher in the middle, drops abruptly to the sloping cave floor between room 20 and the retaining wall below room 7. On the southeast side of the court a few courses of masonry cap the cliff terrace that serves as northwest wall for rooms 20-21. One sees no evidence of a passageway to court 13, above and at the northwest, but six pecked steps in the cliff at the north corner gave access to the roof of room 18.

At the cliff base, 3 feet 4 inches (1.01 m.) from the north corner, a pot-shaped hole 11 inches (0.27 m.) deep had been pecked in the solid rock. Three inches below the surface the diameter of this receptacle is 11 inches, but the body diameter, like that at the orifice, is 13 inches. Open fires had burned between this hole and the north corner of the court.

Room 20, a probable storeroom, stands below and south of court 19. (Pl. 10, B.) The face of a cliff terrace, thinly plastered, forms its northwest wall; the others are of masonry. Smoke stains are not present. The floor is mostly artificial. A cedar log is embedded in the masonry of the southwest wall, about 2 feet below the floor level.

Four northwest-southeast beams, two of which lie side by side in the middle of the room, carry 17 cross poles with overlying layers of willows and cedar bark. At the northwest all four beams rest upon a log which lies on a shoulder of the cliff, although notches for their individual support had been pecked in the cliff face above the log. Eight pegs protrude from the walls, close up under the beams; a hole for one additional peg is noted. The only entrance to the room is a hatchway, 20 by 24 inches (0.51 by 0.61 m.), in the south corner.

The terrace on which this storeroom was built had previously settled away from the cliff 14 inches; the resultant crack, extending lengthwise through the middle of the floor, had been filled with household débris. A 2-inch fracture in the northeast masonry evidences further settling since abandonment of the room. To check this we tied the southeast wall to the cliff with two steel rods, equipped with turnbuckles and expansion bolts. In addition, a hole in the lower southwest side was closed, the walls were recapped, and the roof patched.

Room 21, the longest in Betatakin, may also have served for storage, since its walls bear no trace of smoke. The sandstone cliff, capped with about 14 inches (0.35 m.) of masonry, forms its northwest wall; those adjoining on the northeast and southwest have been cracked by settling of the ledge on which the room stands. The floor is mostly native rock.

Four northwest-southeast beams supported the roof. Of this, only two cross poles now remain; upon them, in the west corner, are willows and cedar bark. Five wall pegs are noted, broken off flush with the masonry. Lacking evidence to the contrary, we assume the hatchway—sole entrance to the room—was located in the south corner, as in room 20.

The southeast wall we anchored to the cliff with a single steel rod. The north end of this, provided with an expansion bolt, was set in a drilled hole and packed with cement. In addition, we repaired the upper walls and replaced a missing beam. No effort was made to complete the roof.

Room 22, probably a kiva, adjoins room 21 and occupies the same terrace. Its northwest wall is formed by the face of the next higher ledge, topped by 2 feet of masonry. The lower three-fourths of all four walls are plastered and heavily smoked; the floor, mostly native rock, was worked down in the south corner to within 6 inches of the general level. Without lateral doors the chamber necessarily was entered through a hatchway.

Two northwest-southeast beams supported the roof; seven pecked rests for cross poles appear in the masonry of the southwest wall. At the floor level a 9 by 7 inch (0.22 by 0.17 m.) ventilator opens through the southeast wall 38 inches (0.97 m.) from the south corner. Extending into the room from the east jamb of this vent is a deflector slab, 17 inches (0.43 m.) wide by 16 inches (0.40 m.) high; at its northeast base lies a broken, stone-lined fireplace.

Two pecked steps at the west end of the northwest wall were doubtless cut before construction of the room; another "step," 6 inches (0.15 m.) wide by 4 inches (0.10 m.) high by 1 inch (0.025 m.) deep, appears in the middle of the same wall, 21 inches (0.53 m.) above the floor. Near by is a partially demolished shelf, 5 inches (0.12 m.) wide by 8 inches (0.20 m.) long, built of adobe on a narrow surface. One wall peg protrudes from the northeast side.

A rock ledge extending the entire length of the southwest wall was leveled in front with masonry to form a bench, 16 inches (0.40 m.) wide by 25 inches (0.64 m.) high. Four sandstone slabs surface this bench, the face of which had been battered by stone hammers and subsequently plastered. The crack caused by settling away of the terrace on which rooms 20-23 were built had been filled through-

out with rubbish. But in room 22 the southwest wall masonry continued down into this crack, thus leaving, under the paved bench, a recess 10 inches (0.25 m.) wide by 16 inches (0.40 m.) deep.

Incised designs appear on the plastered bench face and on all four walls. (Fig. 2.) An irregular rectangle about 5½ inches (0.13 m.) high by 7 inches (0.17 m.) wide, with crossed lines forming 100 small squares, is seen on the southeast wall; a similar figure shows faintly on the northeast side near the east corner, and just to the left of it is a familiar pottery design. The best preserved of all these incised

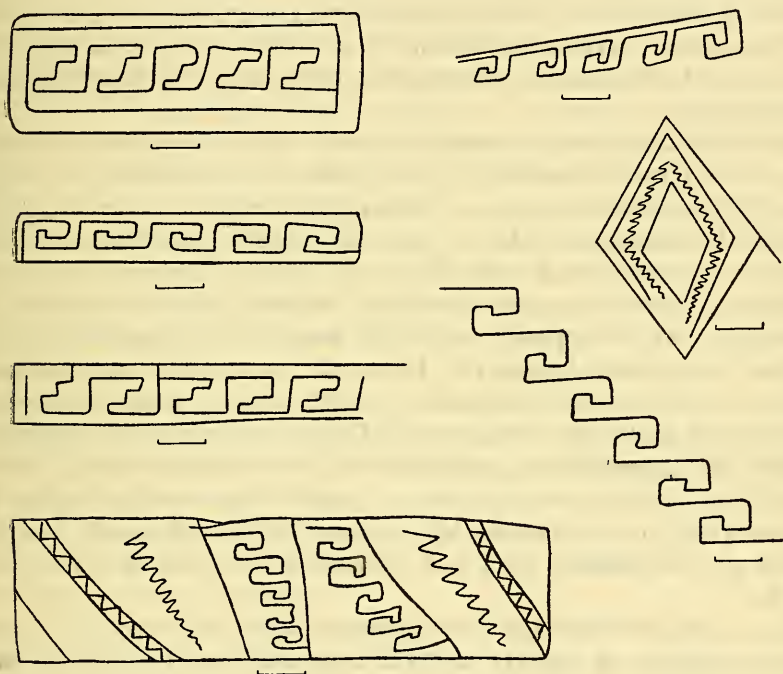


FIGURE 2.—DESIGNS CARVED ON THE WALLS OF ROOM 22. (THE BAR REPRESENTS 1 INCH)

figures appear on the middle northwest wall, in the plaster covering the cliff face; in addition, there are faint wavy lines and miscellaneous scratchings. A series of six "turkey tracks," with other figures, will be noted in the plaster above the southwest bench.

To check settling of the southeast wall we anchored it to the cliff with two steel rods fitted with turnbuckles. Minor wall repairs were made.

Room 23 is a relatively small structure between rooms 22 and 42, south of and below passage 40. Its northwest wall is formed mostly by the perpendicular face of a ledge; the other three are masonry. Of the northeast wall only three stones remain and these lie in the

subfloor crack continuing through rooms 20-23; of the southeast wall, only a fragment in the south corner has survived. The floor is entirely artificial. Fires had burned against the southwest wall, near the south corner. Upon the floor at the base of the northwest wall lay 3 feet of old débris; above this, the looser earth and sand thrown out by earlier excavators.

Although the roof is entirely missing, two beam rests show in the stonework above the cliff and holes for five cross poles appear in the masonry of the southwest wall, 5 feet 6 inches (1.7 m.) above the floor.

The Douglass ground plan inadvertently shows the northeast wall of room 23 a continuation of that in room 39. Its correct position, evidenced by the masonry fragment in the subfloor crack, is indicated on Plate 3.

Court 24 lies between rooms 16 and 25. A cliff ledge on the northwest side forms a bench 18 inches (0.45 m.) wide at the west by 3 feet (0.91 m.) wide at the east; its middle surface rises nearly a foot above the remainder. At the east end, which stands about 3 feet high, a depression had been filled with spalls and débris; over this, a series of nine stone steps led from the court floor to the roof of room 26. At the opposite end of the bench four pecked steps gave access to the roof of room 16. Below this shelf is a second and narrower ledge from which the native rock floor slopes gently downward toward the south side of the court. Here a southeast wall supports a débris fill, approximating the level of the sandstone surface at the northwest. In the west corner two shallow mortar-like basins, 11 inches (0.27 m.) in diameter by 2 inches (0.05 m.) deep and 8 inches (0.20 m.) in diameter by 1 inch deep, had been pecked in the solid rock.

The southeast side and the adjacent wattled wall required minor repairs (pls. 11, A; 12, B) in 1917; three of the north steps were re-laid (pl. 27, B) and a notched cedar was substituted for those pecked at the west.

Room 25, east of court 24, stands against the cliff immediately below room 26. Half of its wattled southwest wall was still standing; we reconstructed, but did not surface, the remaining portion. (Pl. 11, B.) The lower 3 feet (0.91 m.) of the three masonry walls had been surfaced; 10 superposed layers of plaster were counted in one place. Incised designs appear on all except the wattled wall. In the north corner, 2 feet 8 inches (0.81 m.) above the floor, is a triangular shelf measuring 7 inches (0.17 m.) on the northeast by 6 inches (0.15 m.) on the northwest. The charred ends of two beams, 8 inches in diameter, protrude on the northwest, 4 feet 5 inches (1.34 m.) above the floor; a lesser beam supported the top of

the wattled wall. Seatings for 10 crosspoles appear on the north-east side.

Three feet eight inches (1.11 m.) from the west corner a door, 18 inches (0.45 m.) wide and 10 inches (0.25 m.) above the floor, opens through the wattled wall into court 24. Against its inner north jamb stands a shattered masonry abutment, 9 inches (0.22 m.) thick. This joined the wall to a now missing fire screen which stood in front of the door to shield a fireplace, 24 inches (0.61 m.) in diameter by 5 inches (0.13 m.) deep, pecked into the rock floor. A subfloor cist 3 feet (0.91 m.) deep, about 2 feet 6 inches (0.76 m.) in diameter and lined with rough masonry, occupies the east corner of the dwelling.

In the northwest wall, 19 inches (0.48 m.) from the west corner and 13 inches (0.33 m.) above the floor, is a pecked recess measuring 4 inches (0.10 m.) square by 4 inches deep. A second recess of equal size and comparable depth lies in the northeast wall, 3 feet 6 inches (1.1 m.) from the north corner and 14 inches (0.35 m.) above the floor. A peg protrudes at an angle from the north half of the wattled southwest wall. In the upper southeast wall, near the east corner, is a 7 by 9 inch (0.17 by 0.22 m.) opening whose external dimensions are 5 by 6 inches (0.13 by 0.15 m.). A former ventilator, now blocked, about 11 inches (0.27 m.) wide by 14 inches (0.35 m.) high, is discernible at the floor level in the middle southeast wall.

Room 26, built upon an upper terrace northwest of and overlooking room 25, was used for storage purposes. Its rock floor slopes unevenly downward toward the southeast. Although the roof is missing, two pecked beam rests are noted in the northwest cliff; timbers protrude slightly from room 25. In the south corner three jutting stones in the northwest wall and two in that adjoining served as steps to a former hatchway.

In 1917 we substituted other timbers for the two missing beams and laid a hewn plank lengthwise of the room to facilitate access between courts 24 and 34.

On the cliff about 6 feet (1.82 m.) above the roof level of room 26 are four pairs of holes—shallow, pecked depressions connected by drilling. Two of these pairs are still occupied by small willows which protrude at right angles from the upper member. Like similar holes elsewhere on the walls of Betatakin cave, these were obviously prepared for suspension of maize, herbs, or equally light articles. They could hardly have been intended for loom cords since they are unequally spaced and the smaller pairs would not have resisted the tension required.

Room 27, a dwelling between rooms 25 and 100, stands below and in front of court 34. The cliff, surmounted by 18 inches (0.45 m.) of stonework, forms its northwest side; the southeast wall is of

wattle, mud covered. Only the lower half of the three masonry walls was plastered. The charred ends of three northwest-southeast beams are visible, and two of these lie side by side, near the west corner. At the southeast these three beams rested upon individual posts set just within the wattled wall. Seatings for five cross poles were pecked in the upper northeast masonry, but the former ceiling undoubtedly included 10 or 12 such timbers. The stonework upon the northwest, or cliff, wall was set back 5 inches (0.12 m.), thus forming a shelf the entire width of the room and about 4 inches (0.10 m.) below the beams. This shelf we repaired; at the same time the northwest and northeast walls were recapped.

In the middle southeast wall is a broken door. Within it, 22 inches (0.56 m.) from the wall, stands a slab fire screen measuring 25 inches (0.64 m.) wide by 14 inches (0.35 m.) high; its west end is joined to the wattled wall by slabs embedded on edge and extending 4 inches above the floor. At the northwest base of the screen is a fireplace, 7 inches (0.17 m.) deep, and averaging 16 by 21 inches (0.40 by 0.53 m.).

Court 28 lies between rooms 27 and 29, southeast of room 100. Like other courts, it served as an open living room in which diverse domestic activities were pursued. Its northeast wall, 5 feet 3 inches (1.6 m.) long, is of wattle (pl. 12, A); on the southeast a low retaining wall, extends westwardly to form a narrow passage fronting room 27. In the middle northwest side a door opens into room 100; both jambs are grooved and loops are present for wooden fasteners. Minor repairs were made on the wattled wall and on that adjoining at the southeast.

Room 29-30. A 2-story dwelling northeast of court 28 and room 100; southeast of and below room 31. Little remains of the upper chamber; the following notes pertain to the lower: For the most part, the floor is artificial, but along its northwest side the native rock had been worked down to approximate the general level. In the west corner a hole, 10 inches (0.25 m.) in diameter by 12 inches (0.30 m.) deep and now fire stained inside, had been pecked from the solid sandstone. Three shallow grooves where axes were sharpened appear in the northwest half of the room; here also are three pecked holes, averaging 2 inches in diameter by 2 inches deep, one of which contains a loom anchor stick. The wattled portion of the southwest wall was entirely plastered; of the others, only the lower half was so treated. No door being present, this lower room necessarily was entered through a hatchway.

The southeast wall was built upon a horizontal log. At the northwest, lying on a low ledge of rock and supporting the upper wall masonry, is a similar log; above it, 4 feet (1.2 m.) from the

sloping floor, is a second log (boxelder) and a foot higher, the charred ends of two pairs of northwest-southeast beams. A fifth beam, its ends only slightly embedded, rested close against the northeast wall. On this same side are recesses for, or the broken ends of, seven cross poles; three pole ends appear in the north 4 feet 3 inches (1.3 m.) of the southwest wall, the remaining 5 feet (1.5 m.) of which is of wattle. Extending along the base of this wattled section is a masonry bench 15 inches (0.38 m.) wide by 3 feet 4 inches (1.01 m.) long. An upright slab, 2 feet (0.60 m.) wide by 2 feet 8 inches (0.81 m.) high, adjoins the southeast corner of this bench as a screen for an ovoid fireplace. The latter measures 18 by 17 inches by 7 inches deep (0.45 by 0.43 by 0.17 m.); although pecked from solid rock, it is lined on the southeast and southwest by slabs. To further shelter this fireplace, a second upright slab, 12 inches wide by 2 feet high, extends eastwardly from the bench corner and the first screen. The bases of both these deflectors are supported by embedded slab fragments. In the west end of the south wall and at the floor level is an air vent, 8 inches (0.20 m.) wide by 12 inches (0.30 m.) high. The southeast masonry continues 2 feet beyond the abutting wattled wall. In the west corner narrow shelves on the northwest and southwest sides were capped with slabs. Only one wall peg is evident, on the southeast.

The second-story northeast wall apparently was added after completion of the lower room, for its basic stones are larger than the others. Although still in excellent condition, this upper wall shows no seatings for ceiling beams or cross poles; an unusual feature of it is the stepped construction at its south end, the "step" being 14 inches (0.35 m.) deep by about 30 inches (0.76 m.) long. (Pl. 11, A.) In this same second-story wall are two small recesses, approximately 5 inches (0.12 m.) wide by 4 inches (0.10 m.) high by 4 inches deep. One lies in the north corner; the other, in the middle wall and about 2 feet (0.60 m.) above the second-story floor level. The first of these recesses was plainly left during construction, but the second appears to have been made subsequently by removal of a few small stones.

Room 31, northwest of and above room 29, is another storeroom. Its floor is of native rock. A cliff terrace forms its northwest wall, but masonry was employed at each end to support the ceiling cross poles; between these seatings are three holes, pecked for other pole ends. A single northeast-southwest beam crossed the middle room. Through the southeast wall a 15 by 22 inch (0.38 by 0.56 m.) door opens upon the roof of room 29. The slab sill and both jambs are grooved; loops occur at either side.

After patching and recapping the walls, we presumed to reconstruct the roof. (Pl. 13, A.) Ceiling poles and willows were sal-

vaged from other sections of the village; new willows were brought in from the banks of the creek near camp. Upon the poles a layer of willows was spread and tied with strips of yucca leaves; upon the willows we placed a layer of cedar bark and covered it with dry sand. Although in roof construction they invariably used mud as a covering for willows or reeds, the builders of Betatakin seem often to have employed dry sand only in completing a roof in which cedar bark formed the next but final layer.

Room 32, northwest of and above room 31, also was utilized for storage. Unworked native rock, quite uneven and sloping sharply downward toward the south corner, sufficed as floor. In this slanting surface a single pecked step occurs. A shallow, pecked beam rest is noted on the cliff in the north corner; a few inches lower, but outside the northeast wall, is a similar recess, 5 inches (0.12 m.) in diameter by $2\frac{1}{2}$ inches (0.06 m.) deep. It is conceivable that the builder's plans were altered during construction.

Through the middle east wall a 16 by 24 inch (0.40 by 0.61 m.) door opens upon an irregular bench. Although its lintel had disappeared both jambs are grooved and the remains of willow loops show at either side.

In repairing this room we placed two adjacent beams parallel with and next to the northwest, or cliff, wall; a single beam was embedded in the restored masonry near the southeast wall and three steps at the east end were enlarged.

Room 33, on a ledge west of room 32, is yet another storeroom. Its floor is of native rock, higher in the middle than at either end. One peg protrudes from the upper southeast wall; no doubt others were formerly present.

A door, 15 by 20 inches (0.38 by 0.50 m.), opens through the middle southwest wall. Its south jamb is a stone slab on end; the other, an upright stick embedded in adobe. Outside, both are rounded off with mud and grooved for a door slab; holes at either side were once occupied by willow loops. The lintel is a stone slab supported by six strips of wood; the sill consists of two slabs set at different levels. The uppermost of these, 11 inches (0.27 m.) wide by 13 inches (0.33 m.) long, lies $6\frac{1}{2}$ inches (0.16 m.) above the lower; the latter, 8 inches (0.20 m.) wide by 15 inches (0.38 m.) long, lies 7 inches above the general floor level. Outside this door the cliff ledge forms a flat space approximately 2 by 4 feet (0.60 by 1.2 m.).

We placed two salvaged beams lengthwise of the room, seating their ends in the restored upper northeast and southwest walls.

Court 34 lies between rooms 26 and 31, in front of and below room 33. The face of the narrow ledge on which rooms 32-33 stand forms its northwest side; at the west corner seven pecked steps lead up and over this ledge to the roof of room 26. In the north corner three

similar steps and a fourth in the outer wall of room 31 gave access to the roof of the latter. The court floor is mostly artificial and continues at the same level with the roof of room 100.

We substituted a notched cedar for the west steps and placed a similar, though larger, ladder in the north corner.

Room 35, a dwelling, is situated between room 37 and court 45. We observed no evidence of the second story shown in Douglass's ground plan as reproduced by Fewkes (1911).

The northwest side is sheer cliff, surmounted by rooms 29 and 30; the southeast and southwest walls are masonry; the northeast, of wattle. While the latter was surfaced all over, only the lower half of the other three was plastered. The north part of the floor is native rock, worked down nearly 2 feet (0.60 m.) in the west corner and along the southwest side. A slab-lined but screenless fireplace, 18 by 20 inches (0.45 by 0.50 m.), occupies the middle floor. Three feet two inches above the floor a 5 by 9 inch (0.12 by 0.22 m.) opening extends diagonally through the middle southeast wall. In the west corner, 11 inches (0.27 m.) above the floor, is an 8 by 4 inch (0.20 by 0.10 m.) shelf.

A small beam lies against the northwest cliff; two larger northeast-southwest beams cross the middle room. At the northeast these three timbers rested upon individual posts set just within the wattled wall. Although five cross poles (1 single, 2 pairs) appear in the southeast wall, at least four others were formerly present.

In 1917 we repaired but did not replaster the wattled wall; we reconstructed the rounded adobe sill of its door and rebuilt the central fireplace.

Court 37. The northwest wall is sheer cliff, 8 feet (2.4 m.) high, surmounted by the retaining wall fronting court 28. No beam rests appear on this side. Two beam ends from room 35 protrude through the northeast wall, which apparently never extended more than 5½ feet (1.7 m.) above the court floor. Of the southeast side only traces now remain in the east corner. At the northwest is the cleaved end of a rock ledge on whose sloping surface stands the fragmentary northeast wall of room 39, ending abruptly with the southeast face of the ledge. Court 37 lies several feet below passage 40, but connects with it by a single pecked step. Other similar steps may long since have disappeared with disintegration of the soft, friable sandstone.

Bone awls were pointed on the northwest cliff face; stone axes were sharpened on the sandstone floor. In the west corner four steps were pecked in the gently sloping surface where steps seem quite unnecessary.

We observed no suggestion of the second story indicated on Douglass's ground plan.

Room 39 is a dwelling, between rooms 41 and 37. Its northwest wall is formed by the face of a cliff terrace, surmounted by room 25; a fragment of northeast masonry remains at the north. The southeast wall, of wattle construction, was plastered all over; successive plaster layers show on the lower half of the northwest and southwest walls. While the north half of the floor is of native rock, the remainder consists of a debris fill surfaced with adobe. A protruding rock mass on the southwest side had been worked down 5 inches to the general floor level. Through the middle southeast wall a door gave access to passage 40, which in turn connects with court 37.

A narrow ledge lies at the base of the northwest, or cliff, side; on this ledge, in the north corner and abutting the northeast wall, stands a masonry column, 12 inches square, that probably once reached to the ceiling. The lower half of this column is plastered; its southeast face is smoked. On the same rock ledge and abutting the southwest side of the column is a masonry shelf, 8 inches (0.20 m.) wide by 2 feet 3 inches (0.68 m.) long. An adobe-rimmed fireplace, the north side of which lies 3 feet 5 inches (1.04 m.) from the middle southeast wall, had been partially destroyed with caving of the east quarter of the floor. Both firescreen and door-sill were lost at the same time.

Pecked into the rock floor at an average distance of 17 inches (0.43 m.) from the cliff are four loom anchor holes averaging $2\frac{1}{2}$ inches (0.06 m.) in diameter. The westernmost of these lies 2 feet 8 inches (0.81 m.) from the southwest wall; the second, 16 inches (0.40) from the first; the third, 16 inches from the second and 16 inches from the northwest wall; the fourth, unfinished, lies $8\frac{1}{2}$ inches (0.21 m.) from the third and 19 inches (0.48 m.) from the cliff. Another incomplete hole is noted on the north side, between the third and fourth. Hole No. 1 contained a $\frac{3}{8}$ -inch stick embedded 1 inch below the room floor; hole No. 2 held two quarter-inch sticks, placed one upon the other, with the uppermost $1\frac{1}{4}$ inches (0.031 m.) below the floor; hole No. 3 contained a single stick. Each anchor rested in an undercut at one side of a vertical groove (fig. 3); each had been introduced through the groove into the undercut, after which both groove and socket were packed with adobe mud. At some later time all five holes were filled with mud; their presence was disclosed by the difference in color between this adobe filling and the sandstone. From the uniformly discolored floor here we infer the loom anchors were in disuse long before abandonment of the room.

Room 40, a passageway about 21 feet (6.4 m.) long, furnished access from court 37 to rooms 39 and 41 and the roof of room 22. At its west end the alley is 18 inches (0.45 m.) wide; between rooms

39 and 41 it attains its maximum width of 35 inches (0.88 m.). The southeast wall probably did not extend more than 3 feet (0.91 m.) above the floor level and may have been stepped down at the east end. An earlier débris-covered floor lies 6 inches (0.15 m.) below that last utilized.

The masonry separating rooms 39 and 41 ends flush with their wattled southeast walls, instead of continuing, as shown on Douglass's plan.

Room 41, between rooms 17 and 39, opens into passage 40. As so frequently happens in Betatakin, its northwest wall is formed by the face of a rock ledge, in this instance surmounted by the southeast wall of court 24. A fracture in the cliff, 4 inches (0.10 m.) above the room floor, left a flat surface 12 inches wide by 3 feet (0.91 m.) long.

The northeast and southwest walls of the room are of masonry; the southeast, of wattle. The roof had been supported by at least two large northwest-southeast beams whose south ends rested on posts incorporated within the wattle construction. Charred ends of nine cross poles protrude from the southwest wall. The floor, almost wholly of solid rock, had been pecked away more than 2 feet in the west corner. Such an excavation, made only with hammerstones, furnishes ample proof of the patience and industry of prehistoric Pueblo workmen.

A doorway, with stone sill slab lying 3 inches above the floor and wholly outside the door, pierced the middle southeast wall. Directly in front of and 15 inches (0.38 m.) within the door stands the remnant of a masonry fire screen, 30 inches (0.76 m.) wide by 7 inches (0.17 m.) thick; an upright stone slab connects its west end and the southeast wall. It is not improbable that this slab, like others present in houses with wattled south walls, was intended both as a secondary screen for the fireplace and as a check for sand carried by the winds which usually sweep through the cave from east to west. In 1917 we had ample opportunity to observe the force of these winds and the amount of sand they transported. The fire-pit, pecked from

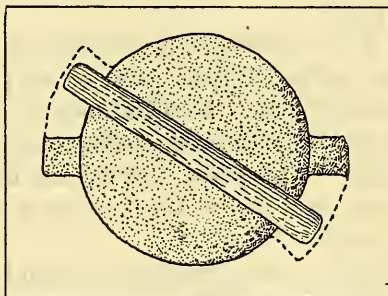
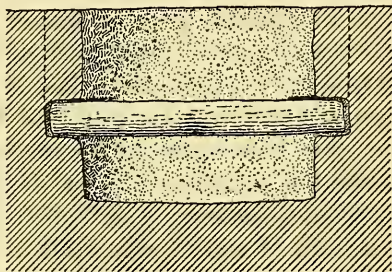


FIGURE 3.—CROSS SECTION AND PLAN OF LOOM ANCHOR

the solid rock floor, measures 2 feet 4 inches (0.71 m.) long by 16 inches (0.40 m.) by 5 inches (0.12 m.) deep.

When we repaired the upper northwest wall no effort was made to indicate positions for the principal ceiling timbers.

Room 42. The long room numbered 42 on Douglass's plan is not now traceable, although the ledge which marks its site, especially at the west end next room 23, is wide enough and not too sloping to have supported a room. Débris covering the floor of room 23 extended downward and across the sloping surface of this ledge. No portion of the southeast wall shown by Douglass is evident.

Room 43, a dwelling, stands between rooms 48 and 49, above court 45. Five medium-sized beams were covered directly with a thick layer of Johnson grass to form its ceiling; there were no cross poles. In the west corner native rock was worked out to a depth of 16 inches (0.40 m.); the remaining floor is a rubbish fill, surfaced with adobe. Part of the southeast wall had fallen, releasing some of the débris. Two feet four inches of the northeast wall consists of room 51 stonework; the remainder, of wattle (now mostly destroyed), apparently replaced a masonry wall 7 inches (0.17 m.) thicker. The southwest side, also of wattle, was built in after completion of the roof which covers both rooms 43 and 48. All four walls are heavily smoke stained.

A door through the middle of the northeast wattled wall has four thin strips of split cedar to support its stone lintel; as usual, a slab forms its sill. Another door, 16 by 20 inches (0.40 by 0.50 m.), opens through the middle southwest side; its sill is a slab on edge, 11 inches high. A fireplace, now broken but probably slab-lined, lies 15 inches (0.38 m.) inside the northeast door. We observed no trace of a screen.

In 1917 we propped a broken beam with a post, replaced two other beams, patched the roof edges with willows and cedar bark, repaired the broken southeast wall, and filled the floor break above noted.

Room 44, above and northwest of room 51, is a storeroom. On account of the sloping cliff at the northwest the floor area is reduced to half that of the ceiling. Two large slabs of rock had slipped down the cliff (pl. 13 B), breaking the northeast wall and pushing it outward 7 inches (0.17 m.) from its original position. The southwest side was built over a ledge which had been worked down within the room. Smoke stains appear on all four walls; more prominently in the south corner. Two narrow, groovelike notches were pecked in the cliff near the west corner, perhaps as beam rests. Only two cross-pole fragments, one at each end of the room, remained in place.

A former northeast door had been blocked; its jutting lintel slab and the recessed masonry above, form a shelf 6 inches (0.15 m.)

wide by 2 feet 8 inches (0.81 m.) long. A later door, 15 by 25 inches (0.38 by 0.64 m.), opened through the southeast wall onto the roof of room 51; two stones composed its sill. Although the outer jambs of this second door are slightly grooved, fasteners were not provided.

Restoring the southeast door in 1917, we seated a single lintel slab, without supporting sticks. To suggest the original beam level, a pole was placed parallel with the cliff.

Court 45 lies in the left front of the village with room 35 adjoining on the southwest; rooms 46 and 50, on the northeast. The northwest side is sandstone cliff, sloping up from the floor to rooms 29, 43, and 48. The southwest wall, of wattle, is divided by a door whose slab sill lies 4 inches above the court floor. At each side of this door stands a post, joined to the wall by 6 inches of masonry. In the upper middle of the southeast inclosing wall was an opening (reproduced in 1917) slightly larger than the usual "windows" or ventilators.

Most of the court floor is artificial; fires had burned in various places. Several pecked steps lead up the sloping northwest side to a small flattish area in the corner formed by the outer walls of rooms 29 and 48. Two loom anchor holes, pecked in the north corner of the main court floor, each measure 3 inches (0.076 m.) in diameter by 2½ inches (0.06 m.) deep; a third hole, unfinished, lies slightly to the west. A narrow bench, 8 inches (0.20 m.) wide by 14 inches (0.35 m.) high, extends nearly the entire length of the northeast wall and serves as a sill for the door to room 46. This door measures 18 inches (0.45 m.) wide by 25 inches (0.64 m.) high; staples appear at each side.

Where it abuts the nearly vertical cliff, the northeast wall was built into a dug groove about 3 inches deep. (Pl. 14, B.) We repaired the broken masonry here, repaired the wattled southwest wall, and did miscellaneous patching elsewhere.

Room 46 stands east of court 45 and southeast of room 50. Its northwest and southeast walls follow the irregular cliff ledges on which they were built. For example, the southeast wall extends 4 feet 9 inches (1.4 m.) from the south corner to a northwest-southeast jog, 2 feet 3 inches (0.68 m.) long; thence, 3 feet 7 inches (1.1 m.) to the east corner. The northwest wall, standing on parts of two narrow sloping ledges, has a similar offset 3 feet 10 inches (1.16 m.) from the west corner and 5 feet (1.5 m.) from the north corner. While the floor consists mostly of native rock, depressions along the southeast side were filled and surfaced with adobe.

A door opens through the southwest wall into court 45; 24 inches (0.61 m.) below its sill a step, 6 inches (0.15 m.) wide by 17 inches (0.43 m.) long, was pecked into a protruding mass of native rock.

The crude masonry of room 46 required much repair in 1917. The west end of its northwest wall was rebuilt to furnish support for the south corner of room 50, but no attempt was made to show beam seatings.

Room 47, adjoining room 46 on the east, occupies a sloping rock surface in the lower middle front of the cave. Only the southwest and part of the southeast walls remain. The pecked groove on which the northwest masonry rested continues to the probable north corner where we restored a small section in 1917. The east half of the southeast wall, built on a lower ledge, necessarily includes masonry much higher than that in its west half. Within and against this wall a very considerable fill of débris provided a floor the former level of which is not now evident.

Room 48 is a small chamber that originally formed part of room 43, which it adjoins on the southwest. Its two roof beams support numerous small cedar sticks and a thick layer of Johnson grass. Owing to the sloping cliff on the northwest side, the floor area is reduced to less than half that of its ceiling. For example, the floor measures 2 feet 8 inches (0.81 m.) by 16 inches (0.40 m.), while the ceiling measures 2 feet 8 inches by 4 feet (0.81 by 1.2 m.). The wattled northeast wall is not plastered as is its opposite face in room 43. A triangular space between the cliff and the northeast door is occupied by a single large stone, forming a low shelf 5 by 14 inches (0.13 by 0.35 m.). The inner walls are heavily smoked.

The lower southeast masonry, having fallen, was replaced in 1917 (pl. 14, A) and the floor brought up to its former level.

Room 49 stands on a ledge northeast of room 43, between rooms 50 and 51. The northeast wall has wholly disappeared; the southeast, a fragment only of which remains, formerly concealed a large, rounded rock mass that lay just below the floor level of the east quarter. Absence of seatings for ceiling timbers suggests that room 49 might have served as a court, its floor at the roof level of room 50 or possibly separated from it by low stonework.

Part of a slab-lined fireplace will be noted against the southeast wall near the south corner. Through the middle southwest wall a door connects with room 43; a second door, whose grooved west jamb only remained, opened into room 51 through the west half of the northwest wall. We partially restored this latter wall and its broken door in 1917.

Room 50 lies north of court 45, between rooms 46 and 49. Its northeast wall is wholly missing, while that on the northwest is represented merely by sections of masonry at the west corner and under the boulderlike rock noted below the east corner of room 49. Of the southeast side, a fragment remains in the south corner; the adjacent southwest wall is complete and shows seven holes left by

cross poles. The lower half of this latter wall is plastered and smoke stained. Native rock at the base of the northwest side had been worked down to the general floor level; elsewhere, the floor was of abode mud over a débris fill. This rubbish covered three earlier steps, pecked in the sloping sandstone.

In 1917 we rebuilt an alcove in the west corner; reconstructed the northwest wall and thus again concealed all except the protruding east end of the rock mass under room 49. A beam was also replaced on top the northwest wall.

Room 51 may be found in front of and below rooms 44 and 56, northwest of room 49. North of the angle in its southwest wall, rude masonry holds back the débris forming a level for the unnumbered court marked "Bench" on Douglass's ground plan. Four shallow steps, pecked into the sloping rock floor of this west corner, suggest the rude masonry above them was added when room 51 was constructed in this space, originally used as a passageway.

The lower west half of the northwest side is sandstone cliff, with room 44 above and at the roof level; the remainder is the masonry foundation of the wattled southeast wall of room 56. Stones loosely piled in débris marked the northeast wall. In the middle southeast wall a door connected with room 49; east of this opening the masonry had fallen.

We supplied a new sill for the southeast door and partly reconstructed both the southeast and northeast walls. In the latter, we left an irregular opening to provide ready access to the ladder placed in the west corner. The north leg of this ladder stands in a shallow hole we pecked in the sloping cave floor.

Room 52. The only traces of this structure were a few superposed stones of its southwest wall and several others under the north edge of the boulderlike mass upon which the southeast wall had rested. Room 57, at the northwest, may have opened onto the roof of this building, although we have no reason to say it did. Room 56 protrudes slightly into the west corner from which a low ledge, worked down several inches, extends the entire length of the room. Two cup-shaped depressions had been pecked into the cliff floor as rests for the northeast masonry.

We reconstructed portions of the southeast and northeast walls in 1917 and left an opening in the northeast side to facilitate access to the rooms beyond. (Pl. 15, B.)

The series of pecked steps under the southwest wall of room 52 is a continuation of the trail which passes up the slope westwardly from room 55. These steps and the fact that all partitions had abutted the major northeast-southwest walls seem to indicate that rooms 51, 52, 53, etc., were later additions to the village, built upon

the narrow ledge previously used as a passage between the east and west house groups. It is certain that the ledge crossing the cave at this level was used as a trail for its course is marked by pecked steps and otherwise. (Pls. 6, B; 15, B.) Water seeps out just above the old path, providing lodgment for wind-driven sand and moisture for growing plants. From this area we removed a thick mat of columbine and other vegetation. Also we cleared the old trail and deepened some of its more weathered steps.

Room 53. In front of and below room 60-61, the pecked out cliff between room 52 and the projecting southeast wall of room 64-65 marks the former floor level of room 53 and its northeast-southwest length as 8 feet 7 inches (2.61 m.). A shallow groove, pecked in the sloping sandstone, served as a rest for the southeast wall, in continuation of that in room 52.

During our repairs six steps were cut in the cave floor of room 53 to facilitate access to the western portion of the ruin.

Room 54. Not indicated on Douglass's plan.

Room 55, obviously a ceremonial chamber, stands in the lower middle front of the cave. Like other Betatakin kivas, its special function is evidenced by certain furnishings never present in secular structures.

Although the south wall is now missing its former position is marked by a pecked rest on the cliff face below the floor level. The east and west walls stand more than 7 feet (2.13 m.) in height without trace of beam seatings; unlike any other in the ruin, they measure over 2 feet thick and include a core of sandstone spalls and adobe, faced on each side with masonry.

On the north the sharply inclined terrace face was squared up in front with masonry to form a shelf 18 inches (0.45 m.) wide at the east and 10 inches (0.25 m.) wide at the west, extending the entire length of the room, 3 feet 11 inches (1.19 m.) above the floor. In the middle face of this shelf, 22 inches (0.56 m.) above the floor, is a pecked hole, 7½ inches (0.19 m.) in diameter by 3 inches (0.07 m.) deep; above the shelf, where the room length is a few inches less than that below, masonry continued to the roof level. The walls were plastered and smoke stained.

Filling was necessary adjacent to the south wall, but elsewhere the floor is the flat surface of the lowermost terrace. In this are four loom anchor holes, averaging 3 inches (0.07 m.) in diameter by 2¼ inches (0.056 m.) deep. They were pecked in the sandstone about 12 inches (0.30 m.) from each other and about 17 inches (0.43 m.) from the base of the north shelf; each hole lacks its former anchor stick.

Built in the lower northwest corner is a triangular bench, 2 feet 3 inches (0.68 m.) high by 2 feet 4 inches (0.71 m.) on the north and

3 feet 7 inches (1.09 m.) on the west. In the face of this bench, at the floor level, is a recess measuring 6 inches (0.15 m.) wide by 18 inches (0.45 m.) high by 11 inches (0.27 m.) deep; its unplastered interior is but lightly smoked.

At the beginning of our 1917 excavations débris sloped downward from near the present top of the north wall, covering the floor and extending beyond its south margin. In this rubbish were quantities of cedar bark, sticks, and adobe flooring from dwellings higher in the cave. We repaired the northwest corner bench and the broken edge of the north shelf; recapped the walls and replaced some of the missing plaster. (Pl. 23, B.)

Room 56 lies north of room 51, between rooms 44 and 57. Its northeast and southwest sides are of masonry, but its southeast wall, above a masonry base which supports a débris fill and the floor level, appears to have been of wattle construction. There is no trace of masonry abutting the outer east corner of room 44. Of the northeast wall only a small section remained; in this, next the cliff, was the charred end of a ceiling cross pole and, in the lower front portion, the north jamb of a door. An offset in this same wall forms a triangular shelf, 12 inches (0.30 m.) wide by 18 inches (0.45 m.) long, against the cliff and just below the ceiling level. The slab sill of the blocked door to room 44 protrudes 4 inches (0.10 m.), forming a shelf 2 feet (0.60 m.) above the floor.

From the built-in floor the cave surface slopes sharply upward to the rear cliff, which may have served as the northwest wall of a second-story room.

In the débris-filled front part of the room were three mealing bins. For two of these the inclosing slabs were still in position when our excavations began; those of the third bin had fallen. The two bins measured 28 inches (0.71 m.) long by 17 inches (0.43 m.) and 14 inches (0.35 m.) wide, respectively. Although the original metates were missing, their angle of inclination was evidenced by the adobe packing inside the bins.

In repairing this chamber we set three posts just inside the masonry base of the southeast wall to suggest the wattling which probably once stood there. Also we partly rebuilt the adjoining northeast wall while retaining its original irregularities. But it should be understood that the present dimensions of the restored door are approximations only. We reset the slab sides of the three mealing bins and substituted for those formerly employed, metates salvaged from other sections of the ruin. (Pl. 18, B.)

Room 57 lies between rooms 56 and 60; in front of and below room 58; above and behind room 52. From the rather precipitous cave floor a section 20 inches (0.51 m.) high by 12 inches (0.30 m.) deep and extending the entire width of the room had been battered away

with hammerstones. This excavation doubtless marks the former floor level, the front portion having been filled in with rubbish and surfaced with adobe as in so many other rooms, similarly situated. Two charred beam ends protrude from the upper southwest wall, next the cliff. A long narrow groove, pecked in the sandstone, formerly supported the now missing southeast wall. This latter, as in the case of room 56, we assume to have been of wattle above a masonry base that rose only to the floor level. It should be admitted, however, that we have no real justification for the assumption.

We deepened the southeast wall groove and, upon it, reconstructed the masonry foundation to approximately its original height; the adjacent sides were also represented by limited stonework built upon deep steps we cut to replace the shallow, pecked seatings provided by the aboriginal masons. (Pl. 17, B.)

Room 58 is merely a platform fronting room 59. When examined in 1917 its retaining (southeast) wall extended only one course above the landing; there was no certain evidence of a former southwest wall, although several large stones had been piled in there, below the floor level.

Directly in front of the door to room 59 is a groove where a stone ax was sharpened. On the slanting cliff west of the platform is a single pecked step which, with similar steps on the large rocks that had slumped into room 44, suggests that room 59 was entered from above the roof levels of rooms 44 and 56.

We added a second course of stones on the southeast side and, perhaps erroneously, replaced the loose subfloor blocks at the southwest with masonry extending two layers above the platform level.

Room 59, a probable storeroom, situated high in the middle portion of the cave, above and northwest of room 60-61. The foundation of its southeast wall was supported by a log resting upon the precipitous cave floor with its ends embedded in the northeast and southwest walls of room 60-61. A post about 6 feet (1.82 m.) high and reaching from floor to arching cliff above was incorporated in the masonry at the north corner. Rough stonework fills the space between this post and the adjacent lower cliff, thus creating an angle in the northeast side as shown in Plate 3. Smoke stains are discernible on the lower walls. Although the floor is mostly of solid sandstone, a shallow fill was made in front. Pecked in the rock floor at the west end is a seemingly unnecessary step.

The roof was supported by two parallel beams next the cliff and a third, now missing, toward the front. Through the middle southwest wall, with two large cedar sticks as lintel, is a 17 by 30-inch (0.43 by 0.76 m.) door. Its outer jambs are not grooved; hence the space within may not have been utilized solely for storage purposes.

During progress of our work the southeast wall collapsed, for reasons explained below. It was subsequently rebuilt; the space behind its supporting log was filled with spalls and covered by slabs extending out over the timber thus to provide a sturdier foundation for our new stonework. A salvaged pole replaced the missing ceiling beam.

Room 60-61 lies northeast of room 57, in front of and below room 59. The front wall continues from that in room 57 and, like it, rested on a pecked groove several feet below the actual floor level. We observed nothing to indicate that this wall included other than masonry. The two sides were erected above series of shallow, pecked steps. Some notion of the degree of inclination here may be gained from the fact that the floor length of the lower room is less than half its ceiling length. It is possible, therefore, that the lower chamber was utilized primarily for storage while the upper provided living quarters.

Part of the northeast wall and a small section of that adjoining on the southeast were in position when our work began. But these fragments, cracked by previous settling (pl. 16, A), collapsed utterly on April 18 after their adobe mortar had softened under the clinging snow of successive storms. Twelve days later, while we were reconstructing these fallen walls upon more deeply cut steps (pls. 17 and 18), the upper northwest wall gave way owing to vibrations set up by the reverberating echoes of an unusually severe thunderstorm. This wall, which serves as a foundation for room 59, was also reconstructed and upon its original horizontal supporting log. Our experiences here afford evidence of two distinct factors contributing to the destruction of cave dwellings.

A third factor might be noted in passing, namely, the abrasive property of wind-blown sand. As blown sand contributed to the creation of Betatakin cave, so has it played a part in destruction of those prehistoric dwellings subsequently built within that huge cavern. When the spring sandstorms were at their worst our work was repeatedly interrupted. The wind that leveled camp on April 9 and hung our spare clothes on far, high branches also drove us to seek shelter in the old rooms. Scouring sand cut pellets from the cave roof and showered them down with surprising velocity. Came, also, occasional larger stones. Storms of comparable temper persisted well into May. Blown sand has left its mark on both cave and house walls; masonry has been undercut and thrown down. Over a period of years the amount of destruction so caused might prove not inconsiderable.

Room 62. As shown on Douglass's ground plan, this room does not exist.

Room 63 is a small storeroom adjoining room 59, above and northwest of room 64-65. The cliff at the rear rises vertically to the gallery wall. As with rooms 58 and 59 a masonry foundation on the southeast side rose to the floor level; of the northeast wall, only a few stones remained in position. In 1917 we added several courses to these two fragmentary walls.

Northeast of room 63 the ledge upon which it stands bears several grooves where stone axes were whetted; farther along, this ledge narrows and disappears. But the line of cleavage continues as a seepage zone from which, in 1917, rippled a fluffy green band of columbine. A second similar band grew down slope, on a parallel seepage extending eastwardly from room 53. Over and below this lower seep, wind-blown earth and sand had gathered to a depth of 3 feet (0.91 m.); in this grew several oaks and box elders, from 3 to 5 inches in diameter. The decaying trunks of others were disclosed during removal of the accumulation.

Room 64-65. Of this structure only one wall was standing in 1917. (Pl. 16 A.) The lower story, quite V-shaped, might have been utilized for storage; with equal plausibility, it could have been packed with rubbish. Pecked grooves and steps as former wall rests and a difference in floor coloration marked the house site. Where once covered by masonry, the slanting sandstone remained unsoiled; elsewhere it was darkened by ash and débris of occupation. As in other structures similarly situated, the floor level of the lower room is now represented by a battered and partially excavated cliff section from which an adobe-surfaced, rubbish fill formerly extended to the front wall. This latter had been erected above a pecked groove 2 feet 8 inches (0.81 m.) lower on the slope than the southeast wall of room 60-61, which adjoins on the west.

Before construction of the dwelling several dissociated steps had been pecked on this lower slope. These were never actually used as wall seatings, although they may have been intended as such. There is also the possibility that they served as foot rests during building operations or as earlier trails across the precipitous cave floor.

Upon specially prepared cuts we reconstructed so much of the front and side walls as would indicate the original position and size of this room. (Pls. 17 and 18.)

Room 66 is identified as a second-story dwelling in the lower, middle portion of the cave. We find here a certain discrepancy in the Douglass ground plan. Therein, room 66 is shown as a 1-story house separated from a 2-story structure (R. 68-69) by narrow room 67. As a matter of fact, room 68 is barely traceable; room 66 is the only one of the three chambers having two doors in its west wall. One of these occurs in the first story; the other, in the second. If

one takes these two openings as the distinguishing feature of room 66, its correct position relative to its neighbors will be that shown by our Plate 3.

The upper story of this structure had burned during occupancy for the charred beams and willows of its original roof still show in the wall masonry 3 feet 10 inches (1.2 m.) above its floor. Subsequently, a new ceiling was constructed approximately 6 inches (0.15 m.) above the remains of the earlier. Only one door occurs and that in the west wall, near the southwest corner; it measures 18 inches (0.45 m.) wide by 31 inches (0.78 m.) high. Two feet inside this door and 2 feet 6 inches (0.76 m.) from the south wall is a slab-lined fireplace, 13 by 24 inches (0.33 by 0.61 m.) by 9 inches (0.22 m.) deep; it was protected by a wattled firescreen whose charred willows are still visible. Between this screen and the door, 4 inches (0.10 m.) below the sill, is a platform measuring 20 inches (0.51 m.) wide by 8 inches (0.20 m.) high; on the south side of this, joining screen and west wall, one notes the fragment of an upright slab which once served as a secondary deflector. In the middle south wall, 3 feet 5 inches (1.04 m.) above the floor, is a 6-inch square smoke vent.

During our 1917 repairs we replaced one of the missing upper beams and added split sticks and a stone lintel to the broken west door. The adobe floor was patched where needed; the walls, re-capped.

Beneath room 66 is an unexcavated, débris-filled chamber whose floor area, on account of the sloping cliff, is considerably less than that of the upper story. In the north half of the lower west wall is a partially blocked door. (Pl. 9 B.) While some of the closing stones may have been removed within recent years, the writer seems to recall that this particular opening was in much the same condition when Betatakin was discovered by Professor Cummings in 1909. We presumed to close it completely in 1917.

Room 67 is a narrow building, east of room 66. Only a decayed fragment of its south wall remained and this we replaced in 1917. The adjoining sides had entirely disappeared; no grooves were present to mark their former positions. The north wall, about 5 feet (1.5 m.) long, was doubtless a continuation of that in room 66.

Room 68. Of this structure no trace survived except the battered cliff edge, east of room 67. Here the south wall had stood; the east and west sides doubtless continued from those in room 122, which lies next on the north.

Room 70 formerly rested precariously on the cliff edge, east of rooms 68 and 122. Pecked wall seatings give the approximate dimensions recorded in the table on page 73. The stonework had en-

tirely disappeared with the exception of a small north section supporting the artificial platform adjoining room 122, at the foot of the steps leading to room 73 and beyond. Upon the seatings they formerly covered we partially reconstructed this retaining wall and those adjacent.

Room 71. Although no masonry remained at the time of our work, the former presence of this room, on the lower cliff terrace east of room 70, is well evidenced by the series of steps pecked for support of its north wall. These steps may be noted on the upper edge of a slight break in the sloping cave floor; they extend thence, eastwardly toward the cliff edge. Below the break mentioned the native rock had been battered away to mark the floor level.

Room 72. Not shown on Dougláss's plan.

Room 73 is a small storeroom built midway of the old step series leading from room 122 to the upper east end of the cave. (Most of these steps were enlarged and deepened in 1917.) The east, west, and south walls are of masonry; the north side is an acclivity, about 2 feet high, on which a number of horizontally pecked steps may represent footings for former masonry. But these steps continue to the west of room 73, along the crest of the same slanting ledge.

Abutting the outer southwest corner of the storeroom a short retaining wall supports a platform, partially made with débris, at a turn in the old trail. Fires had burned on this platform. A crack in the north, or cliff, side had been enlarged by pecking and continued, in snakelike fashion, downward toward the floor.

Construction of room 73 caused annoyance to some of the villagers, since it formed an obstacle on their much-traveled trail between the east and west house groups. Those most deeply irritated thereafter used another step series at the very top of the sloping sandstone; the others soon made a new path close on the north side of the granary.

In clearing room 73 we found numerous corn cobs and a small circular basket. (Pl. 42, 1.) Also, a stone ax was discovered in a recess created by removal of a stone from the lower south wall.

Room 74. The former presence of this room is evidenced by a fragment of masonry at the northeast corner; by the battered cliff at the floor level and by pecked grooves on which the north and south walls were erected.

Room 75 lies east of room 74, in the lower northeast portion of the cave. Most of its west wall still stands and the lower half of this bears traces of plaster. The north side, now missing, stood upon a well-marked groove; the south wall, also missing, had been built on the very edge of the cliff. Of the east wall a small section found in position rested upon several inches of loose household rubbish.

The north half of the floor had been worked out of native rock, while the remainder was filled in and adobe surfaced. Pecked in the sandstone near the east wall is a shallow hole, 2 inches in diameter; just below it is a step that may have been cut before the house was built. A stone in the outer east wall bears an incised, swastika-like design. (Fig. 4.)

In 1917 we partially restored the north and east walls. (Pl. 22, B.)

Room 76 was built on the sharply inclined cave floor between rooms 75 and 77. A pecked groove marks the former position of its south wall; its east and west sides, now represented by a few courses of masonry, had been erected upon loose débris. We saved the west fragment by building in new foundations as the rubbish was removed; the north end of this same wall and the east side were partially reconstructed.

Room 77 is a small chamber between room 76 and the retaining wall in the upper northeast section of the cave. Its missing south



FIGURE 4.—DESIGN INCISED ON OUTER EAST WALL OF ROOM 75

wall formerly stood upon a narrow, pecked groove; a worked-out area marked its floor level. The east and west walls, having disintegrated beyond hope of repair, were partially restored in 1917, as was also the adjacent retaining wall. (Pl. 20, B.)

Room 78, also in the upper east end of the cave, was designed for storage purposes. (Pl. 19, A, B.) Sheer cliff forms its north-east wall; masonry, the others. Externally the stonework of this room is among the best in the ruin; inside it is crude and irregular. The level floor is wholly of native rock. Four beams supported the roof; two of these, of aspen and still present, lie side by side next the cliff.

Thirteen inches above the floor in the middle northwest wall is a 15 by 24-inch (0.38 by 0.61 m.) door, whose heavy stone lintel is supported by five strips of split cedar. The outer jams and lintel of this entrance are deeply grooved for the door slab so typical of Betatakin storerooms. In the southeast wall, 22 inches (0.56 m.) above the floor, one notes a former opening that measured about 16 by 20 inches (0.40 by 0.51 m.). Its irregular sides and the absence both of lintel and sill slabs suggest that this prospective door

was broken through after completion of the room and then closed again before it was actually finished.

Rude masonry, $2\frac{1}{2}$ feet (0.76 m.) high, caps the southeast wall; through this a single beam end protrudes from room 79.

Room 79, a dwelling, stands southeast of and next to room 78. Its ceiling of cross poles, willows, and Johnson grass rested upon two northwest-southeast beams. But the roof had been crushed by large sandstone slabs, fallen from the vaulted cave. (Pl. 21, A.) The northeast wall is cliff; the southwest, of wattle—willows and Johnson grass bound to posts and surfaced inside and out with adobe. No plaster appears on the other three sides; all four are heavily smoked. The northeast half of the rock floor has been pecked out to a depth of 12 or 14 inches (0.30–0.35 m.); a 3-inch fill covers the remainder.

A door opened through the middle southwest wall with its adobe sill at the outside terrace level, 4 feet 3 inches (1.3 m.) from the retaining wall. Just inside this door is a platform, 4 inches high; at its southeast side a slab on edge, 10 inches (0.25 m.) high by 13 inches (0.33 m.) wide, abutted the wattled wall and a now missing masonry firescreen. Against the northeast base of this former screen one notes a slab-lined fireplace, 23 by 11 by 7 inches deep (0.58 by 0.27 by 0.17 m.). On a narrow ledge in the east corner, 3 feet 6 inches (1.06 m.) above the floor, lies a boat-shaped shelf measuring 5 by 12 inches (0.127 by 0.305 m.), made of adobe and chinked with small sandstone chips. The stonework blocking the unfinished opening into room 78 was laid flush with the northwest wall face.

Room 80 will also be found at the upper east end of the cave, between rooms 79 and 81. Its ceiling height may not be determined, for the upper northwest and southeast walls were broken by great slabs falling from the cave roof. The northeast wall is formed by the cliff; the now missing southwest wall, of wattle, stood 4 feet 6 inches (1.4 m.) from the retaining wall. The adobe floor, spread over a shallow fill, lies 3 inches below the outside terrace level. In the west corner of the room is one stone of the former slab-lined fireplace.

Room 81, adjoining room 80 on the south, also was utilized as a dwelling. Like its neighbor, its northeast wall consists of the sandstone cliff; its southwest wall, now missing, was of wattle. The rock floor at the northeast had been slightly reduced by battering; on the opposite side two grooves evidence the whetting of stone axes. A door undoubtedly opened through the wattled southwest wall.

The retaining wall which forms a terrace fronting this and nearby dwellings stands 2 feet 6 inches (0.76 m.) from the south corner and 4 feet 3 inches (1.29 m.) from the west corner of room 81. On

the cave floor just south of this room are two grooves where axes were sharpened. Here the cliff drops sharply away, perhaps 25 feet (7.62 m.), to rooms 83-85; down this slope débris had been thrown from the upper dwellings.

Room 82 stands on the cliff edge in the lower east part of the cave. (Pl. 21, B.) Its east wall is of wattle; the others of masonry. All four walls were plastered their full height; all are heavily smoked. The ceiling beams lay north and south.

A door with the usual slab sill divided the wattled east wall. Against each inner jamb stands an upright slab, that at the north being 18 inches (0.45 m.) high by 18 inches wide; that at the south, 7 inches (0.17 m.) high by 22 inches (0.56 m.) wide. These appear to have abutted a slab fire screen, now missing. A fireplace, 18 inches (0.45 m.) square by 8 inches (0.20 m.) deep, lies 2 feet 6 inches (0.76 m.) from the east side. In the middle south wall, 3 feet (0.91 m.) above the floor, is an 8 by 11 inch (0.20 by 0.27 m.) opening whose outer dimensions are reduced to 4 by 10 inches (0.10 by 0.25 m.).

Our 1917 efforts included repair of the wattled east wall and replacement of the adjacent ceiling beam (pl. 22, B); miscellaneous patching and resurfacing of the three masonry walls; restoration of the fireplace and partial reconstruction of the north wall as a support for an extramural platform or walk, 2 feet (0.60 m.) wide and 3 feet (0.91 m.) above the room floor.

Court 83 lies between rooms 82 and 84, on the cliff edge in the lower east end of the cave. Its south wall was relatively low; opposite this the cliff slopes down to form part of the court floor, the remainder being filled with débris and surfaced with adobe a few inches above that of room 82. A fireplace, 19 by 23 inches (0.48 by 0.58 m.) by 8 inches (0.20 m.) deep, lies against the middle south-east wall. At each end of this wall a single step had been cut into the masonry. In the north corner a series of four pecked steps leads to the platform between room 82 and the cliff.

We repaired the wattled west wall by tying horizontal willows to those still standing between the posts; no plaster was added.

Room 84, a storeroom, adjoins court 83 on the southeast. All four walls are of masonry; that at the northeast stands on a narrow ledge, 3 feet 6 inches (1.06 m.) from the cliff, the space between being filled with débris. Two ceiling beams support nine cross poles with layers of willows and cedar bark. On the northeast side is a 16 by 20 inch (0.40 by 0.51 m.) hatchway, once covered by a door slab; in the masonry beneath this opening are three pecked steps. No wall pegs are present. The most unusual feature of this granary is the fact that it is floored with sandstone slabs, set in adobe mud.

We replaced the stone slabs that rimmed the ceiling hatchway.

Room 85, another storage chamber, adjoins room 84 on the southeast and stands on the very edge of the cliff, at the base of the precipitous slope below rooms 78-81. (Pls. 21, B; 25.) Two parallel ceiling beams near the outer wall and a third next the cliff support seven cross poles with superposed layers of willows and cedar bark. No wall pegs were noted. Like its neighbor on the northwest the room was entered through a 16 by 20 inch hatchway. Beneath this opening two steps were pecked in the cliff. The northeast half of the floor consists of native rock, sloping and uneven; the remainder is paved with slabs set in adobe.

On the roof between rooms 84 and 85 and next the cliff is a slab-lined fireplace measuring 13 by 27 inches (0.33 by 0.68 m.) by 8 inches deep; it is rimmed by slabs and surrounded by an adobe pavement.

We placed two posts in this chamber to support a broken cross pole and the northeast beam.

Room 86, under the cliff at the lower southeast end of the cave, has not been excavated. It is represented by several wall fragments, mostly concealed by rocky débris.

Room 87, also unexcavated, abuts the north corner of room 86. It is filled with large rocks; between these one notes the jamb of a north door. We observed no evidence of the curved west corner shown on Douglass's plan.

Room 88 is a small storeroom, adjoining room 87 at the base of the southeast cliff. Its fragmentary walls disclose no trace of beams; its entrance was probably a ceiling hatchway. A rock ledge on the east cliff about 3 feet (0.91 m.) above the floor forms a shelf 3 feet 6 inches by 4 feet 6 inches (1.06 by 1.4 m.).

On the cliff above one notes a 26-inch circle, painted in dull red except for the upper left quarter. Near this is an indistinct white spiral 3 inches (0.07 m.) in diameter. At the outer southeast corner a rock contains five deep grooves where axes were sharpened.

The space between rooms 88 and 89 has not been excavated. There are no visible indications of a west wall. Smoke stains on the cliff suggest a probable open fireplace.

Room 89 served as a dwelling. Vertical cliff forms its east wall; masonry, the others. Its floor is of native rock, pecked out to a depth of 6 inches (0.15 m.) in the southeast corner.

Part of one jamb places a former door in the middle south wall. Just within the room, 5 inches (0.13 m.) below the door sill, stone slabs form a step 2 inches (0.05 m.) high; close on the west is a slab-lined fireplace measuring 14 by 24 inches (0.35 by 0.61 m.) by 6 inches (0.15 m.) deep. In the west wall at the southwest corner a blocked

door, 12 inches above the floor, measured 19 by 22 inches (0.48 by 0.56 m.); its protruding lintel slab formed a shelf 4 inches (0.10 m.) wide by 22 inches (0.56 m.) long. Below the sill and next the south wall is a ventilator, 8 inches (0.20 m.) square, apparently cut through after the door was blocked.

On the cliff above the former roof level is a white painted figure which Cummings (1915, p. 277) identifies as a "Slayer god"; near by, a typical Pueblo conception of a mountain sheep. (Pl. 29, A.)

Room 90, occupying a narrow ledge north of room 89, was utilized for storage purposes. Of its walls only a few courses remain. At the north end two beam rests had been pecked in the cliff 3 feet 6 inches (1.06 m.) above the ledge surface; no others were noted.

On the same ledge, but north of room 90, three grooves were worn by patient sharpening of stone axes. Two shallow steps, without apparent purpose, are noted on the cliff face.

Room 91. Only a small fragment of the north wall remains. The room is still unexcavated; undisturbed and much-weathered rocks lie at the southeast, close below the northwest corner of room 90.

It seems doubtful that this room could have been so large as Douglass represents or that the retaining wall he shows could have extended all the way to room 94.

Room 92 lies below and slightly south of room 85, on a narrow ledge which has settled outward 10 or 12 inches. The west wall, built on the terrace edge, has fallen; sheer cliff forms the north and east sides. A pecked beam rest may be noted in the north wall, 6 feet (1.82 m.) above the floor; on the adjacent cliff one observes the marks of rubbed implements and numerous daubs of variously colored mud, but no smoke stains. Near by, just above the south wall, is the white imprint of a small hand. The room floor is the unworked ledge surface. A door opened through the south wall at the southwest corner.

Room 93, a small dwelling, was built south of room 92 and on the same ledge. The north and south walls are of masonry; the west has disappeared. Smoke stains are discernible. The south half of the floor had been pecked down to a depth of 23 inches (0.58 m.); in the face of this cut, under the south wall masonry, are two vertical grooves about three-fourths of an inch wide. Marks left by sharpening of stone tools show plainly in the rock floor.

A north door gave access to room 92; near by a circular fireplace, 19 inches (0.48 m.) in diameter, was pecked into the ledge surface. From the near door jamb a masonry wall extended to the east cliff, forming a triangular bin in the northeast corner; against the inner face of this wall is a thin, upright slab.

Room 94. No walls are now visible, but seven pecked beam rests appear in the east side, below the ledge on which room 92 stands.

There are no similar seatings on this same bench face below room 93, which fact, together with the presence of large rocks, suggests that unexcavated room 94 is smaller than Douglass has indicated.

Room 95 is a dwelling on the same ledge with, and south of, room 93. Its north and south walls are of masonry; the west has vanished. Traces of smoke adhere to all standing walls. The ledge surface had been pecked down to a depth of 22 inches (0.56 m.) at the northeast and 27 inches (0.68 m.) at the southeast, but the west side of the floor was filled in. Near the west end of the south wall is the east jamb of a former T-shaped door, the only one observed in Betatakin. Its upper portion, about 20 inches (0.51 m.) high, is set back 4 inches (0.10 m.) from the lower, 13 inches high. A protruding rock east of this door had been partially severed with stone saws.

Just within the door is a platform, 23 inches (0.58 m.) wide by 10 inches (0.25 m.) high; at its north side stands a masonry fire screen, 10 inches (0.25 m.) thick, 3 feet 5 inches (1.04 m.) long and now 21 inches (0.53 m.) high. Pecked in the rock floor at the north base of this screen is a fireplace measuring 13 by 18 inches (0.33 by 0.45 m.) by 7 inches (0.17 m.) deep. Three feet 5 inches from the north wall and 37 inches (0.94 m.) from the cliff a pecked hole, 3 inches (0.07 m.) in diameter by $2\frac{1}{4}$ inches (0.05 m.) deep, contains a single stick as a loom anchor.

A large rock lies south of room 95 and beyond it is space for two rooms. The ledge surface here has been leveled by battering with hammerstones, but no beam rests appear in the cliff and only one masonry wall fragment, at the southwest corner of the floor area, is evident. Daubs of colored mud had been thrown against the cliff; here, also, is a rudely painted white square with sides 2 inches wide and, high above, the rude representation, also in white, of a mountain sheep.

Room 96. Visible wall fragments on the talus below the two probable chambers on the ledge south of room 95 suggest a former irregular retaining wall extending to the outer southwest corner of room 94. This section remains unexcavated.

Room 96 is the last indicated on the Douglass ground plan. In 1917, however, while clearing Betatakin of débris preparatory to our work of repair, a number of additional structures or traces of them were disclosed in the cave proper. These we have numbered 100 and following.

Room 100, lying between rooms 27 and 29 and entered from court 28, could have answered only for storage. Its north wall is the face of a cliff terrace, with superimposed masonry; its floor is of native rock, seamed and uneven. Three northwest-southeast beams support eight aspen cross poles with layers of willows, Johnson grass,

and sand. The roof lay in continuation with the floor level of court 34.

A section of the smoke-stained northwest wall of room 29 extends through into room 100; the upper portion of this protruding masonry had been raised somewhat to form an 8 by 20 inch (0.51 m.) shelf, 22 inches (0.56 m.) above the floor. Below this shelf is the embedded end of the lower log supporting the northwest side of room 29. Through the middle southeast wall a 15 by 23 inch (0.38 by 0.58 m.) door opens into court 28. Six small aspen branches support the stone lintel; its sill slab lies about 12 inches above the floor.

Room 101 will be found in the north middle portion of the cave, adjoining room 64-65. Only a portion of its northeast wall remained in 1917, and this was so disintegrated and so insecure we partially replaced it with new masonry, built upon deepened steps. The southeast wall had rested on two rather shallow steps, slightly north of the southeast corner of room 64-65. Other pecked steps, varying in size and depth, are present on the abruptly sloping cave floor in front of and below rooms 101 and 102. (Pl. 16, B.) While some of these doubtless served as wall rests, it is quite possible the others merely furnished temporary footing for the builders.

Because the space between it and the slanting cliff is so restricted, the southeast wall rose several feet to the floor level. This space may have been filled with débris or it may have served for storage purposes. Above it, however, there must certainly have been a living room, corresponding with that next on the west.

An old step series leads northwesterly up the sloping cliff, across the middle of room 101 and the upper end of room 64-65, to room 63.

Room 102. Of this room, northeast of and adjoining room 101, no walls remained in 1917. But their former positions were plainly evident from the pecked steps and grooves commonly used as rests for masonry. The southeast wall formed a continuation of that in room 101. High on the upper slope great slabs of sandstone have separated from the ledge. Since these slabs are grooved by the grinding of stone axes we endeavored to hold them in place by several steel drills, set on the lower side.

It is improbable that other rooms formerly stood on the sloping cave floor northeast of room 101, but disintegration here has removed all trace of them, if any.

Rooms 103-106. Four buildings northeast of rooms 49 and 50 and northwest of room 47 may be postulated. With but few interruptions a pecked groove continues from the west corner of room 55 to the north corner of room 50; this undoubtedly once served as a wall rest. A similar groove, extending from the north corner of room 46 to the east corner of room 52, is supposed to be that on which the

northeast walls of room 49 and 50 once stood. Other wall seatings in this section are less certain.

Room 107 stood next on the east of room 53, but our excavations exposed only a single fragment of its northeast wall. This abutted the southeast side of room 101 near the outer east corner of room 64-65. Subsequently we restored this small section. (Pl. 15, B.) The former position of the southeast wall has been lost with disintegration of the cave floor.

Rooms 108-109. A pecked groove and the apparently worked appearance of the disintegrated sandstone below rooms 101 and 102 suggests the former presence of two rooms no wall of which remained in 1917. Masses of adobe-covered grass flooring had slid down slope from rooms 64, 101, and 102, and were removed from this area during our preparatory excavations.

Rooms 110-113. Fragments of flooring in place above the north wall of room 55 indicated the former presence of dwellings, but we observed no pecked holes or grooves that would serve to mark the position of masonry walls. There had been much seepage throughout this portion of the cave with resultant disintegration of the sandstone; blown sand had lodged here and in it trees and shrubs had taken root. (Pl. 6, A.)

A narrow ledge between the steep, upper cave floor, and the probable north line of this room series marks the old trail which led past rooms 117 and 122 to room 73 and the upper east end of the village.

Rooms 114-115. The ledge face which formed the north wall of room 55, continuing to the eastward, underlay the south walls of two rooms whose respective floor levels are indicated by pecked-out areas. The floor of room 114 was approximately 2 feet (0.60 m.) below that of room 115. A portion of the east wall of room 115 remained in position; the other walls were not traceable in 1917.

Buried in the accumulated débris removed from this area was an infant's skeleton, the only burial we found.

Room 116. Disintegrated portions of the east and west sides were found, resting on steps pecked in the sloping sandstone. Although the south wall was missing, its former position was plainly marked by a groove along the cliff edge. Two other pecked grooves, apparently incomplete, extend northwestwardly up the slope from the southeast corner of the room. Fully 3 feet of débris against the inside south wall was necessary to complete the floor level, represented by a worked-out section on the cliff face.

Following excavation we partially reconstructed the fragmentary east and west walls.

Room 117, north of room 121 and northwest of room 66 in the middle north portion of the cave, was set aside for the grinding of

maize and other foodstuffs. When exposed by our excavations only sections of the north and west walls remained, and both these were covered by blown sand which had settled about the roots of trees. Pecked grooves identified both the east and south wall positions. Behind the north wall a *débris* fill marked the cross-cave trail heretofore mentioned. In the middle floor were three broken, slab-line mealing bins from which the milling stones had been removed.

In our work of repair we restored the lower walls of this room, rebuilt the grinding bins, and fitted them with metates recovered from other portions of the ruin. (Pl. 23, A.)

Rooms 118-119. Built upon the lowermost terrace and adjoining room 55 on the east was a room approximately 15 feet (4.57 m.) long, subsequently divided by a wattled partition. The fairly level, unworked ledge surface formed a floor several feet above that in room 55. The south and upper north walls had wholly disappeared. Incorporated in the north end of the east side is a projecting block of masonry, 21 inches (0.53 m.) long by 10 inches (0.25 m.) wide, the purpose of which remains unknown. When inhabited, the two rooms were doubtless connected by a door through the dividing, wattled wall.

Room 120 is situated in the lower, middle front of the cave between rooms 119 and 121. Portions of its north and west walls stand at the northwest corner; below these fragments the sloping sandstone has been slightly reduced. The room floor, however, was doubtless lower than this pecked area, and must have rested on a fill supported by the now missing south wall.

Room 121, a large dwelling, adjoins the west side of 2-story house No. 66. (Pl. 9, B.) The west and part of the south walls were missing; at the north, on the next higher terrace edge, masonry which we replaced in 1917 separated this structure from room 117.

In the southeast corner is a subfloor, masonry-walled fireplace measuring 3 feet 4 inches (1.01 m.) north and south by 22 inches (0.56 m.). Its west side had slumped with collapse of the southwest quarter of the dwelling. West of this fireplace the room floor had rested on a deep *débris* fill; sloping cliff, worked down in the northeast corner, occupies the north half of the room. Between the base of this terrace face and the fireplace and 16 inches (0.40 m.) from the east wall is a pothole pecked into the solid rock. It measures 10½ inches (0.26 m.) in diameter by 12 inches (0.31 m.) deep. In this hole we found the earthenware colander illustrated in Plate 46, 1, a charred hairbrush (pl. 39, 1), and a short *mano*. A door blocked with rude masonry formerly connected this dwelling with the storage chamber below room 66.

It is not unreasonable to suppose that rooms 118-121 were originally 2-story buildings.

Room 122. Obviously a later addition, this structure was built across the old trail on the sloping cave floor north of room 68. The north half of its floor area, of native rock, was worked down somewhat; the remainder consists of adobe mud spread over a débris fill. The masonry walls, which had entirely disappeared, were partially restored in 1917. (Pl. 24, A.)

East of room 122 and abutting the north wall of room 70 an artificial terrace forms a landing at the foot of the step series leading past room 73 to the upper east house group. Following construction of room 122 its roof may have been crossed by aid of ladders or the old trail may have been abandoned in favor of the pecked steps one notes higher up the slope.

Room 123 is situated on the front edge of the slope, east of room 71 and below the trail past room 73. Seatings for its missing walls are not at once apparent, but the rock surface has been battered away somewhat and still shows the stains of smoke and ashy deposits.

The rather precipitous cave floor between rooms 123 and 76 was mostly covered at the beginning of our work by large masses of sandstone, fallen from the cave roof. On this slope is space for at least six large rooms.

Room 124, in the upper east end of the cave, is evidenced by smoke stains and wall adobe adhering to the north, or cliff, side. Owing in part to seepage at this point the masonry has wholly disintegrated.

The narrow ledge extending west from this room would seem to have offered desirable house sites, yet no indication of masonry was found beneath the huge masses of sandstone we removed. (Pl. 20, A.) One might infer from this omission that at least part of the broken rock had accumulated prior to or during occupancy of this upper east terrace.

Room 125. Portions of the east wall were present; masonry which doubtless once rose to the ceiling level stood against the north, or cliff, side. The south wall appears to have been of wattle; through it a door must have opened upon the artificial terrace above room 77. Next the cliff the rock surface had been worked down to a uniform floor level.

In front of room 125 is a narrow walk, supported by a retaining wall which meanders from this point to the cliff beyond room 81. (Pl. 19, B.)

Room 126 lies between rooms 125 and 127. The masonry of its east and west walls abuts the cliff; the south wall is of wattle with a door in the middle. At the base of the cliff a masonry bench, 15 inches (0.38 m.) wide by 17 inches (0.43 m.) high, extends the entire width of the room. The artificial floor lies 8 inches (0.20 m.) below

that of room 125; in its middle is a slab-lined fireplace. Three of the slabs bordering this pit extend 5 inches (0.13 m.) above the floor level.

Room 127. The east wall of this dwelling had been demolished by falling blocks of sandstone and wholly disintegrated by seepage. But smoke stains on the cliff indicate a room larger than those immediately to the west. Portions of the west and wattled south walls were present; against them lay broken flooring, 6 inches (0.15 m.) above the walk outside.

Between rooms 127 and 78 is space for two dwellings, but the level terrace surface here, although smoothed with adobe, discloses no evidence either of masonry or wattled walls. The outer jambs and lintel of the door into room 78 are deeply grooved for the door slab characteristic of storerooms. At one side of this opening two pecked steps gave access to the roof.

Room 128 stood on a low detached ledge west of room 74. A cut-out area marks its approximate floor level and indicates the probable wall positions.

From above the northwest corner of this room pecked steps extend northward for several feet up the sloping cave floor, as seatings for a former wall.

Room 129 was built on the cliff edge in the lower east end of the cave, south of room 75 and west of room 82. The cliff face had been worked down in two terraces; the lower of these forms part of the floor, while the upper extends nearly the entire width of the room as a bench 9 inches (0.22 m.) high by 8 inches (0.20 m.) wide. The curved southeast wall, now reduced to 2 feet (0.60 m.) in height, follows the contour of the cliff. No beam holes are evident in the smoke-stained walls.

We repaired the north end of the curved wall, but did not attempt desirable restorations.

Room 130 is one of possibly six large rooms formerly situated on the abrupt slope southeast of room 73 and north of rooms 74 and 128. Pecked grooves and steps as probable wall seatings are noted at intervals, but it seems likely that whatever masonry once stood here was erected upon débris thrown down from dwellings above, as was the case east of room 76.

Rooms 131-135. Excavated areas approximating floor levels, with pecked grooves and steps as rests for masonry walls, indicate the former presence of six or more rooms in that section east of room 76 and north of room 82. At least some of these structures had been erected upon loose débris. No walls were standing in 1917. At beginning of our operations this entire slope was buried under fallen masonry; great blocks of sandstone from the cave roof seemed largely responsible for the destruction.

A series of steps leads up the cliff from the northeast corner of room 75 to the retaining wall opposite the northwest corner of room 78 and was undoubtedly used before houses were built in this quarter. Above rooms 83-85 the cliff appears too precipitous for dwelling sites.

Lack of time precluded even partial restoration of the demolished buildings we have numbered 131-135. But we renewed the old step series from the northeast corner of room 75 down to the platform back of room 82, thus facilitating access to court 83 and its near-by storerooms.

Retaining wall. Rooms 78-81 and 124-127 stand on a level ledge at the upper east end of the cave. Erected upon a 2-inch groove, pecked on the outer edge of this terrace just where the cave floor drops abruptly down to rooms 82-85, is what we have called "the retaining wall." It is the counterpart of that which inclosed court 10 and continued southward to form the walk leading to room 3.

The east retaining wall widened the natural terrace and thus formed in front of the dwellings a walk that varies somewhat in width as it extends from room 81 northward to room 124. Opposite the south corner of room 81 this terrace walk is 2 feet 6 inches (0.76 m.) wide; at the south corner of room 80 it is 4 feet 3 inches (1.3 m.) wide; at the south corner of room 78, 4 feet (1.2 m.); at the west corner of room 78, 3 feet 9 inches (1.14 m.). Three slab steps, totaling 15 inches (0.38 m.) in height, connect the upper terrace level fronting rooms 79-81 with the lower level northwest of room 78.

We repaired and recapped the retaining wall throughout its greater length; rebuilt a missing segment above rooms 132 and 134 after widening and deepening its seating groove; omitted restoration of the extreme ends. (Pls. 19 and 20.) As noted under the description of individual rooms, certain minor repairs were also made on the houses hereabout.

Gallery wall.—In the high, upper portion of the cave, on the very edge of the cliff and about 25 feet (7.62 m.) above room 59, is a long straight wall approximately 4 feet (1.2 m.) high. Viewed from below, this wall appears to stand alone, but there is a bare possibility that other walls lie buried in the loose shale which has accumulated on the slope behind the wall. About 2 feet (0.60 m.) above the front base of the masonry 11 poles protrude to suggest a probable floor level behind the wall.

Access to the gallery was formerly gained by means of the long pine pole still standing at the north end of court 10. Only one who has shinned up this splintery pine and felt it tip threateningly outward from the sheer cliff can fully appreciate our lack of knowledge concerning the upper gallery and the structures, if any, it shelters.

BETATAKIN ARTIFACTS IN THE NATIONAL MUSEUM

The cultural plane attained by any primitive people is determinable in part by their habitations; to an even greater degree, by articles daily employed in and about those habitations. This truism holds not only for Indian tribes living in the United States a generation ago but also for those that passed on before the origin of what we commonly call the "history" of our country, beginning with the voyages of Eric the Red and Columbus.

It would be altogether unjust to the prehistoric builders of Betatakin, therefore, were I to attempt portrayal of their arts and industries from the few, miscellaneous artifacts recovered during the course of our work in 1917. These were all casual finds, disclosed as we cleared away the vast accumulation of detritus and household rubbish with which the ruin was blanketed. Alone, these chance objects tell an incomplete story. But they may add something to that history of the village which is yet to be written; hence, it seems desirable briefly to list those minor Betatakin antiquities now preserved in the national collections.¹⁴ National Museum catalogue numbers accompany those specimens mentioned but not illustrated; the list on page 75 gives the numbers and dimensions of those shown by plate and text figure.

OBJECTS OF STONE

Metate (pl. 31, 1).—The only milling stone brought away was last used for pulverizing yellow ocher; a rubbed area on its under side is smeared with red paint. Of fine-grained sandstone, the specimen has a grinding surface transversely plane but longitudinally concave, being worn in the middle to a depth of five-eighths of an inch.

To judge wholly from want of contrary statements in my field notes, the characteristic Betatakin metate is relatively thin, rather carefully shaped by pecking with hammerstones, and rarely, if ever, deeply troughed.

Manos, or mullers (pl. 31, 2-5) are the hand stones with which maize and other foodstuffs were ground on metates. Among the 30 manos (312207-27) in our collection, certain dissimilarities of shape and size are obvious. This variation is owing to the structure of the sandstone, volcanic breccia, and vesicular quartzite from which all are made and, perhaps in equal degree, to personal differences in method of use. Eight of the 30 appear to be reworked and reused mano fragments; they vary in length from $4\frac{3}{4}$ to $6\frac{3}{4}$ inches (0.120

¹⁴ Every specimen regarded as reasonably secure from the habitual curio collector was left at the ruin.

to 0.171 m.). The remaining 22 average $4\frac{1}{4}$ inches (0.107 m.) in width by $10\frac{1}{4}$ inches (0.260 m.) in length. Six of these are provided with shallow finger grips on the longer sides, while three only, and four of the shorter ones, show wear on both sides. Four of the series, all long mullers, are slightly wedge-shaped in cross section; three, including a reworked fragment, exhibit a convexity due to wear on a narrow, shallowly troughed milling stone. On the flat-faced metates of Betatakin, flat-faced manos naturally were employed.

Rubbing stones, supposedly for smoothing newly surfaced floors, walls, etc., bear a close relationship to the manos and might well have substituted for them upon occasion. Our three specimens of this type (pl. 32, 7-9) are all of sandstone, somewhat oval, carefully shaped at the periphery, rubbed on both faces. Water-worn cobbles frequently were carried long distances by Pueblo peoples living in a region of sand and sandstone. From Betatakin we brought two such cobbles (312231), both of which show slight use as smoothers. One is of quartzite; the other, diorite.

Six small pebbles (312232), worn smooth by stream action, were used to polish the thin clay slip with which earthen vessels were surfaced. Such pebbles were the handy tools of Pueblo potters in middle and late prehistoric times.

Two still smaller pebbles of white flint (312310) are flattened on one or more sides. Similar specimens have been found heretofore in a medicine man's outfit.

Hammerstones.—Any hard, tough stone served as a hammer. Of the three in our series (312233), two are quartzite cobbles polished by blown sand before human use; the third and largest (pl. 32, 6) is of chert.

Mauls.—Our two mauls are each provided with an encircling groove for attachment of the customary withe handle. The larger, of heavy sandstone, is flattish and irregular, but evidences considerable work with the pecking hammer. (Pl. 32, 4.) In marked contrast, the second is merely an elongate basalt cobble (312240), grooved about the middle and probably used but once or twice.

A much smaller and more globular specimen (312241), of vesicular quartzite,¹⁵ while maullike in shape may have been intended as a weapon. There can be little doubt, however, that the one shown in Plate 32, 5, was designed as a club head, for it was carefully pecked then smoothed with a sandstone rasp. Its pointed ends, slightly battered on other rocks, illustrate the readiness with which almost

¹⁵ A seemingly porous material containing varicolored stone pellets and described by the late Dr. George P. Merrill, head curator, Department of Geology, U. S. National Museum, as "a very interesting and peculiar type of quartzite."

any Pueblo implement was pressed into service for which it was not primarily intended.

Stone axes (pl. 32, 1-3).—The four recovered, all of diorite, are relatively crude, like most axes from ruins throughout the San Juan drainage. The smallest of those illustrated has a secondary groove just below the principal one.

Celt.—The well-known celt or *teamahia* of the San Juan Basin is represented by a single, fragmentary specimen of reddish argillaceous chert (312243). Its handle is mostly missing, but on the remaining portion a perceptible difference in coloration indicates the former presence of a covering or wrapping. The blade had been broken, rechipped, and the sharp edges slightly rubbed.

Chipped implements.—Of the six flint points at hand (312312), two are arrowheads. The smaller of these, triangular in shape, is three-quarters of an inch long; the other, notched and slightly barbed, measures $1\frac{3}{4}$ inches. The other four specimens may be regarded as knives. Their bases are square or nearly so, and to two of them some adhesive, probably pitch, still cleaves. The largest of the lot, its tip missing, measures 1 by $2\frac{1}{2}$ inches (0.025 by 0.063 m.); its sides and edges have been slightly smoothed by rubbing.

The wooden knife handle illustrated by Figure 5 was collected at Betatakin by Professor Cummings in 1909 and added to the national collections through exchange with the University of Utah.

A small fragment of a red jasper flake (312313) had been chipped along each side, for use in cutting or scraping.

Stone pellet.—A rounded stone ball (312309), five-eighths of an inch in diam-

eter and blackened by fire, served an unknown purpose.

Effigy.—No one may say what animal is represented by the little stone effigy shown in Figure 6. Its front legs, mere knobs at best, have been broken and subsequently rounded.

Turquoise.—The fragment of a small, semilunate bead, V-drilled on the flatter side, is the only piece of turquoise collected (312311).



FIGURE 5.—WOODEN KNIFE HANDLE

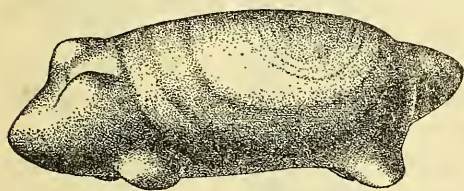


FIGURE 6.—STONE EFFIGY

Pendant.—The only undoubted ornament we recovered is a thin disk of red clay stone (312304), drilled at one edge for suspension and in the middle for diversion.

Lignite ornament (fig. 7).—Through a ridge across the middle back, two V-drillings provided means of attachment. On one edge are four vertical and parallel incised lines. The material is lignitized wood, highly resinous.

OBJECTS OF WOOD

For working wood, the inhabitants of Betatakin had only flakes and chipped knives of flint; they used sandstone for rasping and smoothing.

Board (pl. 33, 1).—The specimen illustrated is an oak board, carefully finished but subsequently burned. Through one corner is a nearly vertical, drilled hole; on the same side and at approximately one-third the total length is a similar hole, bored at an angle of 55°. The two fragments which compose this specimen were found widely separated, the larger on the surface; the smaller, buried in the sand above room 55. Hence the difference in coloration seen on the original.

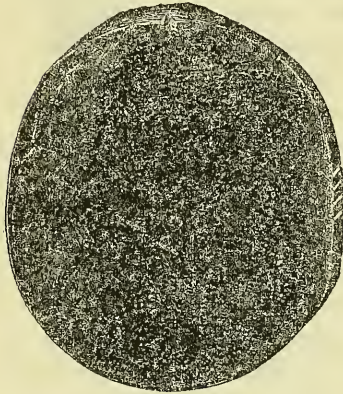


FIGURE 7.—LIGNITE BUTTON

A small, charred fragment of a like board, of cottonwood, is also drilled through one corner; the flatter side is deeply scored by cutting tools (312346).

Billets (pl. 33, 2-4).—Three cottonwood billets, or lapboards, and fragments of two others (312343) are in the collection. Two of the five still possess the original convex curve of the tree trunk, although slightly modified; all exhibit on their flat sides and rounded edges the marks of cutting and scraping implements or the pricks of some sharp-pointed tool. The longest of the three illustrated was made from a cottonwood root; all the others are from sections of the stem.

Digging sticks (pl. 34, 4-7).—Nine reused fragments of oak digging implements are all we found. For fuller understanding of these essential tools of primitive agriculture, reference should be made to Kidder and Guernsey (1919, p. 119) and other authorities.

In addition there is the problematical specimen shown in Plate 34, 1. Doubt hangs upon this latter from the fact that its pointed end is rounded and blunted, not flattened and sharpened as is always

the case with serviceable digging sticks. Conjecture might identify this as the oak staff or cane of some venerable villager.

Staves.—What seems unquestionably a walking stick is that illustrated in Plate 34, 2. Except for smoothing a few knots and trimming the two ends, no specialization is evident. The stick is cottonwood; its grip is worn and the lesser end rounded and abraded. Fragments of a like staff (312327) show a hole drilled transversely through the handle and, at the opposite extreme, the asymmetric wear such as one frequently notes on canes used by elders.

A third cottonwood staff (pl. 34, 3; fig. 8) differs from those just considered in that its lower end is circled by 14 incised grooves. Some of these were



FIGURE 8.—CARVED
END OF COTTON-
WOOD STAFF

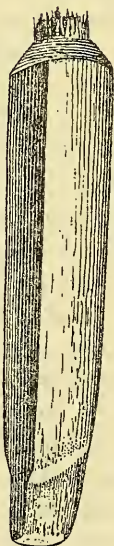


FIGURE 9.—DE-
TACHED BOW END



FIGURE 10.—ARROW
FORESHAFT



FIGURE 11.—SMALL
WOODEN AWLS

made before, others after, an 11-inch splinter was cut away and its place gouged out. Except that the incisures circle its smaller end, this particular specimen might be likened to the so-called "ceremonial staves" occasionally found in Pueblo ruins.

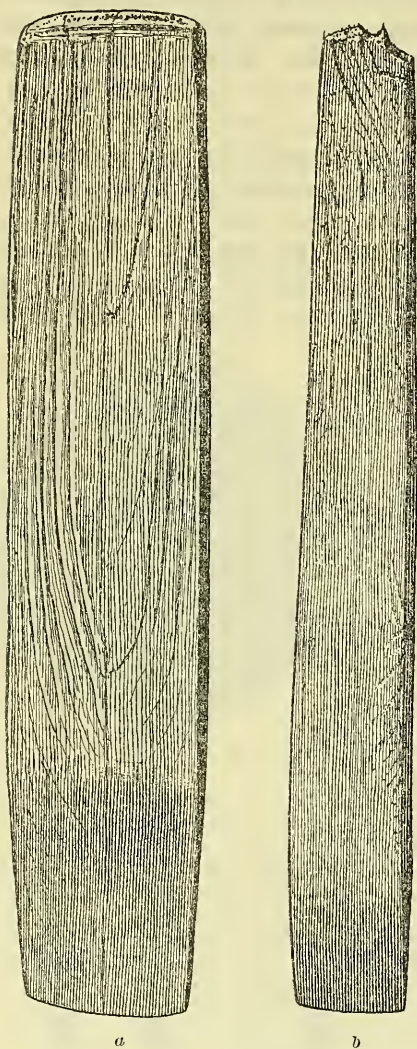


FIGURE 12.—SPATULATE IMPLEMENTS OF WOOD

or three appear to be of red cedar a harder, more durable wood was preferred. Two smaller examples (fig. 11) are probably to be classed in this group.

Toothed implements (pl. 37, 1-5).—Our five examples are all of red cedar. Two of them (2-3) have spatulate or knifelike butts;

Bows and arrows.—In the collection are three fragments of two self bows, each made of red cedar (312331). The fragments are burned and blunted from use about a fireplace, but they show careful workmanship and a grip that measures $1\frac{1}{4}$ inches wide by $\frac{1}{8}$ inch in thickness. Figure 9 shows the severed end of a third bow.

Four wooden foreshafts for reed arrows (312360) average $8\frac{1}{2}$ inches (0.215 m.) long; they are all shouldered and the two unbroken have plain, sharpened points, as does that from a shallow cave near Betatakin. (Fig. 10.)

Fire-making tools (pl. 35, 5, 9).—Three drills, two of them broken, and fragments of two cottonwood sticks with charred sockets identifying them as hearths, constitute all the fire-making apparatus we found in Betatakin.

Awls (pl. 36, 5-11).—The collection includes nine wooden awls measuring from $6\frac{3}{4}$ to $10\frac{3}{8}$ inches (0.171-0.263 m.) in length. Their butts are rounded or flattened and square cut; none is spatulate. While two

1, cut from a splinter, is less carefully finished. It will be noticed that the number of teeth varies. The split and reworked edge of 2 indicates at least a former fifth tine, while the two fragmentary specimens apparently had 10 or more teeth each, and these were closer together, longer, and more rounded than in the others illustrated.

Knives.—Red cedar, of course, will not take an edge capable of cutting hides or equally resistant substances. But the two spatulate objects shown in Figure 12 have knifelike edges, and these are stained with what may be blood. Kidder and Guernsey (1919, p. 120) have called such instruments "skinning knives" under the quite logical assumption that they might have served in flaying animals.

The unfinished specimen represented by Figure 13 is included here only because its two ends are ground to near-cutting edges. Both sides are scored by the coarse sandstone rasp employed in the final shaping process.

Paho (pl. 35, 1).—This cottonwood cylinder bears such a close resemblance to similar objects associated with certain Hopi rituals as seemingly to justify the designation. Its upper end is twice grooved, but displays no evidence of wear owing to cord attachments. A slight depression at this extremity is quite fortuitous, but in the base is a central, drilled concavity five-sixteenths of an inch in diameter by three-sixteenths inch deep.

Flute (?).—Large wooden flutes were employed by prehistoric as by historic Pueblos. But all modern flutes examined by the writer have been made in two parts, each gouged out in perfect agreement with the other and the two fitted together with exactness. The fragmentary specimen in hand (pl. 35, 3; fig. 14) must have been

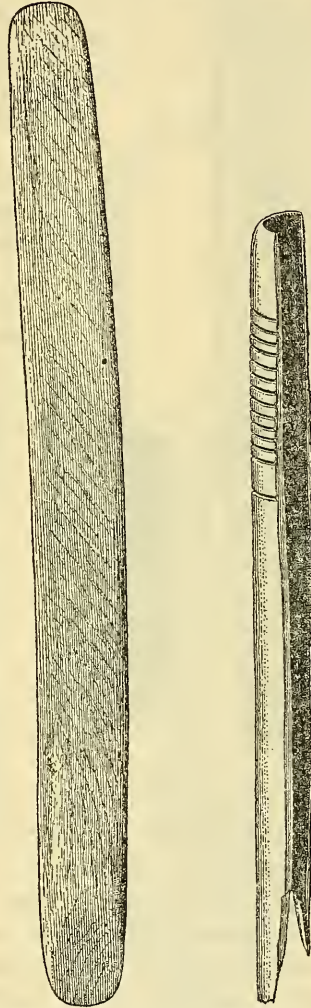


FIGURE 13.—SPATULATE WOODEN IMPLEMENT, UNFINISHED

FIGURE 14.—SECTION OF WOODEN FLUTE (?)

produced by like means, for its inner surface is finished with such nicety; is polished and blackened so uniformly as to preclude use of any method of drilling known from the Southwest. Both edges are split. There remains no evidence of drilled holes; no trace of wrappings. Yet the fragment is almost certainly part of a large flute. The 14 external grooves were incised with flint flakes or knives.

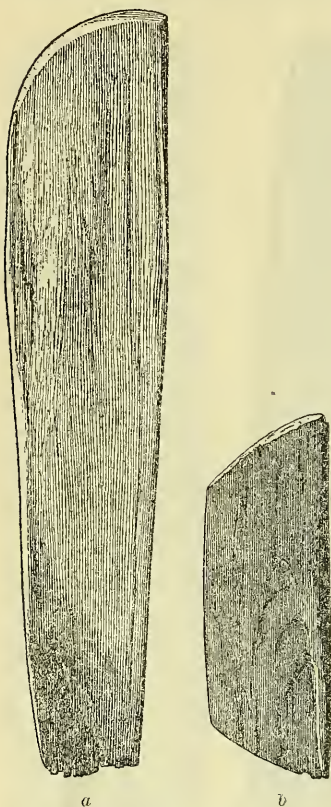


FIGURE 15.—WOODEN SCRAPERS

Scrapers (fig. 15, *a-b*).—The usual number of pine and cedar splinters employed in smoothing and scraping operations is in the collection.

Mask attachment (?).—A stopper-like object of cottonwood (fig. 16) is one of several specimens whose original function may only be surmised. Two cotton strings, projecting from a hole drilled through its lesser diameter, appear to have crossed the larger in the groove indicated.

Painted stick.—A cylindrical piece of wood, probably willow, $\frac{7}{16}$ -inch (0.011 m.) in diameter by $1\frac{3}{4}$ inches (0.044 m.) long, covered with thick, dark green paint (312299).

Drill.—It is incredible that the crude drill shown in Plate 36, 1 and Figure 17, *b* was the tool of a skilled artisan. Its rudely chipped, chert point is set in the split end of a greasewood shaft and loosely bound with a shred of yucca leaf. A second drill, comparable in crudeness but less worn, is mounted in a reed shaft. (Fig. 17, *a*)

Spindle shafts and whorls (pl. 36, 2-4; 12-16).—Spindle shafts are invariably made of some hardwood that takes and holds a smooth, even finish. Our longest (312363), a fragment, measures $\frac{1}{4}$ -inch in diameter by $23\frac{3}{8}$ inches (0.006 by 0.59 m.). Such slender, pointed shafts as 2 seem altogether too fragile for spindles.

Six whorls, mostly cottonwood, vary in diameter from $1\frac{1}{2}$ (0.038 m.) to 2 inches (0.050 m.); in thickness, from $\frac{5}{8}$ (0.015 m.) to $1\frac{5}{16}$ inches (0.033 m.). The finest (13) is convex on one side; flat and centrally cupped on the other. One fragmentary specimen (312287) is convex on

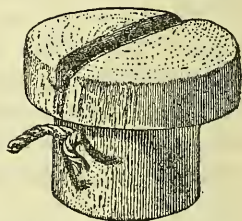


FIGURE 16.—WOODEN OBJECT

both sides. Two (15-16) are of mountain-sheep horn, as is the squared block, a doubtful whorl, shown in Plate 36, 17.

Miscellaneous wooden objects.—We have the usual proportion of peeled and unpeeled sticks with cut ends; fragments severed from finished implements; slender, smoothed twigs with one pointed end; worked objects of unknown use (pl. 35, 6-8); splinters and twigs with sinew or cord wrappings (pls. 35, 2; 37.6-9).

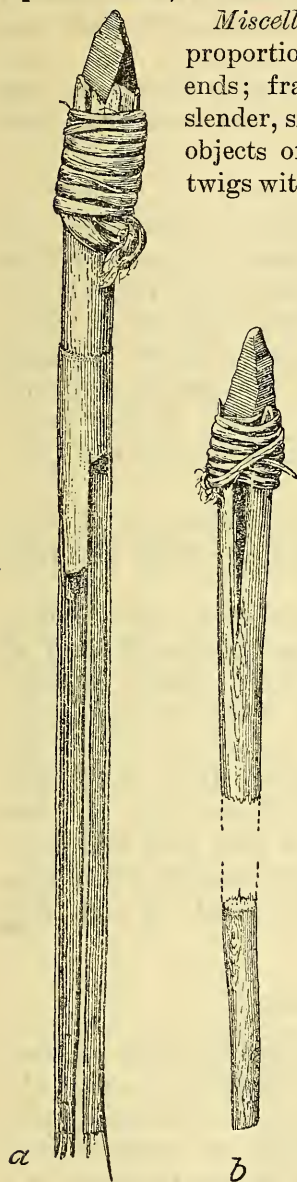


FIGURE 17.—DRILLS

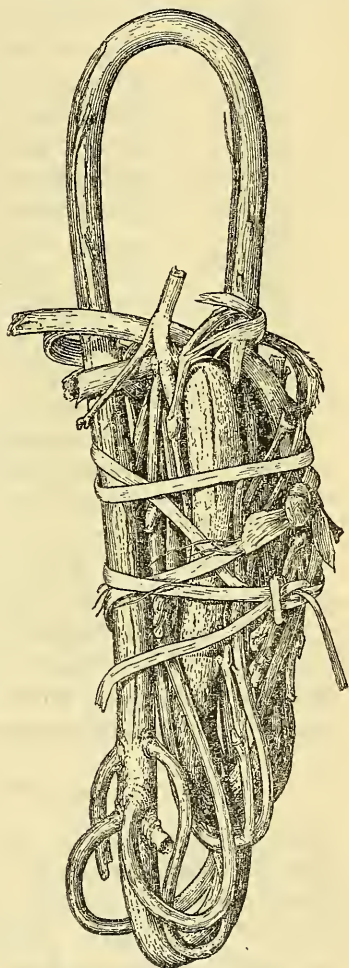


FIGURE 18.—LOOM ANCHOR

The oak stick pictured in Plate 35, 4 has been split to permit insertion of a scrap of cotton cloth; a wrapping of some sort formerly circled the stick and covered this fragment. The willow

rings shown in Plate 34, 8-9 may be regarded as hastily improvised potrests. A charred oak stem (312328) with four branches, the two unbroken having rounded tips, could have served as a vertical support for hanging various articles.

Figure 18 shows a not uncommon type of loom anchor—an oak branch, knotted and tied with yucca, and buried so that the loop lay just below the floor level.

OBJECTS OF BONE



FIGURE 19.—BONE
NEEDLE

Awls (pl. 38, 1-8).—Of the 11 awls in our collection, only one (1) is of bird bone, and that the tibiotarsus of a turkey. The longest (2), with its specialized point, and the two rounded specimens (7-8), are worthy of note; the others are mere splinters and cut sections of mammal bones, shaped by abrasion on sandstone. Figure 19 illustrates a needle whose drilled eye is so small as to take but a single yucca fiber.

Fleshers.—The three typical examples in Plate 38, 9-11, are all of deer bone, the larger two from the femur.

Miscellaneous bones.—From almost every Pueblo ruin come diverse bones and fragments, many of which show at least some slight evidence of modification by human agencies. Only two such pieces were retained from the Betatakin excavations: (1) The humerus of a turkey from which both condyles were removed (312377), and (2) the cannon bone of a deer (312381), partially split by sawing on each side with flint tools. In addition, there is an unworked fragment of mountain-sheep horn (312382). A drilled block and two spindle whorls of horn were noted in a preceding paragraph.

OBJECTS OF VEGETAL ORIGIN

Brushes (pl. 39, 1-3).—The three specimens illustrated are composed of what appears to be cedar bark, completely charred (1), trimmed yucca leaves (2), and wire grass (3). Each is tied with a shred of yucca leaf. Brushes were employed in combing one's hair and in sweeping floors and, often enough, the two ends of a single specimen served these two entirely unlike purposes.

Cordage.—As is well known, most cliff-dweller cord was made of yucca fiber, that handy material so generously distributed throughout the greater part of the Southwest. The bundles figured in Plate

39, 4, 5, are of an unidentified species of apocynum and yucca, respectively. A second hank of yucca cord is embedded in a bit of adobe flooring, marked by the imprints of willow (312257). In addition, we have the usual number of scraps of feather-wrapped yucca cord; a tasseled fragment, square braided, of eight 2-ply cotton strands (312272); several cord fragments made from human hair (312275); a bit consisting of two strands of hair twined with one of yucca fiber (312274); and several knotted scraps of twisted buffalo hair (312281).¹⁶ Bundles of human hair, tied with yucca shreds and perhaps intended for use in cord manufacture, or for weaving bags and other fabrics, are also in the collection.

Mats.—From the Betatakin cave débris came a small section of cedar bark matting, bound with a simple over-and-under lacing of yucca leaf shreds (312321); a similar fragment composed wholly of yucca leaves (312409) and several pieces of a larger mat, twill woven of rushes (312395).

Cloth (pl. 39, 6-9).—Bits of cotton fabrics, often patched and re-patched, are present in nearly every cliff-dwelling rubbish heap. Most of these rags show a plain checkerboard weave, although their component threads may vary in size and compactness. Our rag series includes four specimens of twilled work (312259), two of which appear to be fragments of headbands, and a cotton tassel whose cord, seven-sixteenths inch in diameter, consists of a core of cloth strips inclosed by a covering in which three parallel strands were braided as one.

Our only example of twined textile is woven of human hair. A single specimen of coiled work without foundation has what appears to be buffalo hair twisted in with some species of apocynum fiber.¹⁷

Sandals.—Two types of weaving, twilled and wickerwork, are represented in the 11 sandals or sandal fragments we collected at Betatakin. Of the former, there are but two examples, both made from narrow yucca leaves. (Pl. 40, 1, 3.) The larger is the finer and more tightly woven; its component elements were plaited over-two under-two until the edge was reached, when each strand was tightened, drawn forward under-four, and reintroduced from the lower side, thus creating a slightly thicker, rounded selvage. As the weaving progressed from toe to heel, leaf ends were brought out on the sole, there to be clipped and later frayed through wear into a

¹⁶ Kidder and Guernsey (1919, p. 118) note the finding of a scrap of buffalo hide, with the hair still on, in their ruin 7 and point out the possibility of its having been brought in by Navajos. Biologists have not yet included the Kayenta district in the known, former range of the mountain buffalo.

¹⁷ A similar scrap (303262) in the Betatakin series obtained through exchange with the University of Utah includes both cotton and apocynum strings in which is twisted whitish mammal hair, as yet unidentified, that may be either deer or mountain sheep, and also the brown hair of some undetermined animal.

fibrous pad. (Pl. 40, 2.) To complete the weaving, each strand was tied in a single knot under the heel.

The smaller sandal, woven in the same technique, is a bit cruder and might well be the work of an adolescent. On the border, each leaf was brought forward under-two and reintroduced. The toe

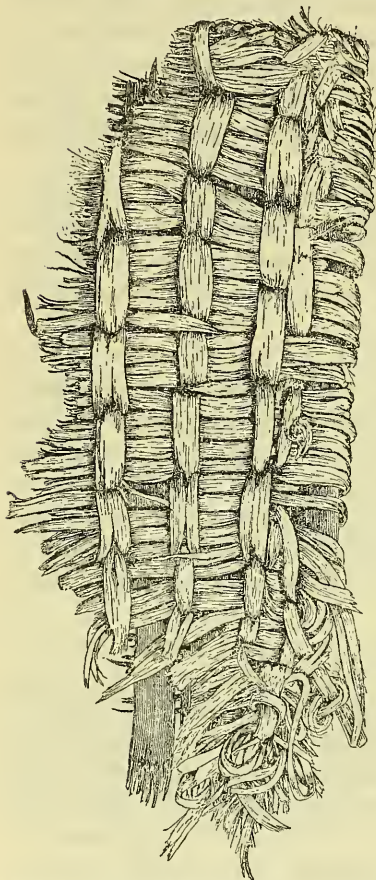


FIGURE 20.—WICKERWORK SANDAL WITH SECONDARY STITCHING

ends were mostly drawn out on top, intertwined, and left to form a knotty pad. In finishing the heel, one strand was brought squarely across and the others looped about it, half above and half below, after which their ends were clipped. As a final touch, two strips, tied together on the middle left edge, were laced back and forth across the sandal, one to end at the toe; the other at the heel.

Although our wickerwork sandals (pl. 41, 1-3) present an entirely different appearance, one from the other, the method of their manufacture was much the same. All are made of yucca. Coarse leaves were looped and tied to form four warp strands; back and forth across these, over one and under the next, the weft element was woven. This might be narrow yucca leaves (2, 3) or a sort of bast of finely shredded leaves (1). Apparently to bind these weft strands together, strips of the same material were sometimes laced through longitudinally between the warps, as in 3. The extreme to which such stitching can go is illustrated by Figure 20.

One fragment in the lot is woven of yucca bast over four warp strands of coarse yucca cord.¹⁸

Basketry.—In our 1917 Betatakin collection, basketry is represented by the two specimens figured in Plate 42 and by several fragments (312394) of similar vessels. The ring basket (1), a very common sort of receptacle among cliff dwellers of the Kayenta district, is woven of trimmed yucca leaves in simple twilled pattern; that is, each weft

¹⁸ For an excellent analysis of wickerwork and twilled technique in sandal weaving, see Kidder-Guernsey, 1919, pp. 101-107.

element alternately goes over-two, then under-two warp elements. Construction began at the center and the two primary strands, at right angles to each other, tend naturally to quarter the fabric. Continuing outward from the middle along these two strands, every fourth weft element extends over-three thus to produce the concentric diamond pattern faintly discernible in the illustration. At the rim, the component strands were gathered in pairs and clipped. Each alternate pair was brought over from the outside and tied with its neighbor just below the ring, by thin twined strips of yucca. In this particular specimen, the unpeeled willow forming the hoop had been broken and subsequently repaired with a similar withe, lashed on with more shreds of that most useful plant, the yucca.

As to our coiled specimen (pl. 42, 2) and fragments, little need be said other than that each was woven in the manner described by Kidder and Guernsey¹⁹ as "two rod and bundle." In this style, each coil consists of two tiny willow rods, placed side by side with a bundle of fibrous material above and between them. Coiling progressed as the sewing splints were drawn through the middle of the bundle and over the three elements (two rods and bundle) of the coil next above.

In the small series of Betatakin artifacts collected by Professor Cummings and obtained by the United States National Museum through exchange with the University of Utah, are two fragmentary yucca ring baskets of twilled weave. (Pl. 43.) One (1) is woven over-three, under-three, with each sixth element on the quartering strands over-five; the other (2), over-two under-two, as described above. The fragment of a larger ring basket, approximately 15 inches (0.381 m.) in diameter (303269), and part of a coiled specimen, 6½ inches (0.165 m.) in diameter, woven on a single-rod and welt foundation (303270), will also be found in this collection.

Cradles.—During the course of our clearing operations we found a fragment of what might have been a cradle (312396). Uncertainty lies in the fact that the specimen, when in use, obviously was broader than known cradles from the Kayenta district; from the further fact that the reed backing follows the curve of the hoop without apparent interruption. This hoop is an unpeeled oak withe; the reeds were added one at a time, each being bent around the oak frame and lashed with a pair of twined yucca strands.

Plates 44 and 45 show the front and back of a fragmentary cradle of superior construction, exhumed at Betatakin by Professor Cummings in 1909. A peeled oak twig, partly split to aid in

¹⁹ 1919, p. 116.

bending it to the shape desired, forms the frame. To the under side of this, selected reeds were bound by a single yucca-leaf strand in running coiled stitch.²⁰ Such lashing, and a cornhusk pad that covered it and the reed ends, was subsequently inclosed by twilled weaving (over-three, under-three) of unidentified basketry material. The original dimensions of this exceptional specimen were approximately 12 by 24 inches (0.304 by 0.609 m.).

Two sets of reeds, at right angles to each other, compose the body of the cradle. First to be attached was the transverse series above mentioned, of which 72 elements now remain. Upon these, 26 longitudinal rods were bound in pleasing pattern with two-ply cords of human hair. Close inspection of the illustrations will show the running coiled stitch that binds the outermost stems of the upper set to each one in the lower. The lowermost and each twenty-fifth cross reed above (pl. 45) is fastened to individual rods of the opposite series by a wrapped stitch in which a single cord twines about the horizontal member as it crosses, successively, those placed lengthwise. This method of attachment resulted in a sequence of three rectangles each of which is bisected diagonally by coiled stitching.

It is to be noted that only 2-ply human hair cord was utilized as a sewing element in binding the two sets of reeds which compose the body of the fragmentary cradle before us. But a shred of yucca leaf, looped over several lateral stems, served subsequently for minor repair.

Foodstuffs.—Maize has formed the staple food crop of Pueblo peoples since **Basket Maker times**. Innumerable cobs appeared in the household rubbish with which Betatakin was terraced; those few we salvaged (312266) average 6½ inches (0.165 m.) and are among the longest. We found also three small red beans (*Phaseolus vulgaris*—No. 312268)²¹ and various squash stems, seeds, and fragments of rind (*Cucurbita pepo*—Nos. 312261, 3, 5). Pinyon nuts, the seeds of desert grasses, and edible roots, such as a species of wild potato that grows abundantly in canyons of the Kayenta district, contributed, each in its proper season, to the products of cultivated gardens. No useful list of the diverse game animals killed for food can be compiled from the handful of worked bones retained.

Figure 21 shows two severed fragments of a gourd vessel. It is understood that to-day, as in prehistoric times, young wild gourds are still eaten by several Southwestern tribes.

²⁰ The thread crosses the twig, goes down and encompasses two reeds beneath; thence back over the twig and down again to inclose one of the same two reeds and the next beyond; thence back over the twig, and so on.

²¹ This and the following identifications were made by Mr. D. N. Shoemaker, of the Bureau of Plant Industry, U. S. Department of Agriculture.

POTTERY

The half dozen specimens we recovered afford no adequate conception of the variety of earthenware vessels employed in Betatakin nor of the skill that went into their making. From shards gathered on débris heaps, something could be written of local technique; of different wares and their characteristic types of paste, surface treatment and decoration. But this has already been done by those diligent, painstaking observers, Kidder and Guernsey.²²

Let us briefly consider the few pieces in hand since they are the only ones in the National Museum collections known to have come from Betatakin.²³ Our two whole vessels (pl. 46, 1, 3) are both polychrome. The flat-topped colander (1) was finished with a red slip, except for a narrow, cream-colored band around the shoulder; on this smooth red surface black geometric decorations were painted and outlined in white. Ornamentation is confined to the body and to the slightly depressed rim. The flat bottom is perforated by 41 holes, one-eighth inch in diameter, punched through from the outside. This is the strainer previously noted as having been found in the hole pecked in the stone floor of room 121.

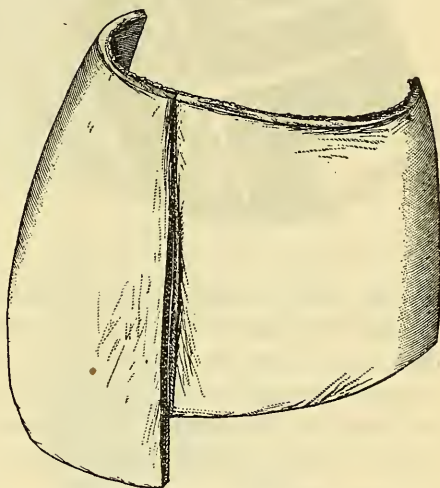


FIGURE 21.—FRAGMENT OF GOURD VESSEL, CUT IN TWO

To the gray paste of the small handled jar (3), a brown paint was applied from the rim to just below the maximum diameter; over this, black designs were drawn and bordered with white. The larger jar (5) likewise was rubbed to a near-polish with waterworn pebbles then ornamented directly with broad, brown bands, outlined with a darker paint that may be regarded as an impure black. The same pigment was employed in tracing the coarse, parallel lines that occupy the interspaces. Bits of wood, gourd rind, and fragments of broken pottery (fig. 22) were employed as scrapers in the manufacture of earthenware vessels.

²² See Kidder-Guernsey, 1919, pp. 129-143; Kidder, 1924, pp. 68-74.

²³ Accession 52301, transferred from the Bureau of American Ethnology, includes a number of vessels perhaps erroneously credited to Betatakin by the collector, Dr. J. W. Fewkes. Certainly they display none of the distinguishing features of Kayenta, or even proto-Kayenta, wares. In the report on his preliminary visit, Fewkes implies (1911, p. 26) that fragments only were gathered at this site.

Of the two bowls, both restored, the larger (6) was first coated inside and out with a thin red slip, polished and then decorated with a coarsely hachured, convoluted design in black. Ornamentation is limited to its inner surface. The smaller specimen (2) has an out-flaring rim and a single, horizontally placed loop-handle—two characteristic features of bowls belonging to the principal Kayenta culture. But this particular vessel bears no decoration whatsoever. Its exterior was roughly smoothed; its inner surface was covered with a cream-colored slip and polished. Variation in Betatakin bowl rims is shown by Figure 23, drawn from fragments in our shard collection.

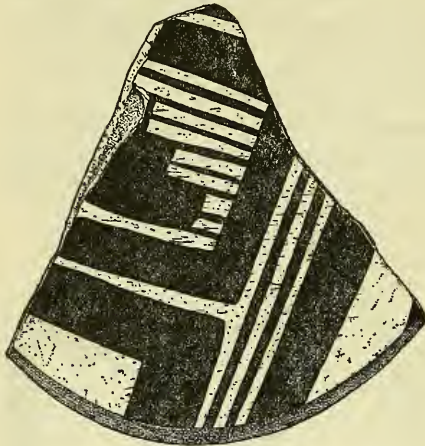


FIGURE 22.—SHARD POTTERY SCRAPER

In this same series are segments of four shallow, platelike vessels with perforated edges (fig. 24), a type limited in distribution, so far as I am aware, to the Kayenta district, and to Jadito Valley, southeast of the modern Hopi villages. Fewkes²⁴ illustrates a restored specimen, $5\frac{1}{4}$ inches (0.133 m.) in diameter, from the Marsh Pass region; Kidder and Guernsey²⁵ observed fragments of similar dishes on ruins in the same locality and were so fortunate as to recover half of a 13-inch (0.330 m.) plate, threaded with strips of yucca, at Sunflower House, on the

Figure 23 shows seven different rim types of Betatakin bowls, ranging from a simple, slightly curved rim to a rim with a distinct, serrated or perforated edge.

Figure 23 shows seven different rim types of Betatakin bowls, ranging from a simple, slightly curved rim to a rim with a distinct, serrated or perforated edge.

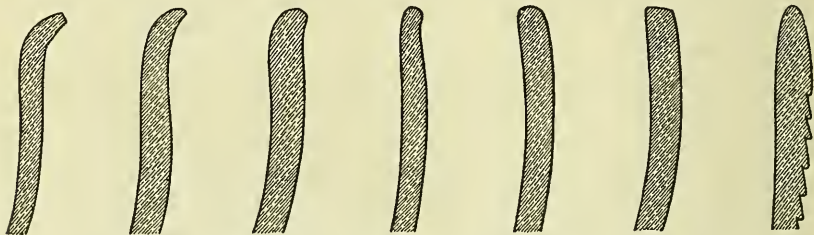


FIGURE 23.—RIM TYPES OF BETATAKIN BOWLS

south margin of Skeleton Mesa some 2 miles below the mouth of Segi Canyon. Both their pronounced shallowness and their marginal perforations attract attention to these unusual vessels. What purpose they originally served remains undetermined. Hough appears to be the only one who has ventured an opinion. After noting the occurrence of fragments in large numbers at Kawaiokuh and

²⁴ 1911, pl. 15, b.

²⁵ 1919, p. 143.

their relative infrequency at Kokopnyama, protohistoric Hopi villages in Jadito Valley, he conjectures the use of such plates as "revolving rests for ware during the process of manufacture."²⁶

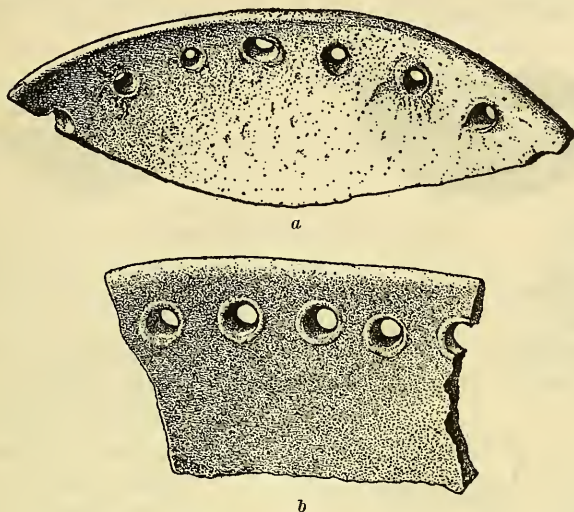


FIGURE 24.—RIM FRAGMENTS OF POTTERY PLATES

In other words, a rotative disk that could be turned as the formative vessel it supported took shape—nearest aboriginal approach in the New World to the potter's wheel.

Like the two jars previously mentioned, the broken ladle shown in Plate 46, 4 received no surface slip. It bears no trace of ornamentation either within the bowl or on its flat, solid handle. In prehistoric times, as to-day, Pueblo potters habitually modeled a ladle handle separately and frequently attached it by inserting one end through a

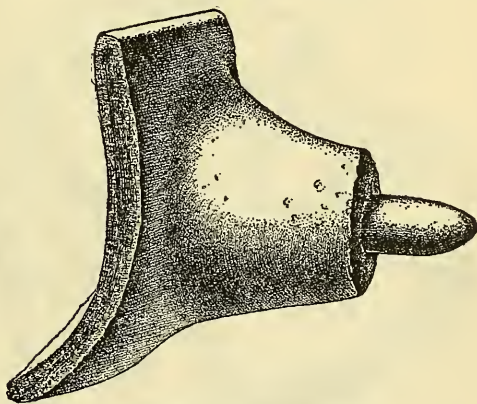


FIGURE 25.—LADLE FRAGMENT

hole punched in the still plastic clay of the bowl, the union then being smoothed over and completely obliterated. This union, in the case of tubular handles, was occasionally strengthened by a cylindrical clay plug, molded separately and introduced from the bowl after the handle was joined to its exterior. (Fig. 25.)

²⁶ See Walter Hough: *Archæological Field Work in Northeastern Arizona*. The Museum-Gates Expedition of 1901. U. S. National Museum, 1901, An. Rept., pp. 337 and 343. Washington, 1903.

Miniature vessels (fig. 26).—These two tiny specimens are perhaps to be regarded as toys for small girls. The larger was crudely modeled and sundried; the smaller, on the other hand, is quite regular in shape and fired. On its inner surface are striations left



FIGURE 26.—MINIATURE VESSELS

by the scraping tool. Part of a third miniature vessel (312254) is also present.

Effigy fragment.—Kidder and Guernsey²⁷ found two small effigies on the surface at Ruin A, Marsh Pass.



FIGURE 27.—LEATHER BAG FRAGMENT

Our Betatakin fragment (312306) is the head from a very similar, though less realistic, specimen. The face is flat—a bit of gray clay pressed between thumb and index finger. The nose is not indicated; eyes and mouth are represented merely by pricks made with a bone awl or like instrument. From this head the neck and rectangular body, if any, have been broken. It should be noted that the specimen is unfired.

Clay pellet (312314).—A flattish ball of molded red clay, $1\frac{3}{8}$ inches (0.034 m.) in diameter by $\frac{7}{8}$ inch (0.022 m.) thick, is in the collection.

With like balls, no doubt, village boys improved their marksmanship, for daubs of variate clay still adhere to the higher walls of Betatakin cave, clustered about casual targets.

²⁷ 1919, p. 143.

LEATHER OBJECTS

Animals slain on the chase furnished flesh for hungry aborigines, bones from which their needed tools could be fashioned, hides suitable for clothing and other purposes. Implements of bone from Betatakin have already been listed; we are now briefly to consider the only two scraps of leather in our 1917 collection.

Figure 27 is part of a bag, made by sewing together with sinew two round-bottomed pieces of tanned hide. In their present condition these resist absolute identification. They closely resemble buckskin and yet are too thin. Perhaps mountain sheep hide was utilized. Whether or no, the bag when in use was approximately $2\frac{1}{2}$ inches (0.063 m.) in diameter. Rodents have gnawed away the upper portion.

Figure 28 represents a trimmed bit of buckskin so well tanned that even today it is as soft and pliable as a piece of chamois. It was perforated at each end for sewing; a fragment of cotton cord occupies a hole on one margin. Traces of white paint adhere to both sides.

In these concluding paragraphs the reader is again reminded that this abridged description is not intended to convey more than a summary of the work of excavation and repair undertaken in the early spring of 1917. Other students of southwestern archeology have found need for certain architectural notes at our command and

have urged their publication. But it is to be emphasized that our observations pertain only to the shell of Betatakin; not to the kernel within. Even though the privilege were properly ours we lack the essential data from which to write the story of this fascinating ruin.

The place of Betatakin in Pueblo history is well known. It was one of the last occupied cliff dwellings; its former inhabitants moved southwardly in late prehistoric times to unite with other clans, and these, in turn, migrated under pressure of nomadic tribes shortly before advent of the Spaniards in 1540. But Fewkes has drawn too short a trail from Betatakin to the modern Hopi villages; has accepted too literally, I am sure, the traditions of his Hopi friends. Future exploration and painstaking attention to details should shortly identify those sites at which the Betatakin folk successively lingered after they abandoned Segi Canyon.

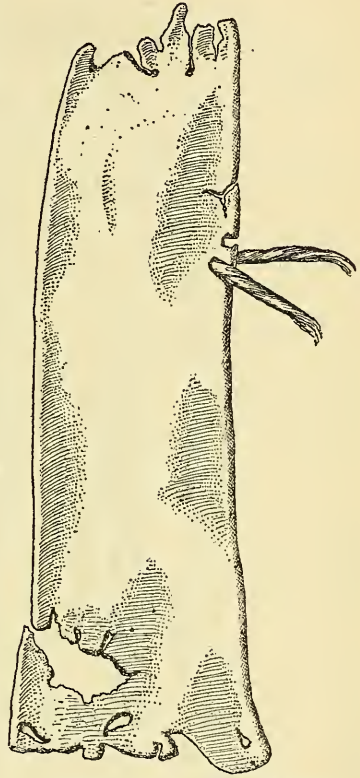


FIGURE 28.—PAINTED BUCKSKIN

APPENDIX I

TABLE OF ROOM DIMENSIONS²⁸

Room	North or northeast		East or south-east		South or South-west		West or north-west		Floor to beams	
	Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters
1	5 3	1.60	6 0	1.82	1 7	0.48	7 2	2.18	4 11	1.49
2	4 11	1.49	5 1	1.54	5 5	1.65	5 5	1.65	4 8	1.42
3	6 11	2.10	9 8	2.94	5 6 SW	1.67	10 6	3.20	4 3	1.29
4					4 9 T.	1.44				
5	4 4	1.32	7 4	2.23	5 4 B.	1.62	6 4	1.93		
6	3 9	1.14	7 6	2.28	6 0 e.	1.82	9 6	2.89	5 3	1.60
7	5 11	1.80	8 0 e.	2.43	4 0	1.21	9 3	2.82	4 4	1.32
8					4 1	1.24	8 9	2.66	4 6	1.37
9					5 7	1.70				
10			7 0 e.	2.13	4 0 e.	1.21				
11	Ct. 8 0 e.	2.43								
12	8 7	2.61	11 1	3.37	8 3	2.51	11 0	3.35	4 5	1.34
13	4 11	1.49	4 0	1.21	4 6	1.37	3 11	1.16	4 2	1.27
14	Ct. 9 4	2.84	16 0	4.87	10 6 e.	3.20	9 2	2.79		
15	7 9	2.36	8 5	2.56	9 1	2.76	9 5	2.87	4 7	1.39
16	9 5	2.87	6 0 e.	1.82	9 6	2.89	6 8	2.03	6 1	1.85
17	11 0 e.	3.35	5 8	1.72	10 9	3.27	5 10	1.77	5 1	1.54
18	9 9 T.	2.97	4 0	1.21	9 8 T.	2.94	4 6	1.37	4 9	1.44
19	7 9 B.	2.36			8 3 B.	2.51				
20	9 5	2.87	10 4	3.15	8 5	2.56	10 6	3.20	4 8	1.42
21	Ct. 8 1	2.46	16 7	5.05						
22	7 10	2.38	8 9	2.66	6 9	2.05	9 2	2.79	6 4	1.93
23	6 7	2.00	16 10	5.13	6 7	2.00	16 8	5.08	4 11	1.49
24	5 4	1.62	9 3	2.82	7 3	2.21	10 1	3.07	5 7	1.70
25	4 6 e.	1.37	5 5	1.65	6 2	1.88	6 2	1.88		
26	Ct. 14 7	4.44	8 7	2.61	11 6 e.	3.50	9 0	2.74		
27	9 3	2.82	8 8	2.64	9 5	2.87	8 10	2.69	4 5	1.34
28	4 10 T.	1.47	8 0	2.43	4 5 T.	1.34	7 6	2.28	4 7	1.39
29	1 8 B.	0.50			1 3 B.	3.81				
30	8 1	2.46	8 1	2.46	8 3	2.51	8 5	2.56	4 2 e	1.27
31	Ct. 5 3	1.60					6 0 e.	1.82		
32	8 1	2.46	7 11	2.41	9 3	2.82	8 1	2.46	4 11	1.49
33	5 4	1.62	8 0	2.43	4 11	1.49	8 4	2.54	4 3	1.29
34	5 1	1.54	8 0	2.43	4 10	1.47	8 0	2.43		
35	4 2	1.27	6 8	2.03	3 2	0.96	7 2	2.18	3 4	1.01
36	Ct. 10 7	3.22	15 0 e.	4.57	5 0 e.	1.52	16 0	4.87		
37	11 5	3.48	10 3	3.12	10 0	3.04	8 1	2.46	4 6	1.37
38			11 3	3.42	9 11	3.02	12 5 T.	3.78		
39	7 0 e.	2.13	9 2 e.	2.79	6 3	1.90	9 2 B.	2.79		
40			21 0 e.	6.40	1 6	0.45	8 8	2.64		
41	6 11	2.10	11 0	3.35	6 11	2.10	12 0	3.65	6 0	1.82
42										
43	7 2	2.18	6 6	1.98	6 5	1.95	5 8	1.72	4 4	1.32
44	7 7 T.	2.31	6 8	2.03	5 3 T.	1.60	9 10	2.99		
	3 2 B.	.96			1 5 B.	0.43				

²⁸ With such irregularities of masonry as occur in Betatakin and with such a pronounced slope as that on which the village was constructed it follows that these room measurements are more or less arbitrary. No two observers will get identical results unless, by chance, their respective tapes are stretched between the same identical building stones. In the present instance the measurements given were taken as near the floor as possible, with these exceptions: "T" denotes one made at the top of the wall; "B," one made at its base; "e" identifies an estimated dimension. Ceiling heights were taken between the floor and the principal beams, usually 4 to 6 inches in diameter; not to the lesser poles supported by those beams.

The writer confesses with sincere regret that some of his room measurements were rendered illegible when the notebook recording them was thoroughly soaked during the snowstorm of May 31—a loss discovered too late for correction.

Table of room dimensions—Continued

Room	North or northeast		East or south-east		South or South-west		West or north-west		Floor to beams	
	Feet	Me-ters	Feet	Me-ters	Feet	Me-ters	Feet	Me-ters	Feet	Me-ters
45	Ct. 16	10	5.13	13 2	4.01	10 0 e.	3.04	12 3	3.73	
46	9 0	2.74	8 4	2.54	10 3	3.12	10 8	3.25		
47					8 0 e.	2.43				
48	4 0 T.	1.21	2 8	.81						
49	1 4 B.	.40								
50			14 0 e.	4.23	4 9	1.44	15 0 e.	4.57		
51	5 4	1.62	10 0 e.	3.04	6 9	2.05	12 0 e.	3.65		
52			7 10	2.38	4 11	1.49	8 3	2.51		
53	5 0 e.	1.52	8 11	2.71	4 7	1.39	7 7	2.31		
55	12 8	3.86					8 7	2.61		
56	10 10 T.	3.30	7 6 e.	2.28	8 6 T.	2.59	8 4 e.	2.54	8 0 e.	2.43
57	5 11 B.	1.80	5 8	1.72	4 0 B.	1.21	5 3 T.	1.60		
58	9 10 T.	2.99			7 2 T.	2.18	4 5 B.	1.34		
59	5 3 B.	1.60	7 2	2.18	3 5 B.	1.04	6 5	1.95		
60	4 0	1.21	4 6	1.37	2 11	.88	4 8	1.42		
61	4 10	1.47	7 6	2.28	3 10	1.99	8 2	2.48	4 3	1.29
63	10 3 T.	3.12	7 5	2.26			7 6	2.28		
64	4 11 B.	1.49			4 9 B.	1.44				
65			4 4	1.32	3 6 e.	1.06	6 4 T.	1.93		
66			6 9 e.	2.05	6 0 B.	1.82	4 10 B.	1.47		
67	8 0 e.	2.43	7 0 e.	2.13					3 10	1.99
68	5 0 e.	1.52	7 0 e.	2.13						
70	8 6 e.	2.59	6 0 e.	1.82			7 0 e.	2.13		
71	7 10 e.	2.38	8 4 e.	2.54						
73	4 5	1.34	5 2	1.57	5 0	1.52	3 7	1.09		
74										
75	10 0 e.	3.04	8 0 e.	2.43						
76	8 0 e.	2.43								
77	8 0 e.	2.43	3 0 e.	.91						
78	7 10	2.38	6 4	1.93	6 11	2.10	6 8	2.03	3 8	1.11
79	7 6	2.28	7 0	2.13	7 3	2.21	6 0	1.82	4 9	1.44
80	6 0	1.82	5 10	1.77	6 8	2.03	6 8	2.03		
81	7 7	2.31	5 0	1.52	6 3	1.90	5 10	1.77		
82	8 0 e.	2.43	8 0 e.	2.43	8 6 e.	2.59	7 6 e.	2.28		
83	Ct. 12	3.65	6 0 e.	1.82	6 0 e.	1.82	10 0 e.	3.04		
84	6 0 e.	1.82	6 0 e.	1.82	5 0 e.	1.52	5 0 e.	1.52	4 0 e.	1.21
85	7 0 e.	2.13	5 0 e.	1.52	7 0 e.	2.13	7 0 e.	2.13	4 0 e.	1.21
86										
87	7 6 e.	2.28	5 6 e.	1.67						
88	5 0 e.	1.52					6 6 e.	1.98		
89	5 0 e.	1.52			6 6 e.	1.98	6 0 e.	1.82		
90	2 0 e.	.60			5 0 e.	1.52	9 6 e.	2.89		
91	4 0 e.	1.21			5 0 e.	1.52	9 0 e.	2.74		
92	3 0 e.	.91	5 6 e.	1.67	5 0 e.	1.52			6 0 e.	1.82
93	5 6 e.	1.67	7 0 e.	2.13	6 0 e.	1.82				
94										
95	8 0 e.	2.43	9 6 e.	2.89	9 0 e.	2.74				
96										
100	4 8 T.	1.42	6 1	1.85	4 5	1.34	5 10	1.77	3 0	.91
101	2 10 B.	.86								
102			5 0	1.52						
103			6 0 e.	1.82						
104										
105										
106							8 0 e.	2.43		
107										
108										
109										
110										
111										
112										
113										
114										
115										
116	7 4	2.23								
117	11 5	3.48	6 3	1.90	11 2	3.40	7 4	2.23		
118	7 0	2.13					8 0 T.	2.43		
119							5 5 B.	1.65		
	7 5	2.26	8 0 T.	2.43	7 7	2.31				
			6 3 B.	1.90						

APPENDIX II

CATALOGUE NUMBERS AND DIMENSIONS OF OBJECTS ILLUSTRATED

Illustration	National Museum No.	Length		Width		Thickness		Diameter			
		Inches	Centi- meters	Inches	Centi- meters	Inches	Centi- meters	Inches	Centi- meters		
Pl. 31,	1	312206	17	43.1	12	30.4	1½	3.8			
	2	312216	11	27.9	4¾	12.0	1	2.5			
	3	312227	5¾	14.6	3½	8.8	1	2.5			
	4	312227	5	12.7	4¾	10.7	1¼	3.1			
	5	312208	11	27.9	5	12.7	2	5.0			
Pl. 32,	1	312238	4¼	10.7	2¼	5.7	1½	4.1			
	2	312235	6¼	15.8	3¼	8.2	2½	6.3			
	3	312237	4¼	10.7	2¾	6.9	2	5.0			
	4	312239	5¼	13.3	4	10.1	2½	6.3			
	5	312242	3¼	8.2	1¾	4.4	1½	3.8			
	6	312233	4	10.1	2¾	6.9	1¾	4.4			
	7	312229	3¾	9.5	3	7.6	1½	3.8			
	8	312230	5¼	13.3	4	10.1	1½	3.8			
	9	312228	4¾	12.0	2¾	6.9	1½	3.8			
Fig.	5	303257	6¼	15.8	1½	2.8	½	1.2			
	6	312317	2¼	5.7	1	2.5	¾	2.2			
	7	312305					½	1.2	1½	4.7	
Pl. 33,	1	312345	19½	49.5	6¾	17.1	¾	2.2			
	2	312341	12	30.4	3½	8.8	1½	3.4			
	3	312342	15¼	38.7	2¾	6.9	1¾	4.4			
	4	312340	12	30.4	4¼	10.7	2	5.0			
Pl. 34,	1	312325	37	93.9					¾	2.2	
	2	312326	44¾	113.6					¾	2.2	
	3	312324	32	81.2					¾	1.9	
	4	312323	25	63.5	2	5.0	1¼	3.1			
	5	312323	22¾	57.0	1½	3.8	¾	2.2			
	6	312323	23¾	59.7	1½	3.4	1	2.5			
	7	312323	22½	57.1	1½	3.8	1	2.5			
	8	312405							7	17.7	
	9	312405							6	15.2	
Fig.	8	312324	32	81.2					¾	1.9	
	9	312303	2¾	6.9	¾	1.9	½	1.2			
	10	312413	8	20.3					5/16	.7	
	11, a	312372	2¾	6.0					1/8	.3	
	11, b	312372	2	5.0					1/8	.3	
		312372	2	5.0					1/8	.3	
Pl. 35,	1	312383	7¼	18.4					1½	3.8	
	2	312332	10½	26.6	9/16	.7	3/16	.4			
	3	312347	12	30.4					1½	3.8	
	4	312339	14¾	37.4					1½	1.2	
	5	312333	13¾	34.9					1½	1.2	
	6	312351	6¼	16.5	1¼	3.1	¼	.6			
	7	312352	5¼	13.3	1	2.5	3/16	.4			
	8	312330	5	12.7	¾	1.5	9/16	1.4			
	9	312334	1¾	4.4							
Pl. 36,	1	312349	19	48.2					5/8	1.5	
	2	312364	17¼	43.8					3/16	.4	
	3	312361	18¾	47.6					1/8	.3	
	4	312362	13¾	34.6					1/4	.6	
	5	312370	9½	23.1	¾	.9	¼	.6			
	6	312370	7¾	20.0	¾	.9	¼	.6			
	7	312370	8½	21.5	9/16	.7	3/16	.4			
	8	312370	6¾	17.1	¾	.9	¼	.6			
	9	312370	8¾	21.2						¾	.9
	10	312370	8	20.3							
	11	312370	8¾	22.2	7/16	1.1	¼	.6			
	12	312283			7/16	1.1	¼	.6			
	13	312286					5/8	1.5	1¾	4.4	
	14	312284					9/16	1.4	2	5.0	
	15	312288					¾	1.9	1¾	4.4	
	16	312290	1¾	4.7	1½	4.1	1/8	.3			
	17	312289	1¼	3.1	1	2.5	¾	.6	1¾	3.4	

Catalogue numbers and dimensions of objects illustrated—Continued

Illustration	National Museum No.	Length		Width		Thickness		Diameter			
		Inches	Centi- meters	Inches	Centi- meters	Inches	Centi- meters	Inches	Centi- meters		
Pl. 37,	1	312357	3½	8.8	1½	2.8	¾	0.4			
	2	312356	3¾	9.5	7⁄8	2.2	¾	.4			
	3	312355	6¾	16.1	¾	.9	1⁄8	.3			
	4	312359	3	7.6	7⁄8	2.2	1⁄4	.6			
	5	312358	3¾	9.5	¾	1.5	¾	.7			
	6	312389	6½	16.5							
	7	312386	6¼	15.8							
	8	312387	5¾	14.6							
	9	312388	7½	19.0							
	Fig.	12, a	312353	5¼	13.3	1	2.5	1⁄4	.6		
		b	312354	5¼	13.3	¾	1.5	¾	.4		
		13	312348	10¾	26.3	1	2.5	1⁄4	.6		
		14	312347	12	30.4					1½	3.8
		15, a	312337	6	15.2	1¾	3.4	¾	.9		
		b	312337	3½	7.9	1¾	2.8	¾	.4		
		16	312297	7⁄8	2.2					1½	2.8
		17, a	312350	6	15.2						
		b	312349	19	48.2					¾	.4
18		312406	7½	19.0							
Pl. 38,	1	312374	4¼	10.7	¾	1.5					
	2	312374	6¾	15.5	¾	1.4					
	3	312374	2¾	7.1							
	4	312374	5	12.7	¾	1.4					
	5	312374	3¾	8.7	¾	.4					
	6	312374	4¾	11.9	¾	.7					
	7	312375	5	12.7							
	8	312375	6¾	16.0					¾	.6	
	9	312379	4¼	10.7	1¾	3.4			¾	.6	
	10	312378	6¾	16.1	1½	3.8					
	11	312380	3½	7.9	¾	2.2					
Fig.	19	312376	2¾	6.6	¾	.6					
Pl. 39,	1	312318	4½	11.4							
	2	312319	8	20.3							
	3	312320	4½	11.4							
	4	312273	2	5.0							
	5	312390	2¼	5.7							
	6	312259	7	17.7							
	7	312259	10	25.4							
	8	312259	10	25.4	2	5.0					
	9	312259	9	22.8	3½	8.8					
Pl. 40,	1	312407	11	27.9	4¼	10.7					
	2	(1)									
	3	312407	7¼	18.4	3	7.6					
Pl. 41,	1	312407	11	27.9	4¾	12.0					
	2	312407	8	20.3	2½	6.3					
	3	312407	9¾	24.7	4	10.1					
Fig.	20	312407	8¾	22.2	3½	8.8					
Pl. 42,	1	312392							9½	24.1	
	2	312393							11	27.9	
Pl. 43,	1	303268							11½	29.2	
	2	303271							11	27.9	
Pl. 44,	45	303275	22	55.8	11	27.9					
	(1)										
Fig.	21	312262	5	12.7					5¼	13.3	
	Pl. 46,	1	312244					2¾	6.9	5	12.7
		2	312248					2½	6.3	5½	13.9
		3	312245					2½	6.3	2½	6.3
	4	312249	3½	8.8					2½	6.3	
5	312246					4	10.1	5¼	13.3		
6	312247					4½	11.4	7¼	18.4		
Fig.	22	312256	2¼	5.7	2½	5.3	¾	.3			
Fig.	23	312255									
	24, a	312255	2½	6.3	1½	3.8	¼	.6			
b	312255	4	10.1	1½	3.8	¼	.6				
Fig.	25	312255									
Fig.	26, a	312252					¾	1.5	1¼	3.1	
	b	312253					¾	.9	1	2.5	
Fig.	27	312270	5½	13.9	4	10.1					
Fig.	28	312271	3¾	9.5	1	2.5					

1 Same specimen.

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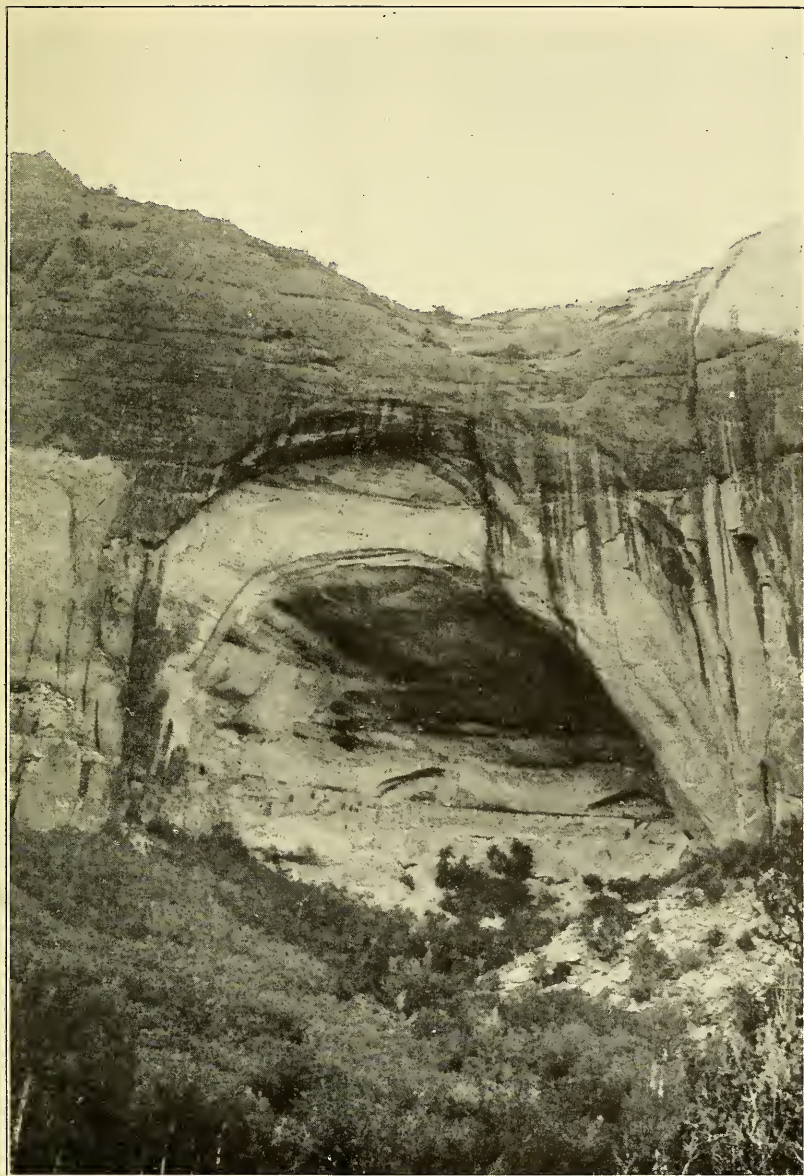
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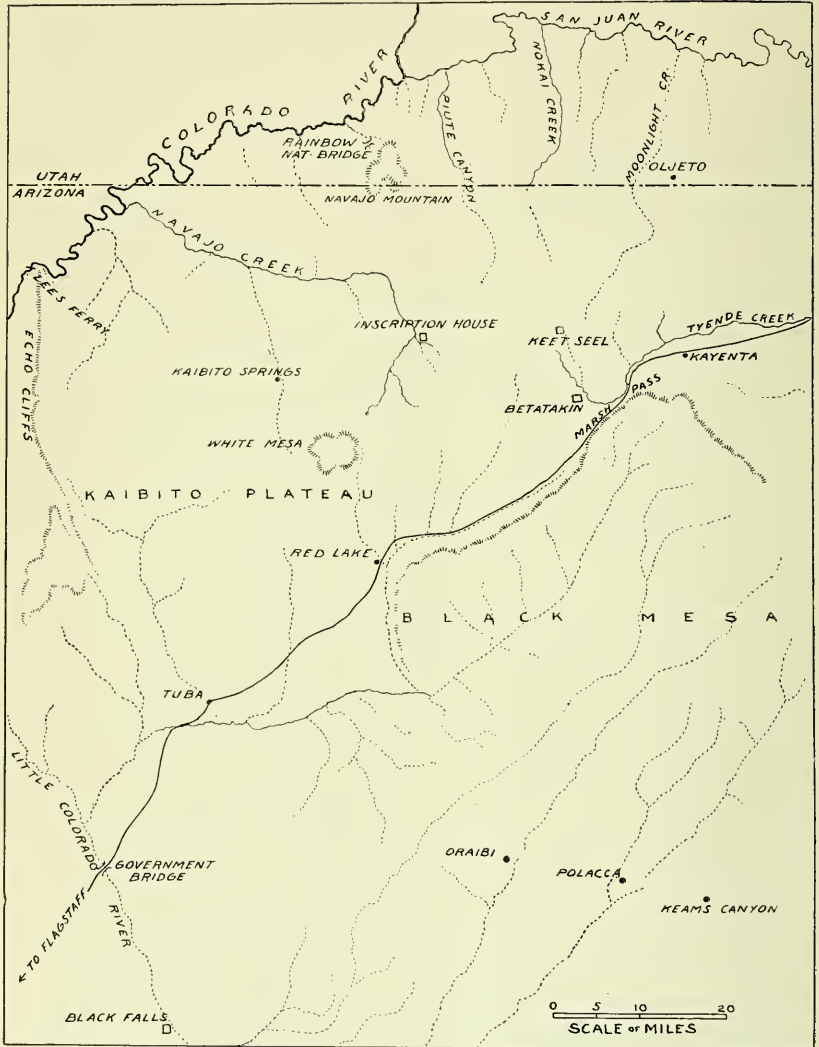
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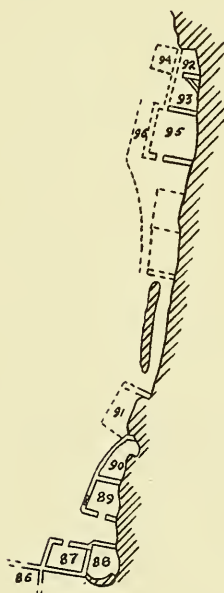
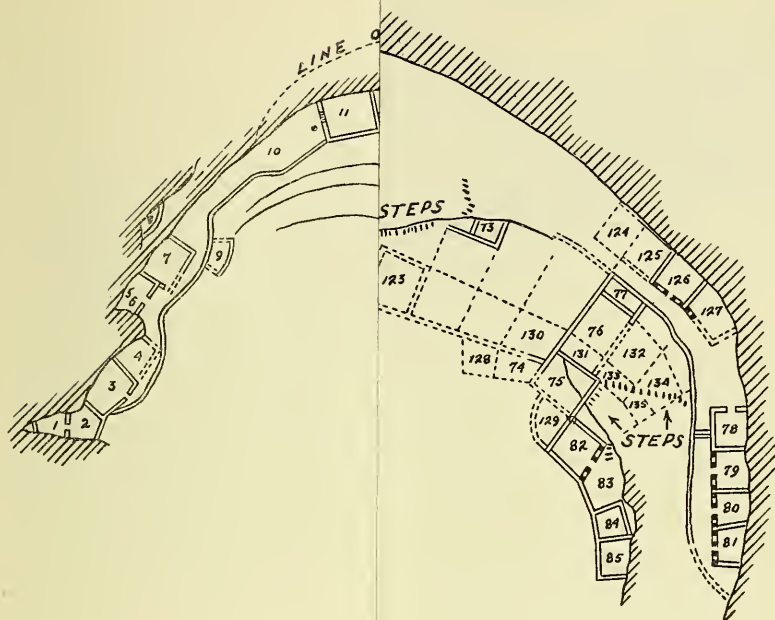
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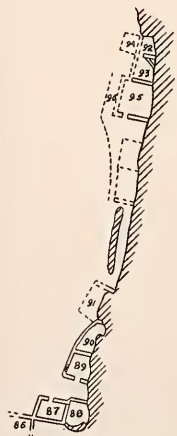
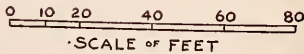
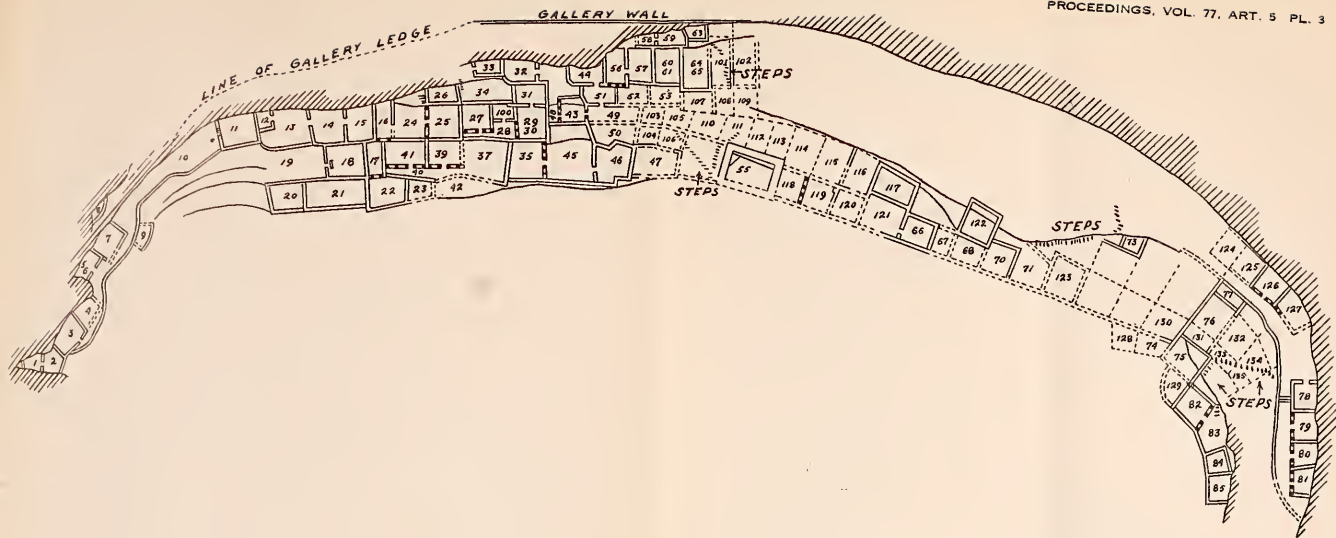


BETATAKIN BLENDS NATURALLY WITH THE WALLS OF ITS VAST CAVE. (1926
PHOTOGRAPH, BY COURTESY OF DR. A. E. DOUGLASS)



MAP SHOWING THE THREE UNITS OF NAVAJO NATIONAL MONUMENT





GROUND PLAN OF BETATAKIN RUIN



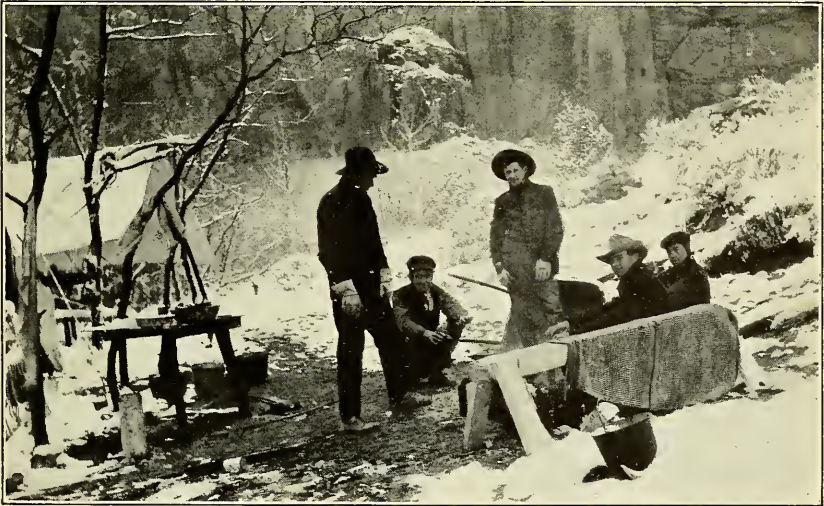
A. TRAIL SCENE IN SEGI CANYON IN AUGUST, 1908



B. APPROACHING BETATAKIN RUIN ON MARCH 27, 1917



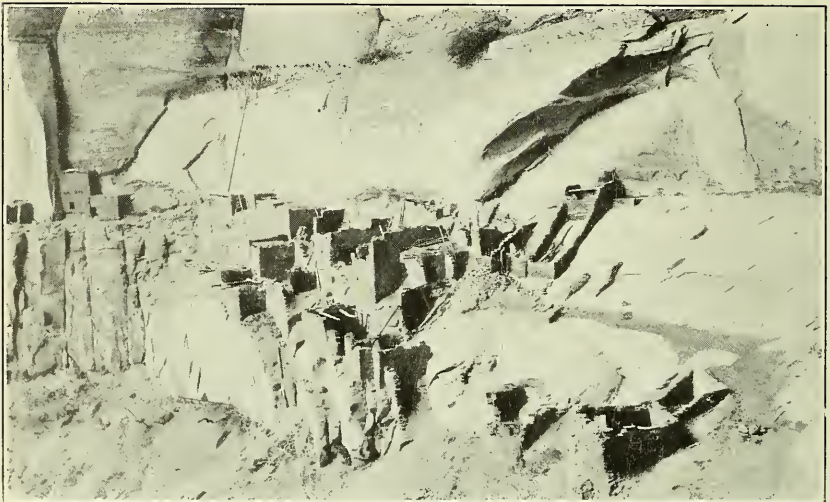
A. BLANKETED WITH SNOW, CAMP WAS A DISMAL PLACE



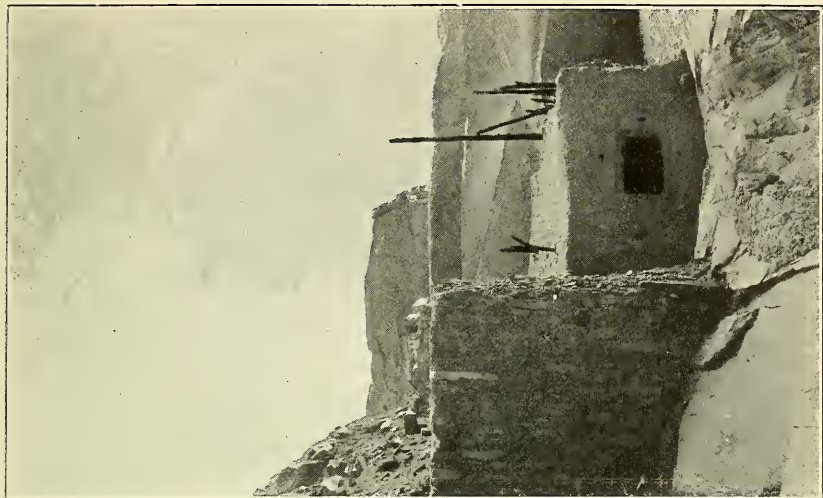
B. WAITING FOR WHATEVER THE COOK MIGHT PROVIDE



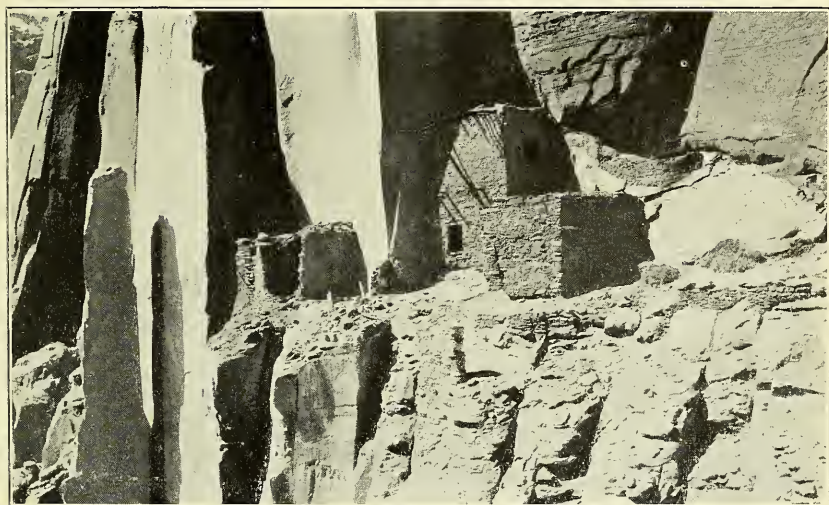
A. THE PRINCIPAL HOUSE GROUP BEFORE EXCAVATION, AS VIEWED FROM ROOM 75. ROOM 66 STANDS AT THE LOWER RIGHT



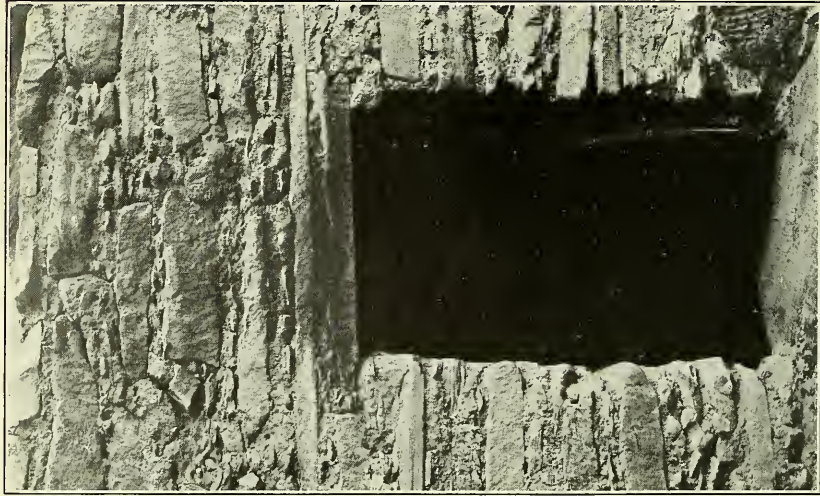
B. ABOVE ROOMS 66 AND 117, IN THE RIGHT FOREGROUND, ONE NOTES THE SEEPAGE ZONE WHICH FORMERLY WATERED DIVERSE VEGETATION



A. THE DOOR OF ROOM 6 AND, ON THE RIGHT MARGIN, THE CONVEX FOUNDATION OF ROOM 8



B. ROOMS 3-7 AND THE NEAR-BY RETAINING WALL, AS VIEWED FROM THE ROOF OF ROOM 20



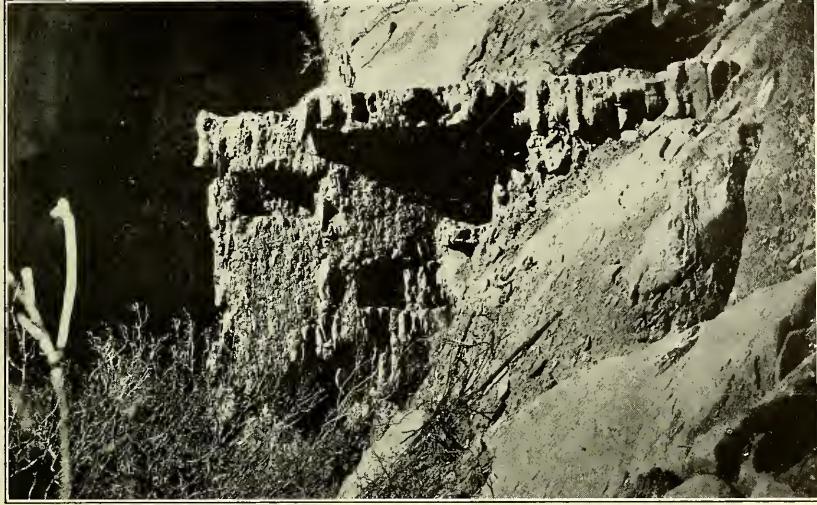
A. A SMALL POLE FORMED A SECONDARY JAMB
FOR THE DOOR TO ROOM 18



B. THE PROBLEMATIC, UNUSUAL DOOR IN
THE SOUTHEAST CORNER OF ROOM 7



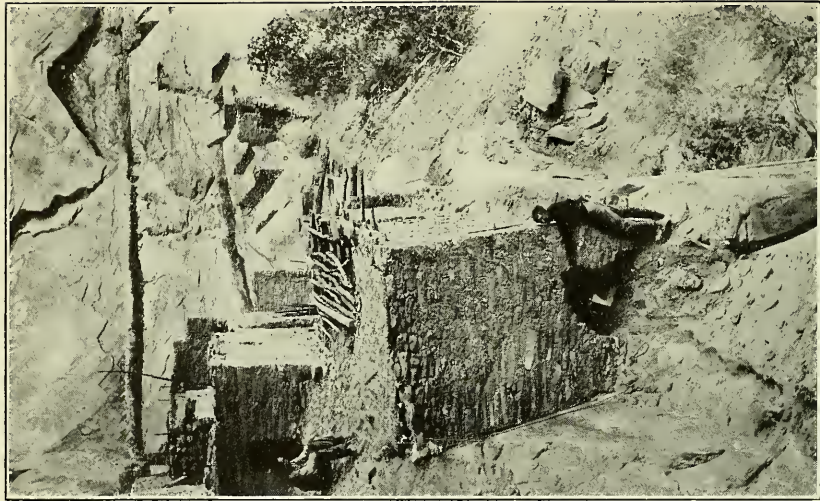
4. ROOM 17 BOASTS THE BEST PRESERVED
WATTLED WALL IN BETATAKIN. AT ITS
TOP IS A FRESH PATCH OF ADOBE MUD



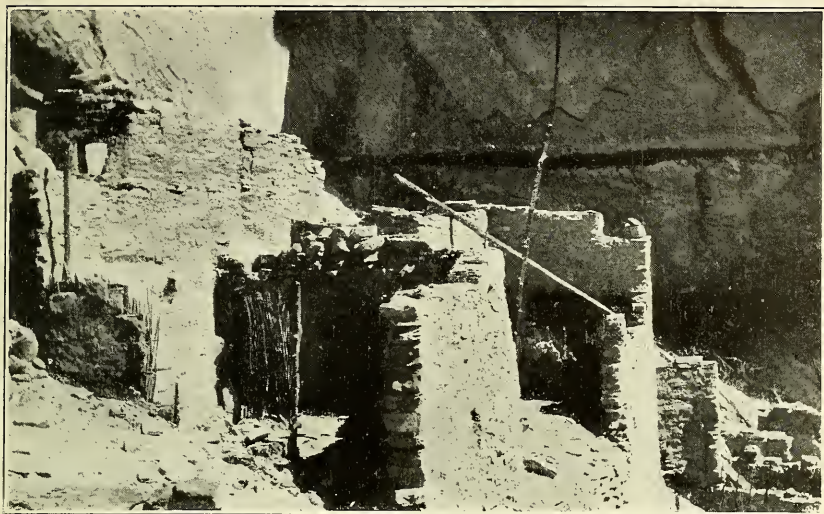
B. HERE IS SHOWN THE PARTLY BLOCKED
FIRST-STORY DOOR OF ROOM 66 AND THE
SHADOWED FIREPLACE IN ROOM 12!



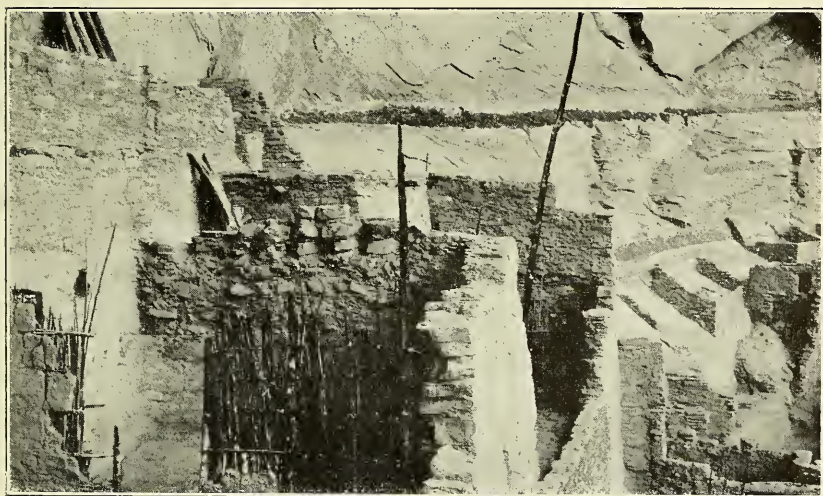
A. BUILDING STONES WERE SALVAGED FROM THE TALUS SLOPE AND PASSED UP FOR USE IN WALL REPAIRS



B. ROOM 20, FROM THE SOUTHWEST. SHOWING, ABOVE THE WORKMAN, A STEEL PLATE AND ANCHOR ROD



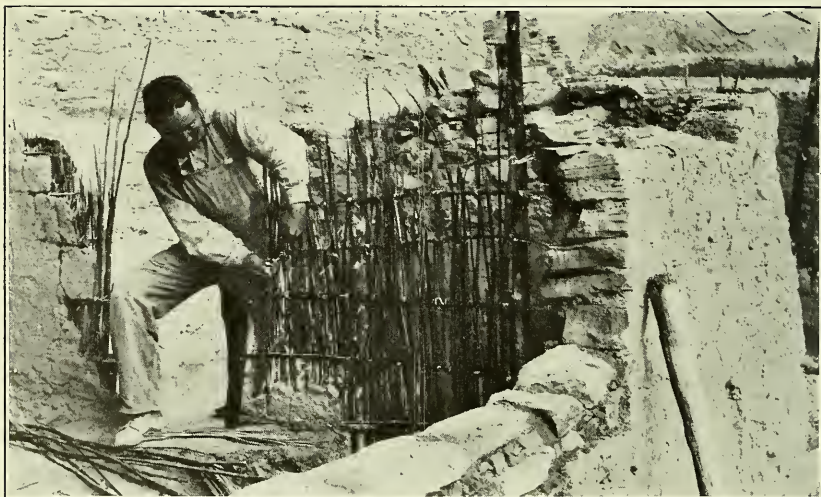
A. THE NORTHEAST WALL OF COURT 24, AT THE LEFT, BEFORE RESTORATION



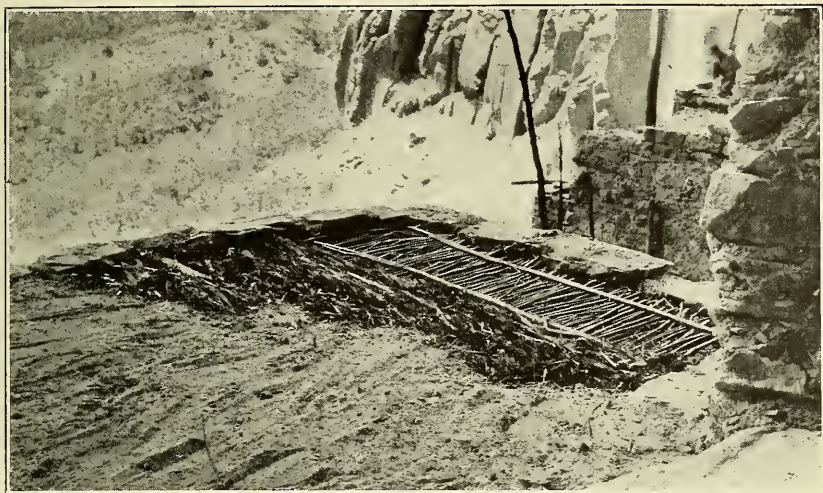
B. TWO-STORY ROOM 66 AND NEAR-BY BUILDINGS STAND AT THE EXTREME RIGHT



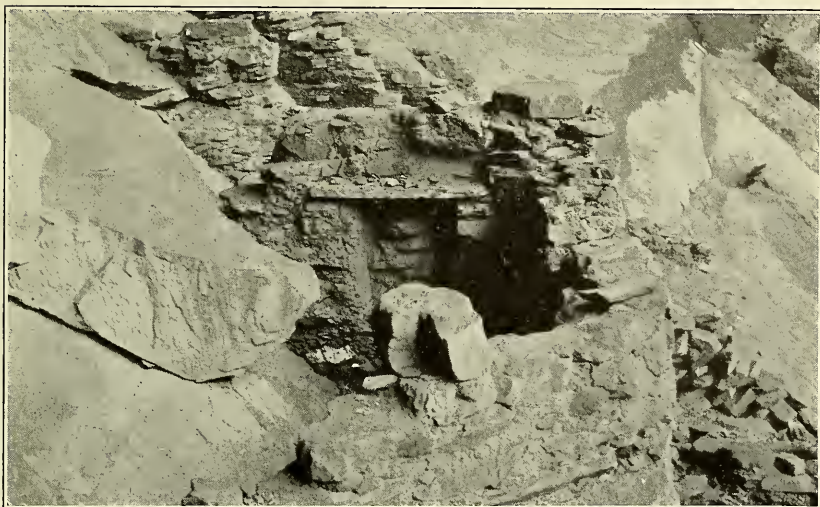
A. THE WATTLED NORTHEAST WALL OF COURT 28, FROM THE WEST



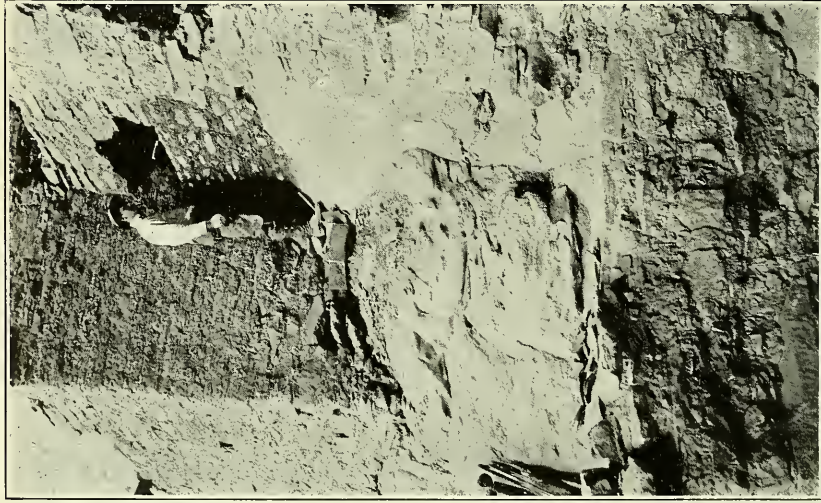
B. NAVAJO INDIAN REPAIRING THE WATTLED WALL OF COURT 24



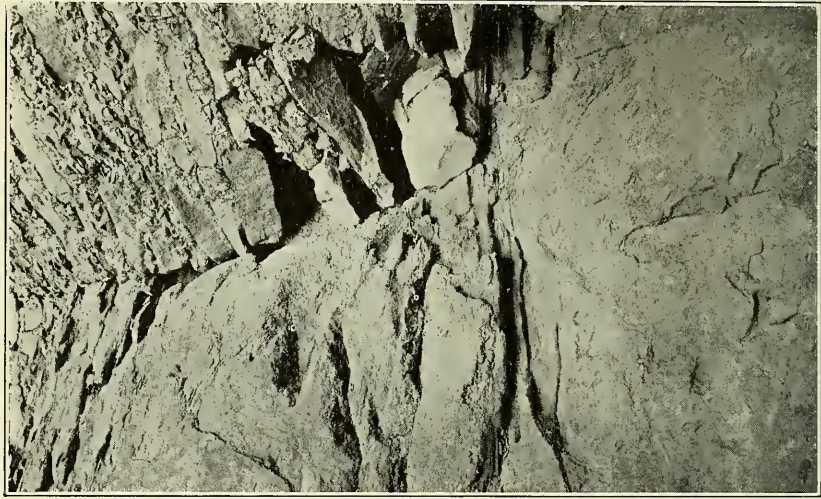
A. WILLOWS, CEDAR BARK, AND SAND MADE A NEW ROOF FOR ROOM 31



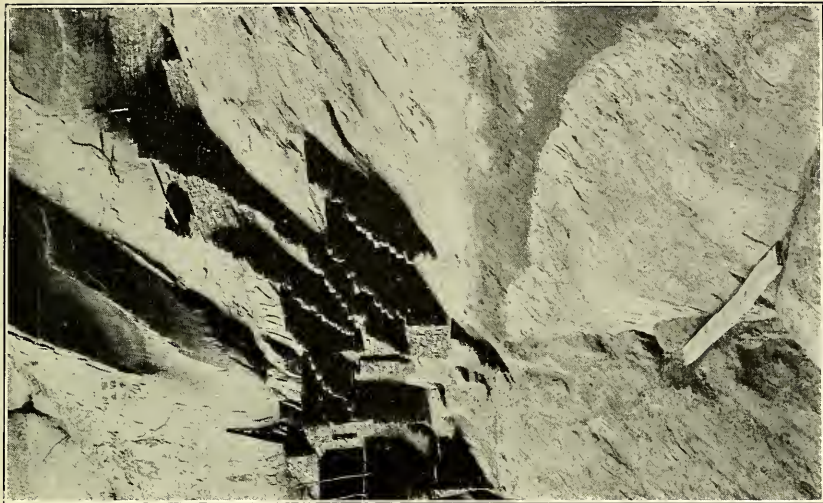
B. ROOM 44, FROM THE WEST; BEYOND, THE LOWER SEEPAGE ZONE AND TRAIL



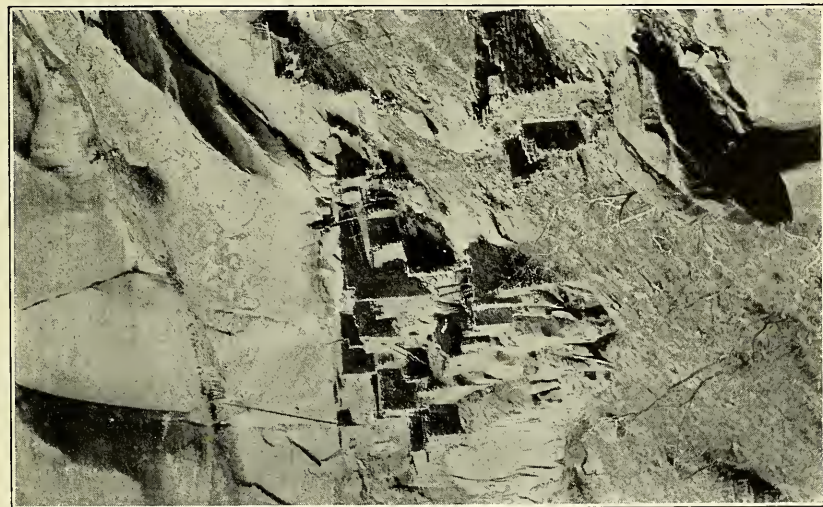
1. REPAIRING THE SOUTH WALL OF ROOM 48.
VIEW TAKEN FROM ROOM 47



B. THE NORTHEAST WALL OF COURT 45 ENDED
IN A CHANNEL, PECKED IN THE CLIFF



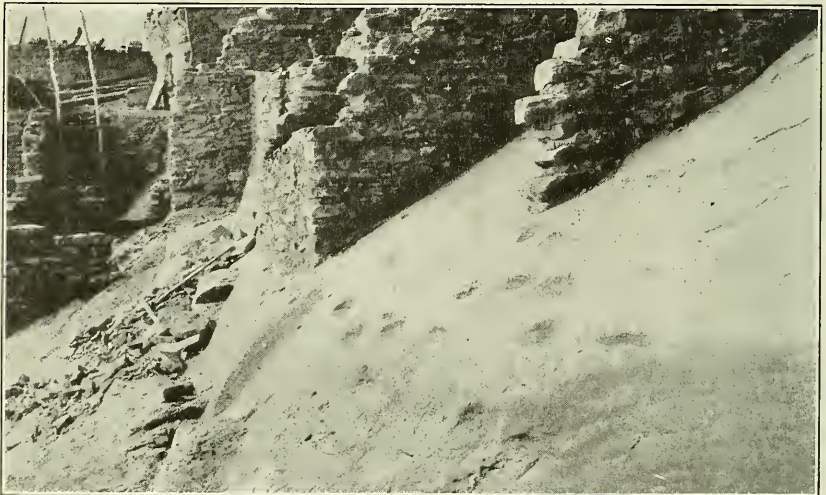
B; BLOWN SAND SOON SETTLED ON THE BARED SEEPAGE ZONE ABOVE THE MAIN CROSS-CAVE TRAIL



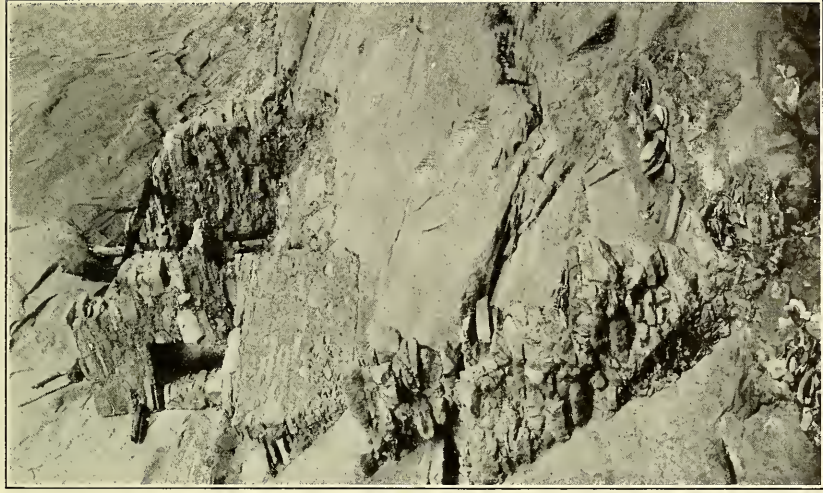
A. THE CENTRAL HOUSE CLUSTER; FROM ROOM 75. IN THE MIDDLE DISTANCE, TWO MEN STAND IN ROOM 51



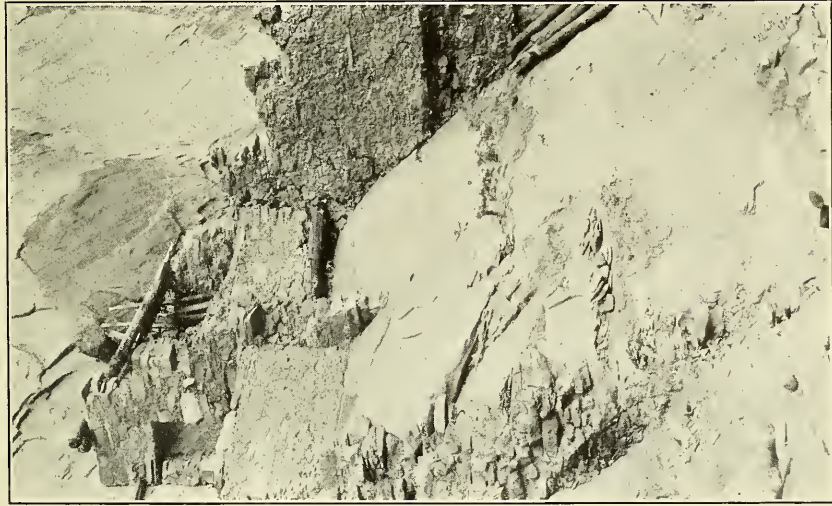
A. THE NORTHWEST WALL OF ROOMS 64-65 (WHICH LATER COLLAPSED) WITH BEAM HOLES MARKING THE FLOOR LEVEL OF THE SECOND-STORY CHAMBER



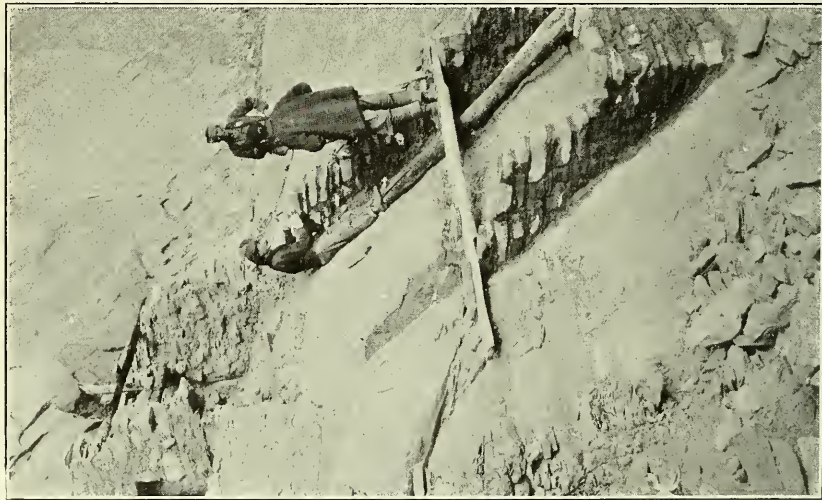
B. MANY BETAKIN WALLS WERE ERECTED UPON SUCH SHALLOW, PECKED STEPS AS THESE, AT THE SOUTHEAST END OF ROOMS 101-102



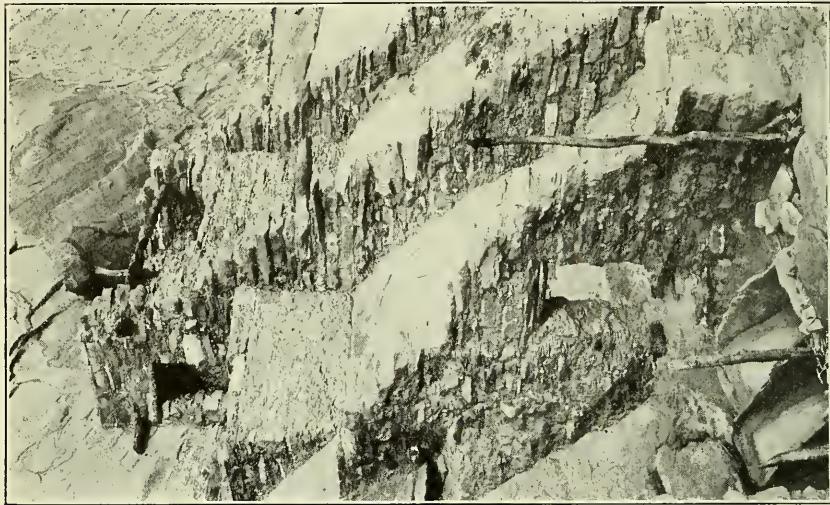
B. AT THE RIGHT, NEW WALL RESTS AWAIT RECONSTRUCTION OF ROOMS 60 AND 64



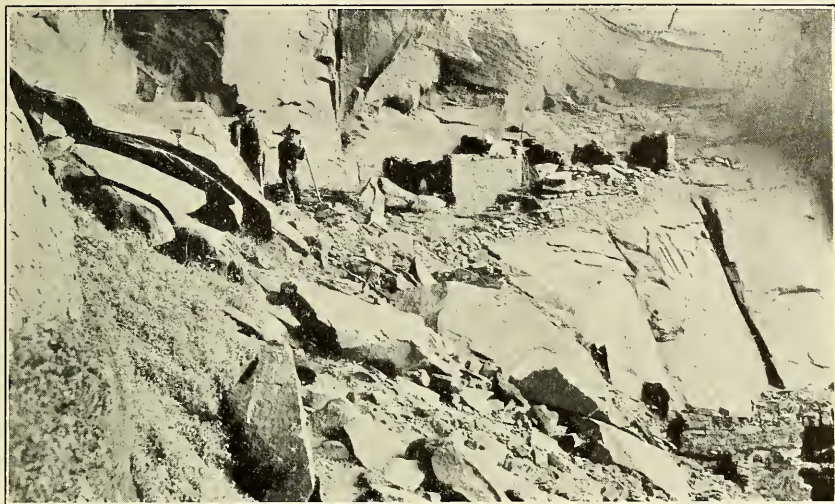
A. PLATFORM 58 AND ROOM 59 STAND ABOVE THE SLOPING SITES OF ROOMS 57 AND 60



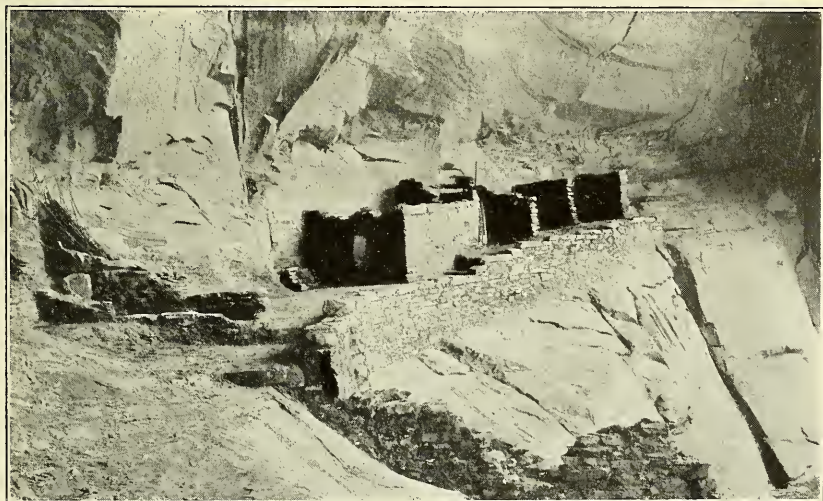
A. RECONSTRUCTING THE NORTHEAST WALL
OF ROOM 60



B. THE PARTIALLY RESTORED WALLS OF
ROOMS 56, 57, AND 60



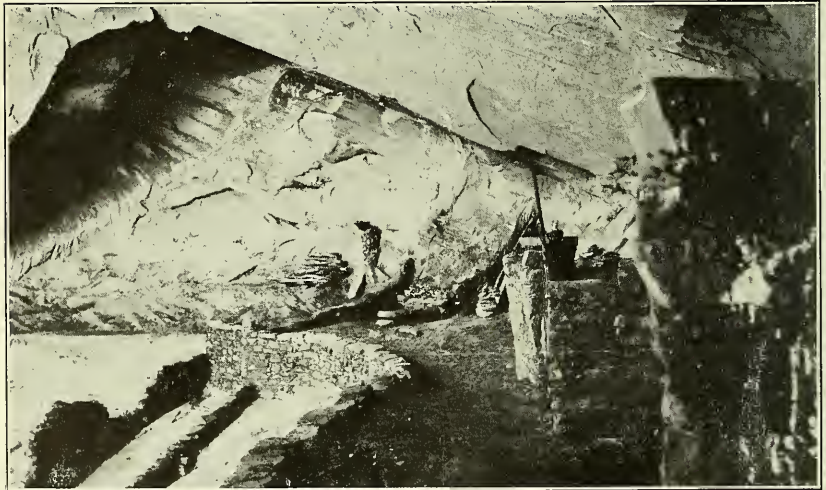
A. THE UPPER, EAST HOUSE GROUP BEFORE EXCAVATION. ROOM 78 SHOWS PROMINENTLY IN THE MIDDLE DISTANCE



B. ROOMS 78-81, AFTER RESTORATION. IN THE RIGHT FOREGROUND, THE REPAIRED WEST WALL OF ROOMS 76-77



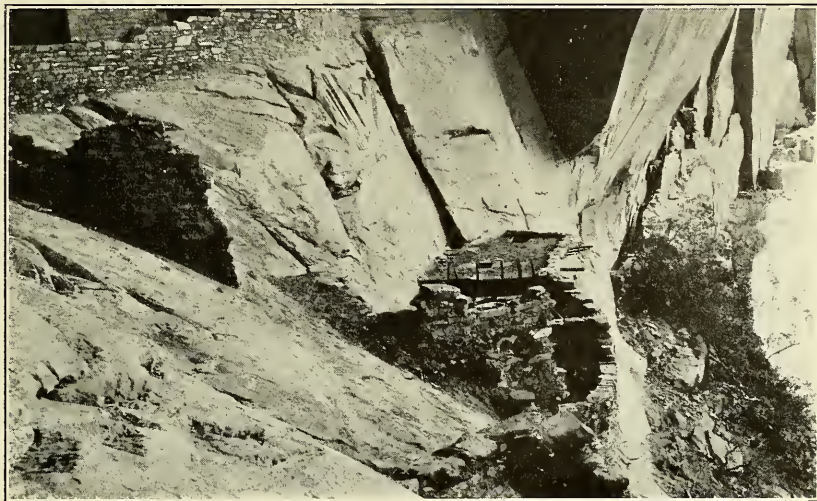
A. HOUSES OF THE NORTHEAST GROUP HAD BEEN DEMOLISHED BY HUGE BLOCKS OF FALLEN SANDSTONE AS THIS VIEW, FROM ROOM 81, PLAINLY SHOWS



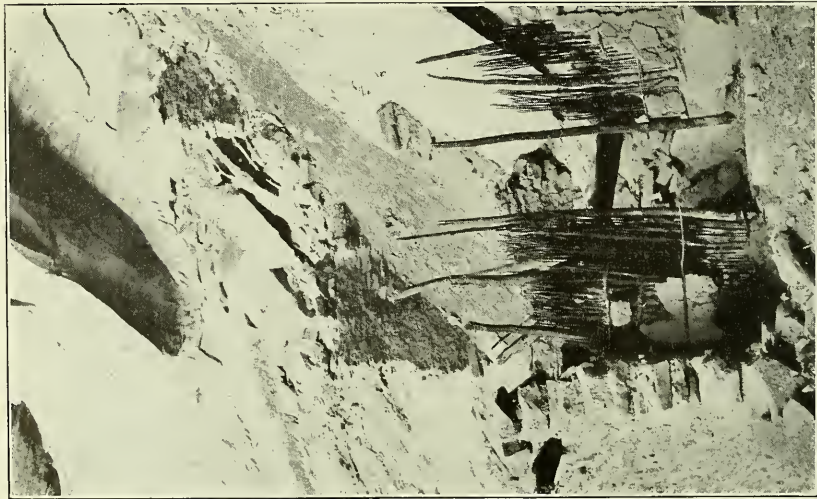
B. IN THE FOREGROUND, THE RESTORED WALK FRONTING ROOMS 78-81. AT THE LOWER LEFT, THE SIDE WALLS OF ROOMS 76-77



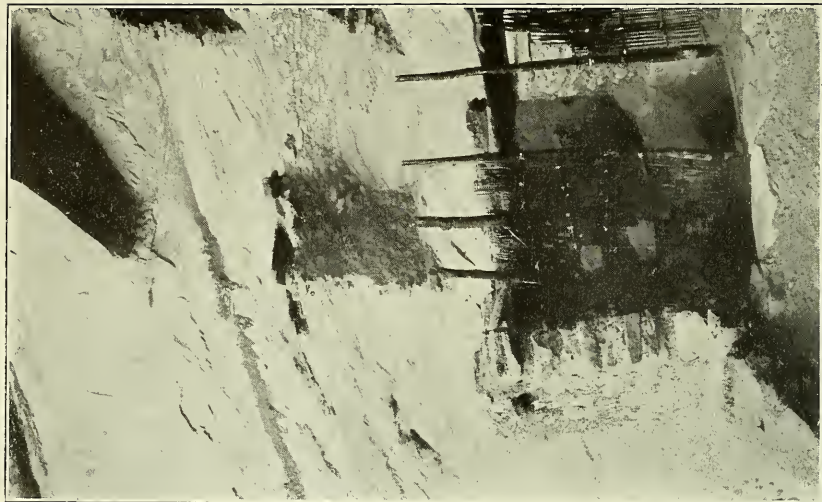
A. MASSIVE SANDSTONE SLABS HAD CRUSHED THE ROOF OF ROOM 79



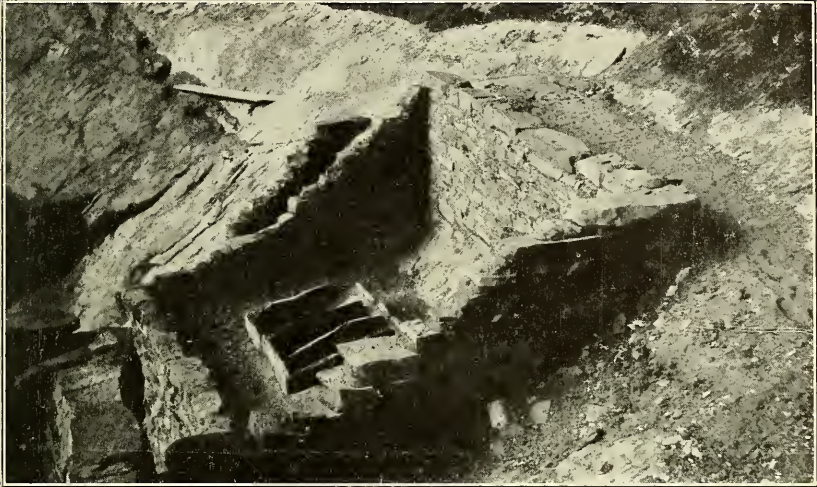
B. THE EAST RETAINING WALL LOOKS DOWN UPON ROOMS 82-85



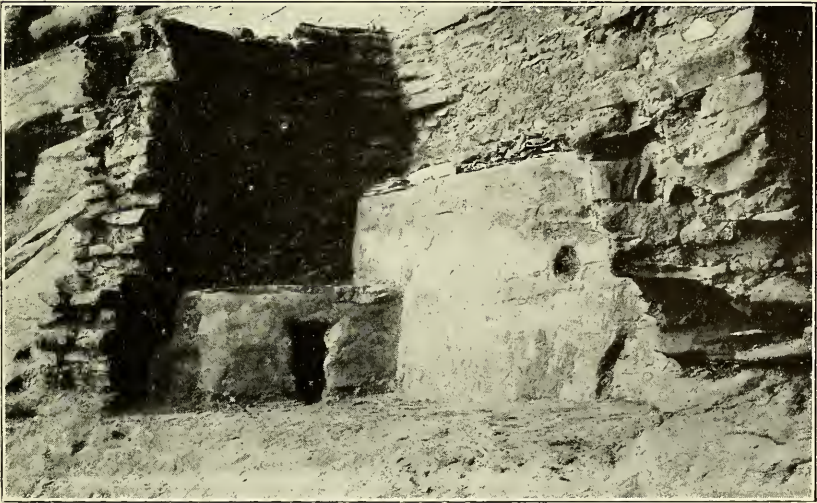
A. THE WATTLE EAST WALL OF ROOM 82 AND, BEYOND, THE BROKEN WEST MASONRY OF ROOMS 75-76



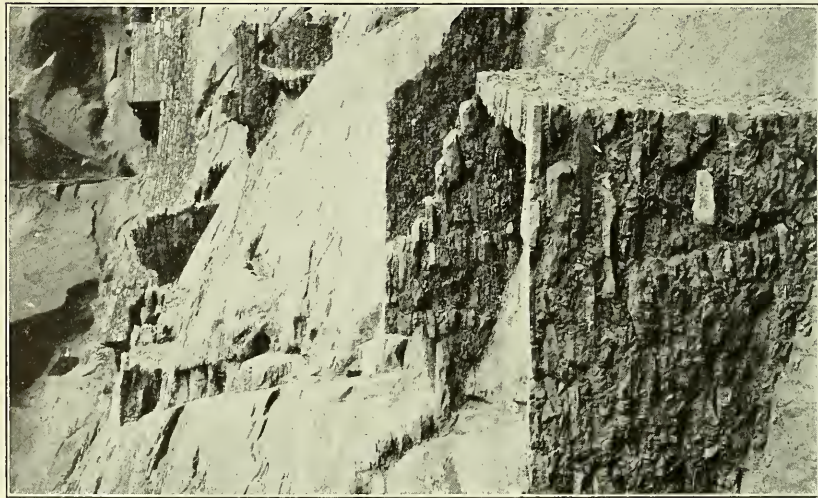
B. PECKED GROOVES AND STEPS ON THESE BARED SLOPES EVIDENCE THE FORMER PRESENCE OF OTHER DWELLINGS



A. WALLS AND MEALING BINS OF ROOM 117, RESTORED; ABOVE, THE PRINCIPAL CROSS-CAVE TRAIL



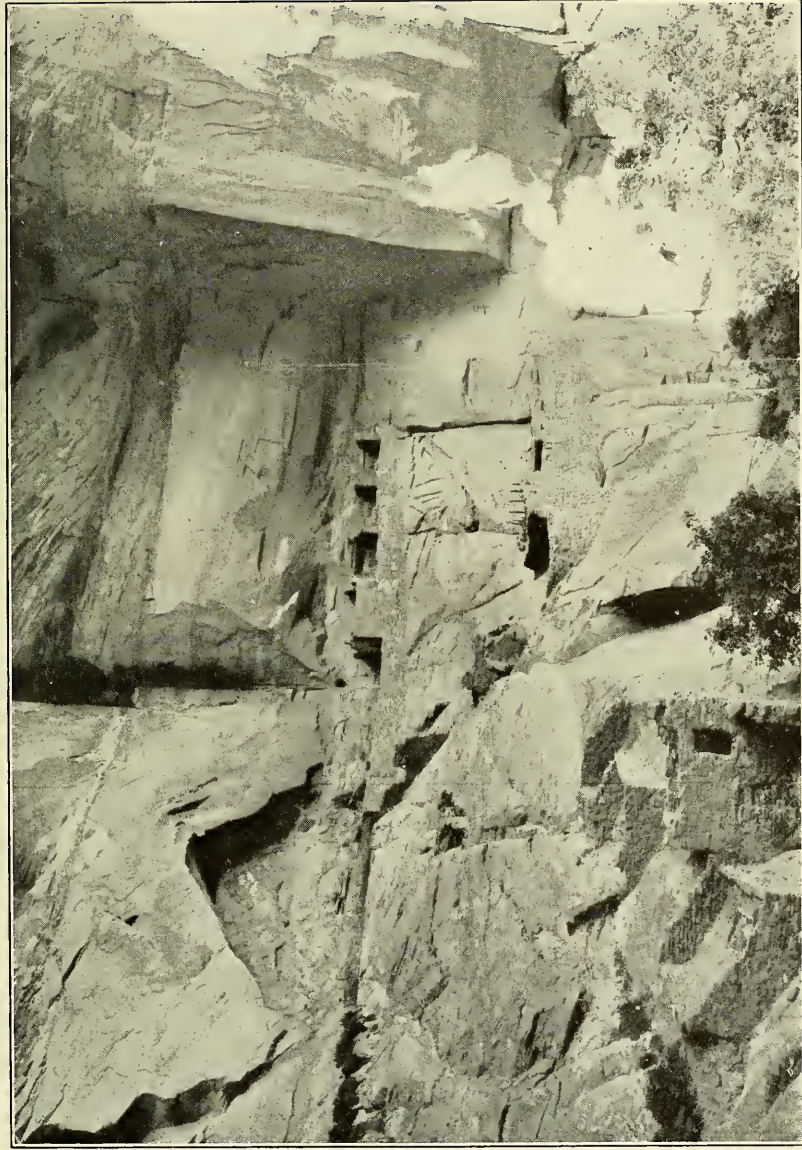
B. THE PLASTERED NORTH SHELF AND CORNER BENCH IN ROOM 55, VIEWED FROM THE EAST



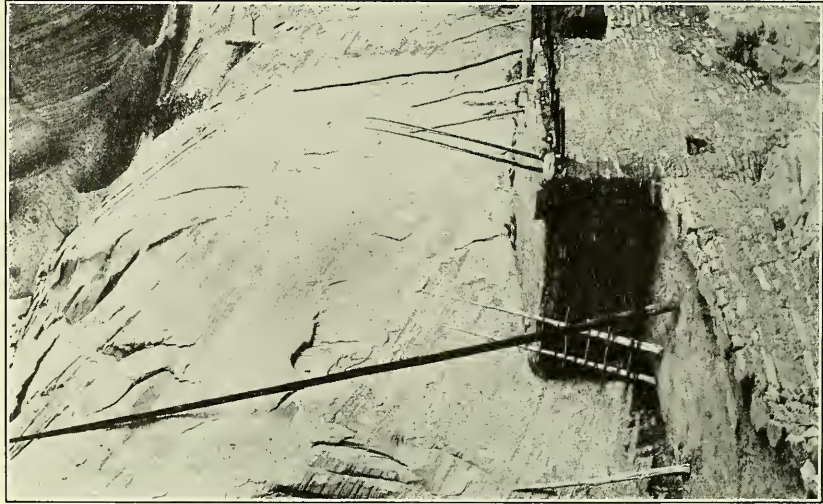
A. IN THE FOREGROUND, RESTORED ROOM 122; AT THE UPPER LEFT, ROOM 73 STANDS ON THE OLD STEPPED TRAIL



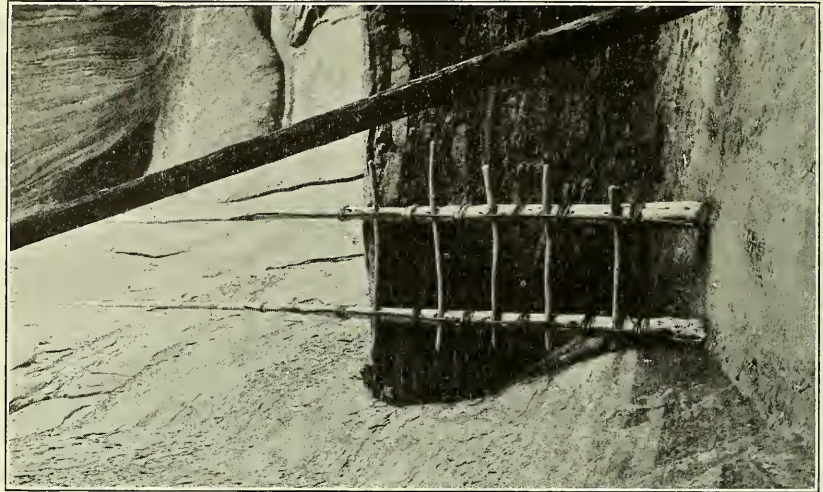
B. FOR REPAIRING THE EAST HOUSE GROUP, MUD WAS DRAGGED UP THE SLOPE FROM COURT 83



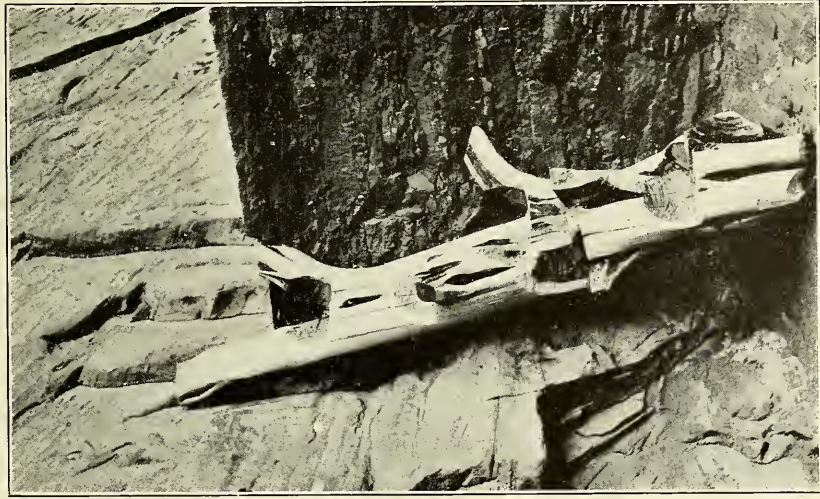
THE EASTERN HOUSE GROUP OCCUPIED TWO SEPARATE TERRACES AND THE SLOPE BETWEEN. RESTORED ROOM 117, AT THE LOWER LEFT. (1926 PHOTOGRAPH, BY COURTESY OF DR. A. E. DOUGLASS)



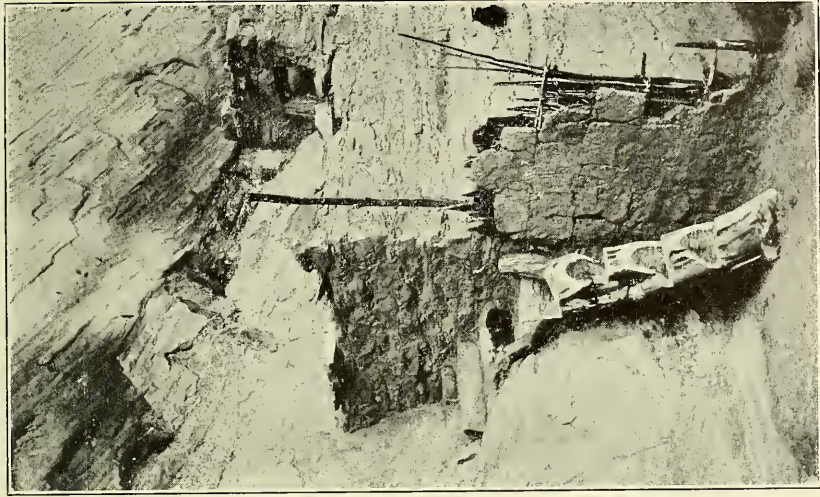
4. A SLENDER POLE FORMERLY PROVIDED ACCESS TO THE GALLERY LEDGE



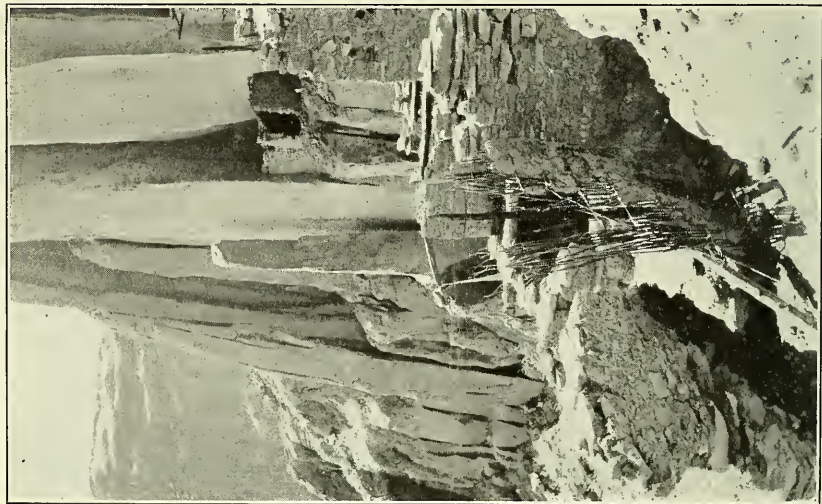
5. IN COURT 10, A LADDER REPLACES STEPS PECKED IN THE CLIFF



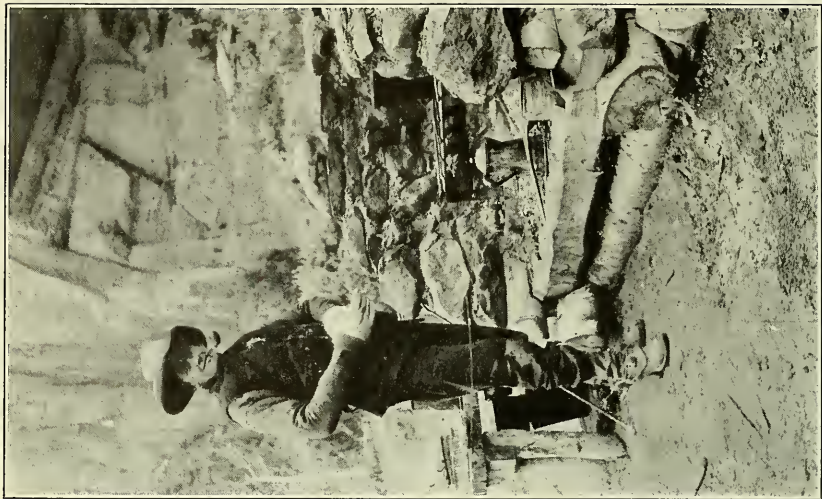
4. A NOTCHED CEDAR LOG STANDS IN THE NORTH CORNER OF COURT 13



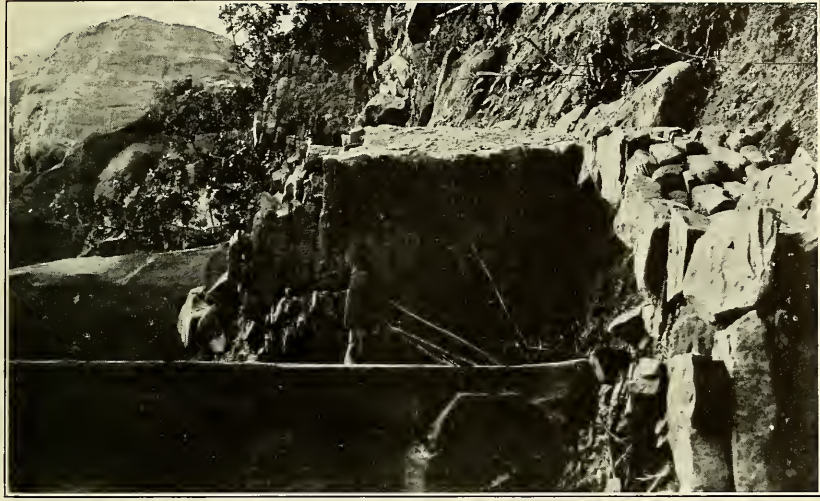
B. LADDER AND STONE STEPS AT THE NORTH CORNER OF COURT 24



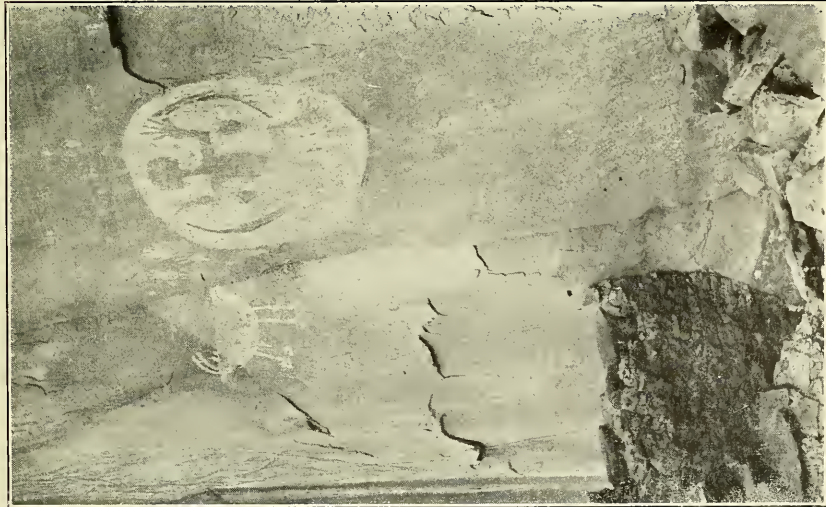
A. VIEW FROM COURT 28; ACROSS THE SOUTH WALL OF ROOM 39 TO ROOMS 1-3, IN THE FAR CREVICE



B. WISE EXPLORERS WILL INDULGE A COOK'S WHIM FOR GLOVES AND SPANISH SPURS



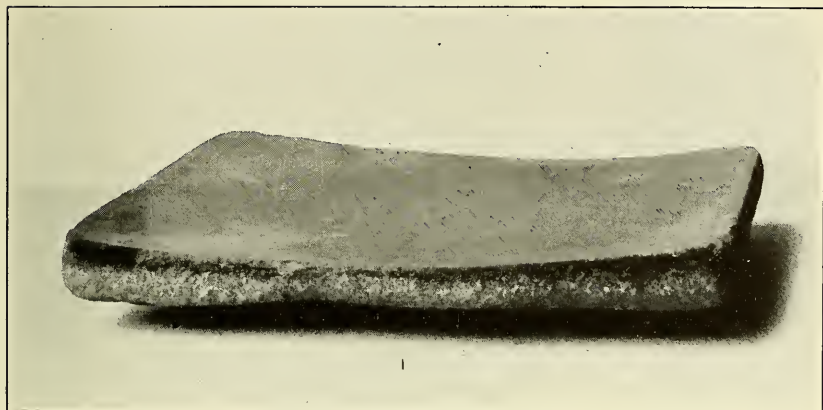
B. ROOMS 86-89, FROM THE NORTH END OF ROOM 90



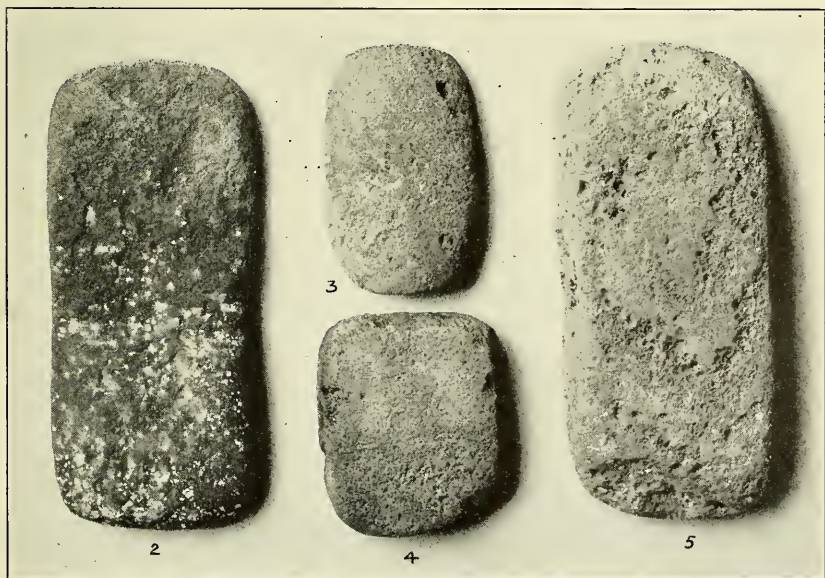
A. PAINTED FIGURES ON THE CLIFF ABOVE ROOMS 89-90



ACROSS THE CANYON FROM BETATAKIN IS AN INCIPIENT CAVE, TOO SHALLOW FOR HUMAN OCCUPANCY. (1926 PHOTOGRAPH, BY COURTESY OF DR. A. E. DOUGLASS)

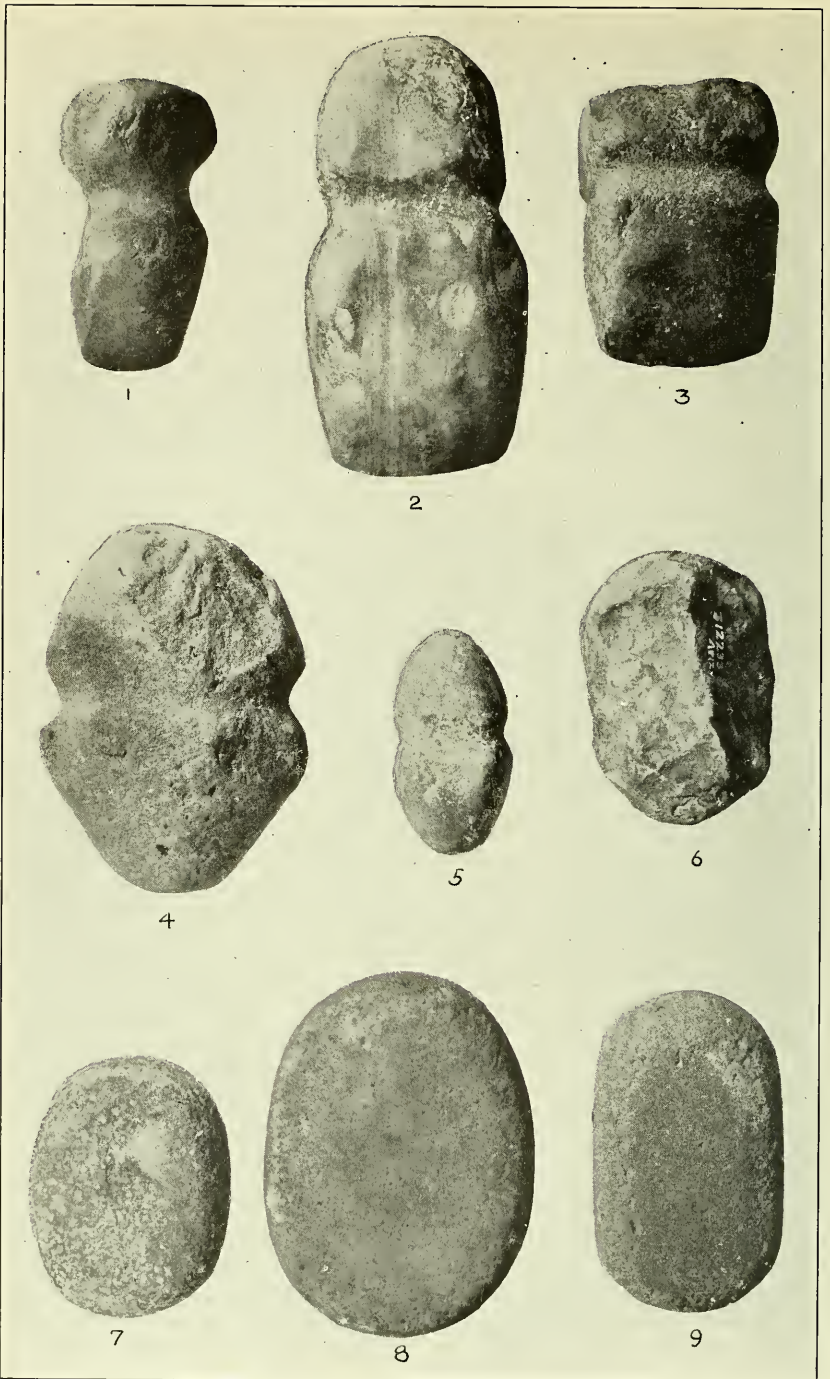


METATE OR MEALING STONE



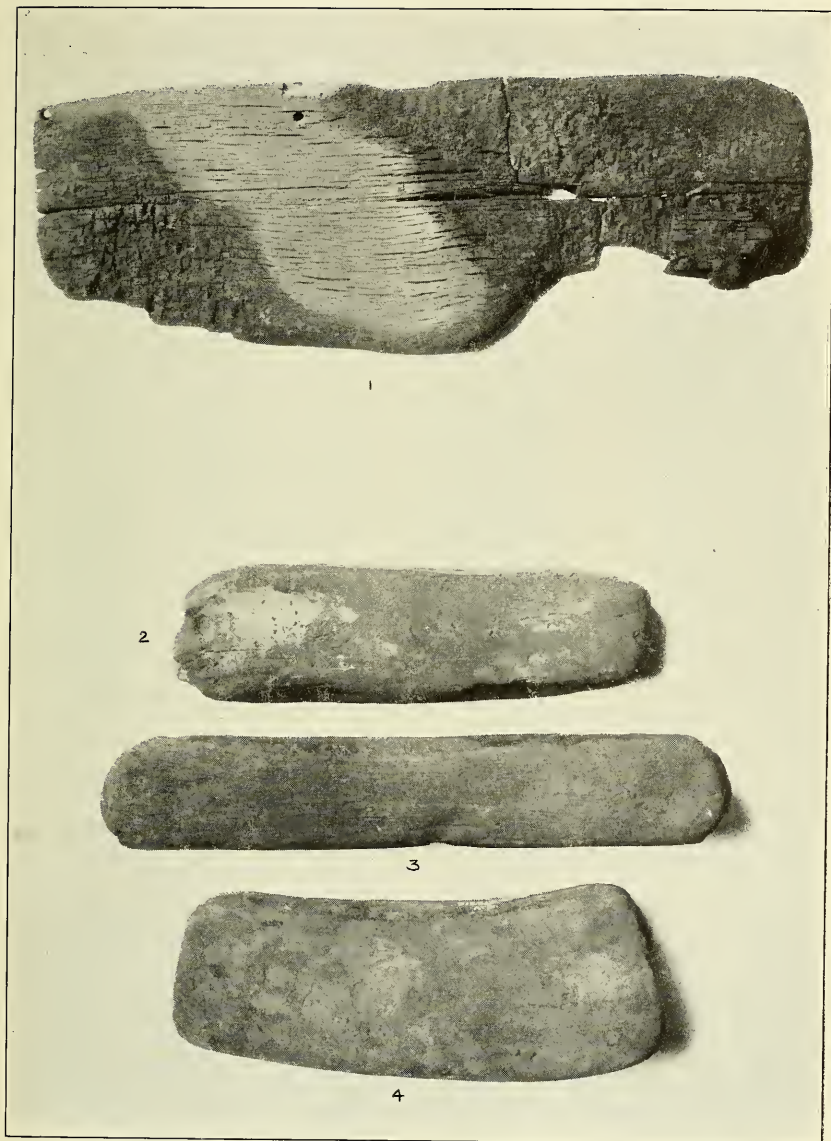
MANOS, OR HAND STONES, USED ON METATES

FOR DESCRIPTION SEE TEXT

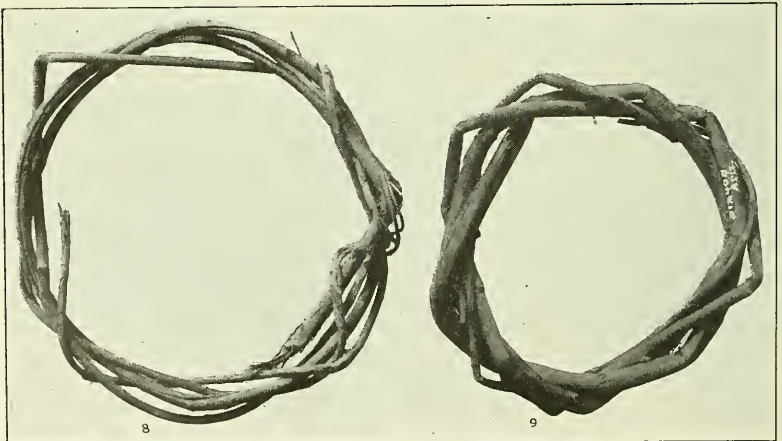
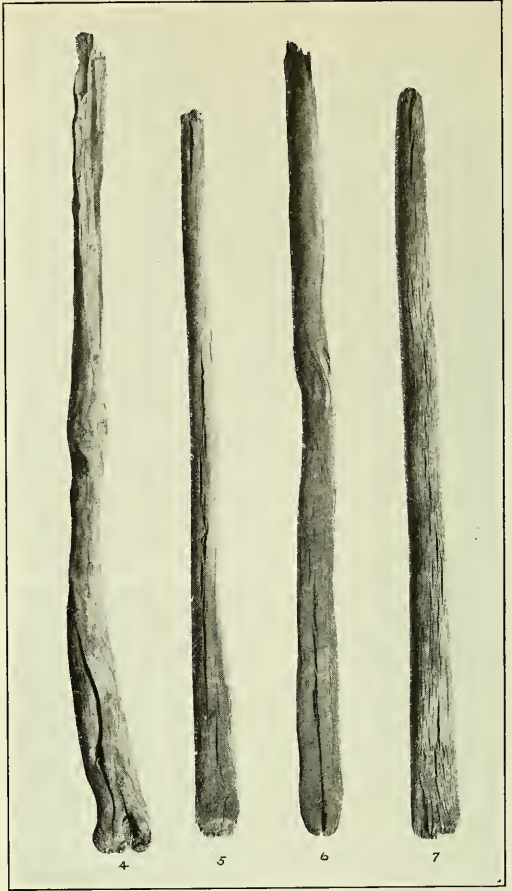


AXES, MAULS, AND SMOOTHING STONES

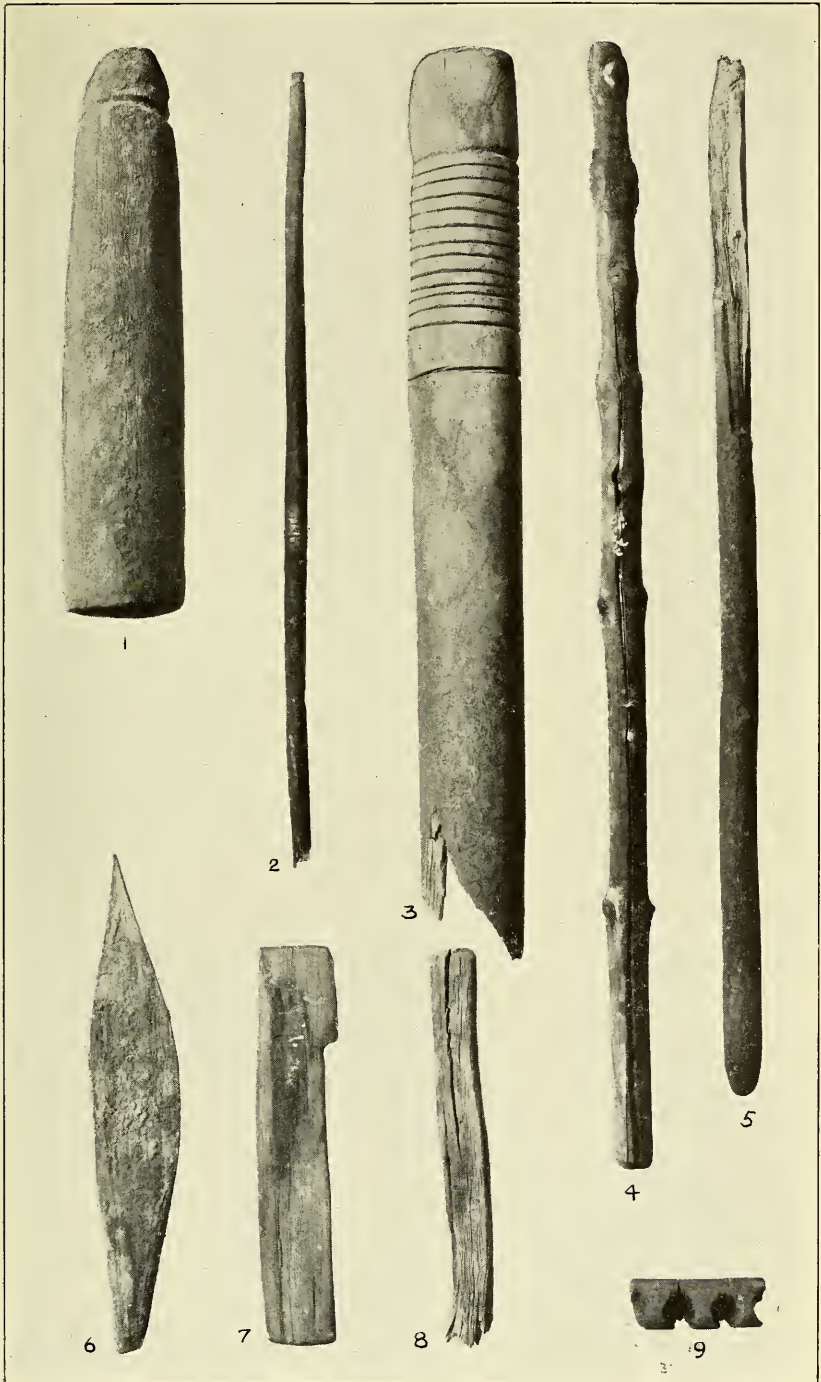
FOR DESCRIPTION SEE TEXT.



DRILLED OAK BOARD AND BILLETS OF COTTONWOOD
FOR DESCRIPTION SEE PAGE 000.

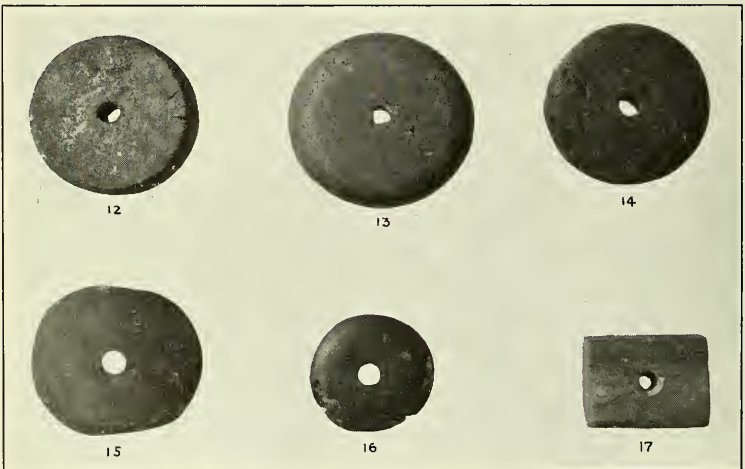
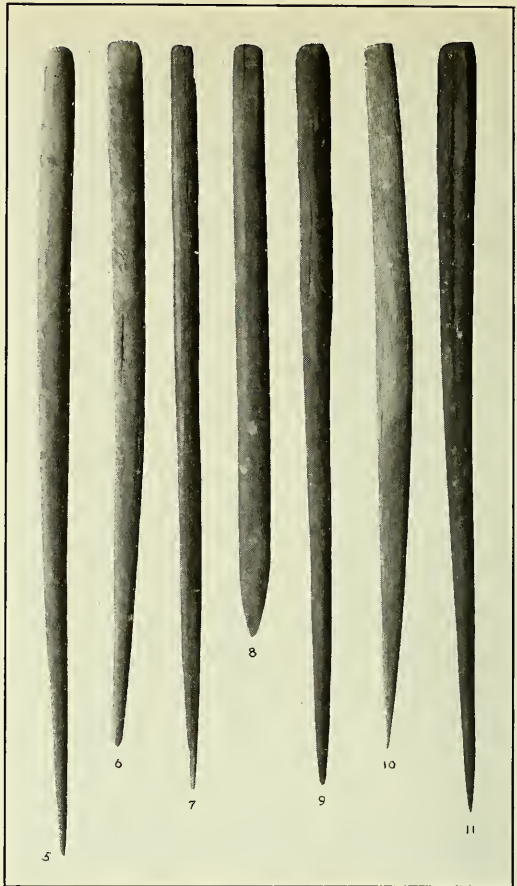


COTTONWOOD STAVES, OAK DIGGING STICKS, AND WILLOW POTRESTS
FOR DESCRIPTION SEE TEXT.



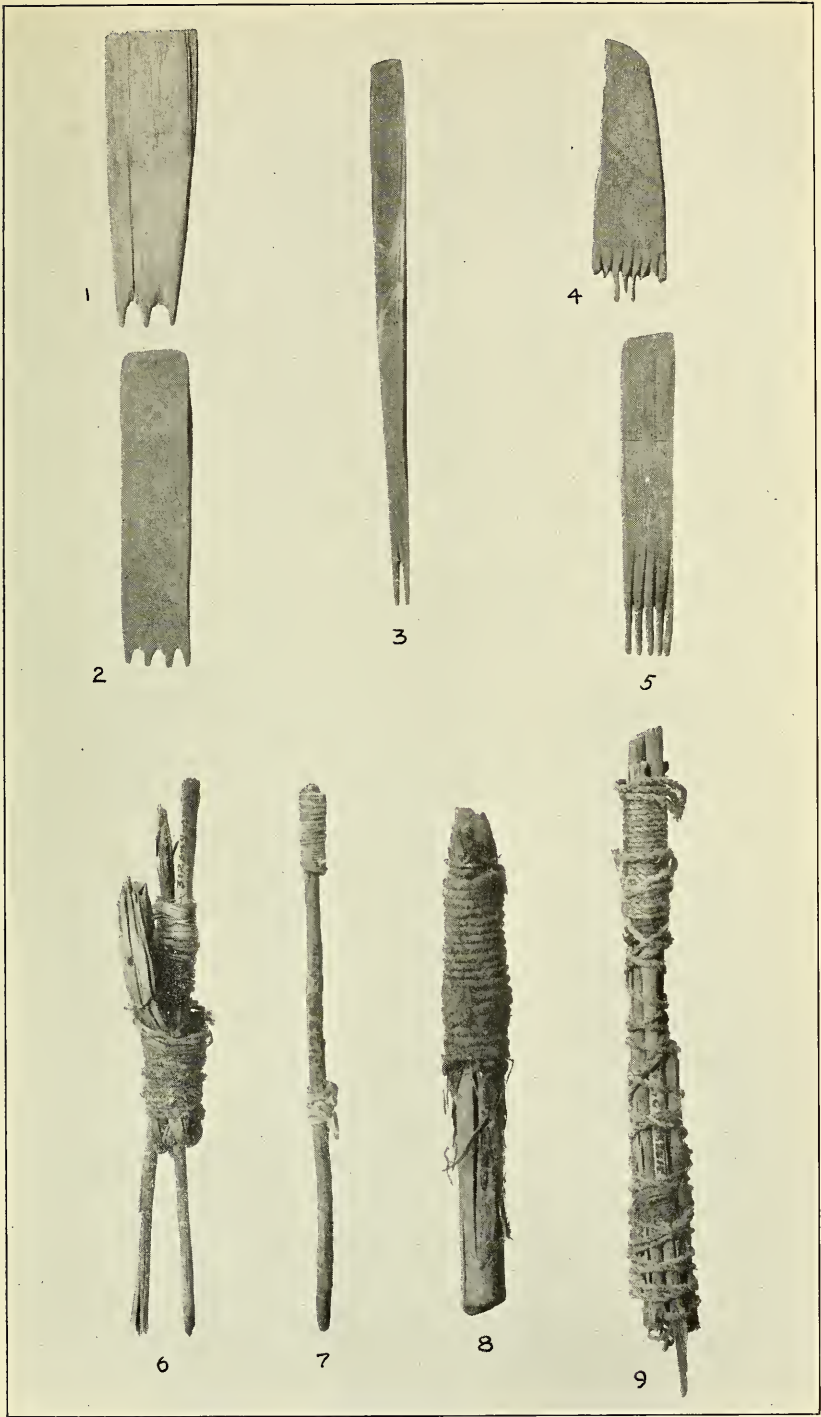
MISCELLANEOUS ARTIFACTS OF WOOD

FOR DESCRIPTION SEE TEXT.



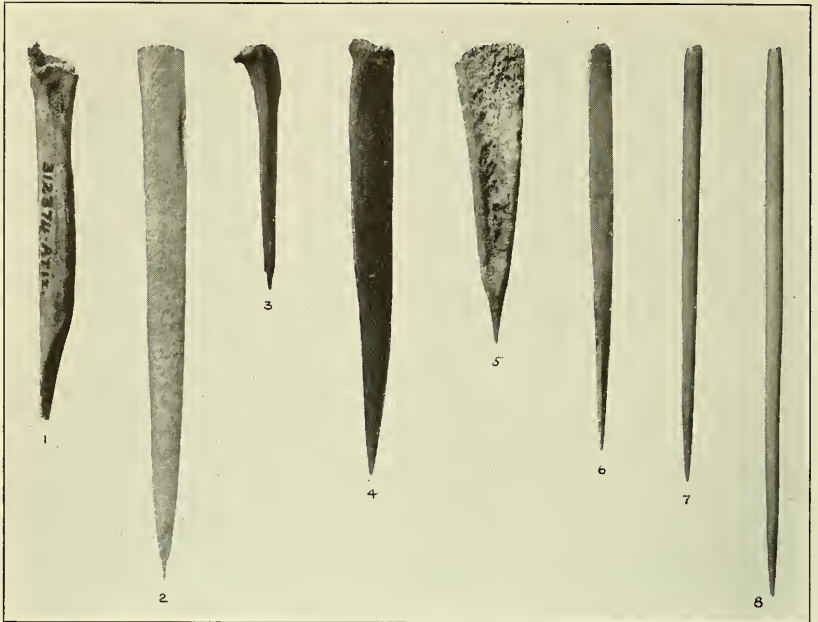
DRILL, WOODEN AWLS, SPINDLE SHAFTS, AND WHORLS

FOR DESCRIPTION SEE TEXT



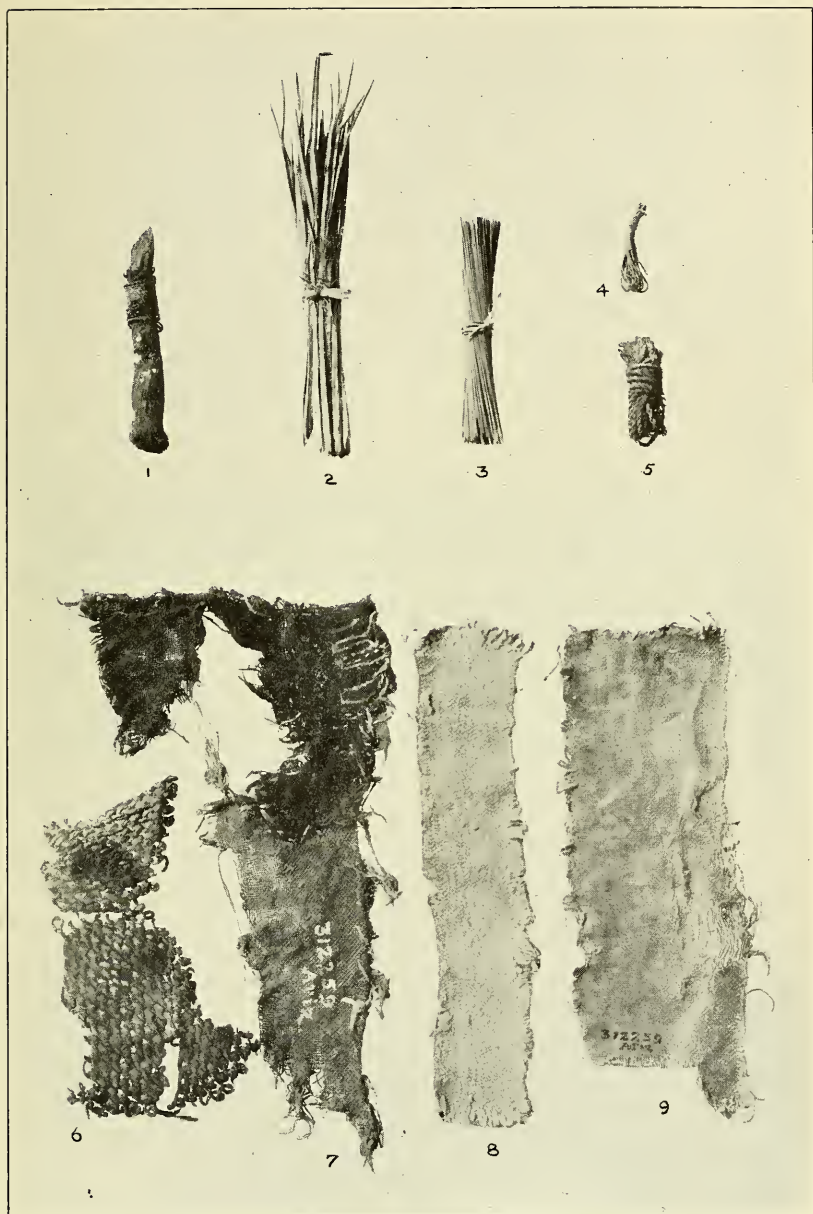
TOOTHED IMPLEMENTS AND CORD-WRAPPED STICKS

FOR DESCRIPTION SEE TEXT.



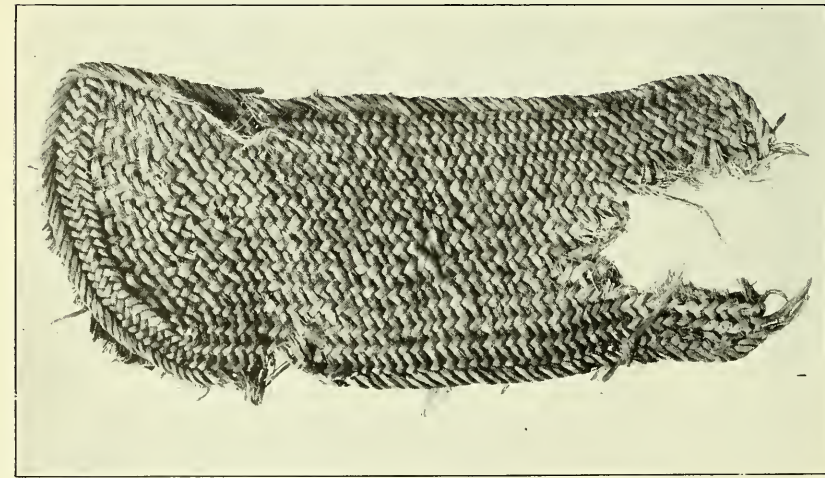
BONE AWLS AND SCRAPERS

FOR DESCRIPTION SEE TEXT

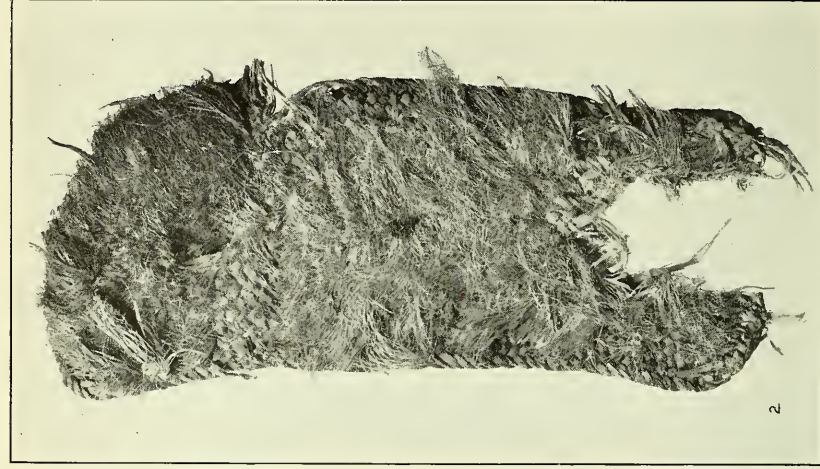


BRUSHES, CORD, AND COTTON RAGS

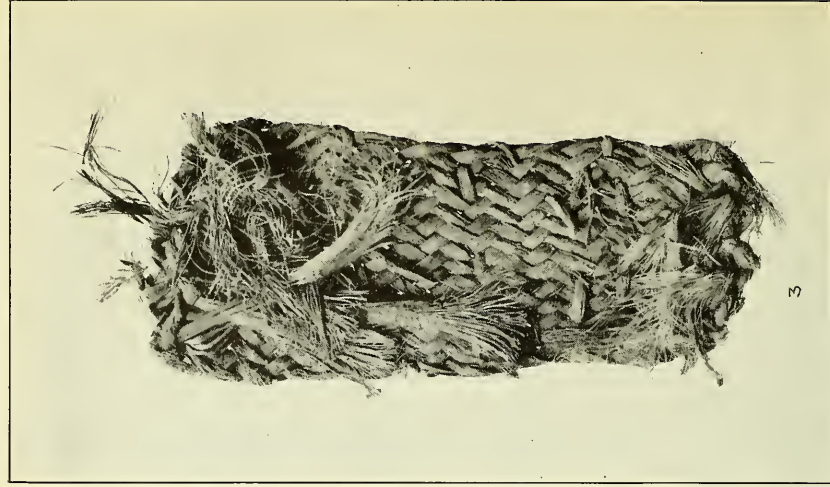
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1



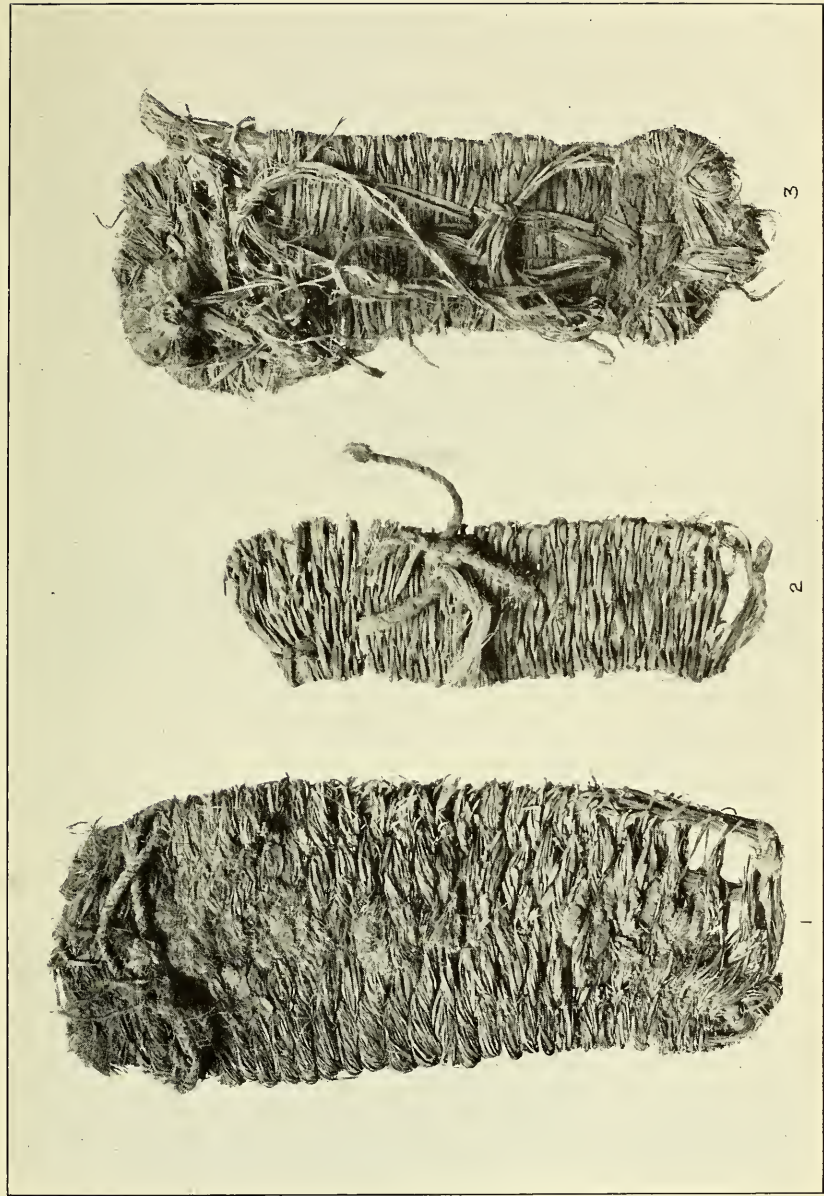
2



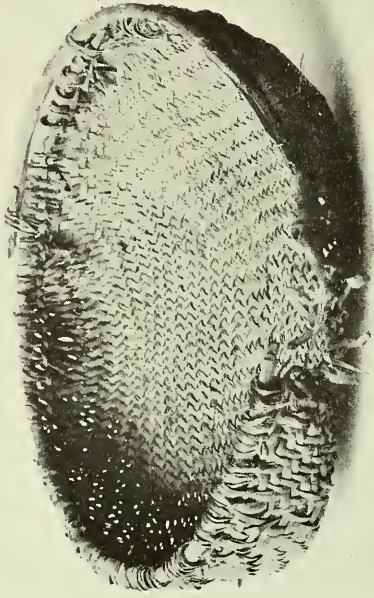
3

TWILLED SANDALS (1 AND 2 SHOW THE SAME SPECIMEN, TOP AND BOTTOM VIEWS)

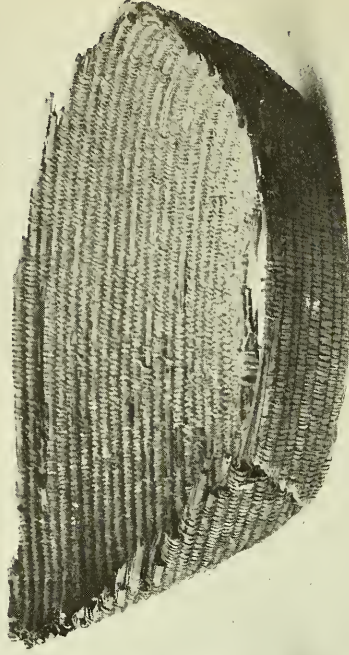
FOR DESCRIPTION SEE TEXT.



WICKERWORK SANDALS
FOR DESCRIPTION SEE TEXT



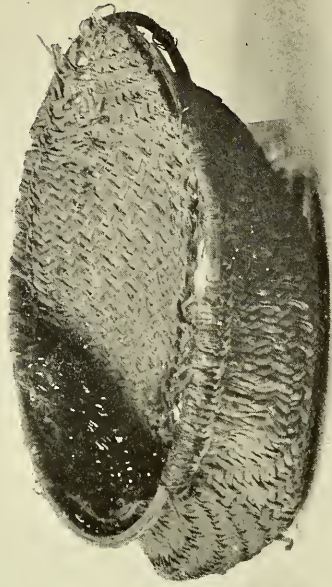
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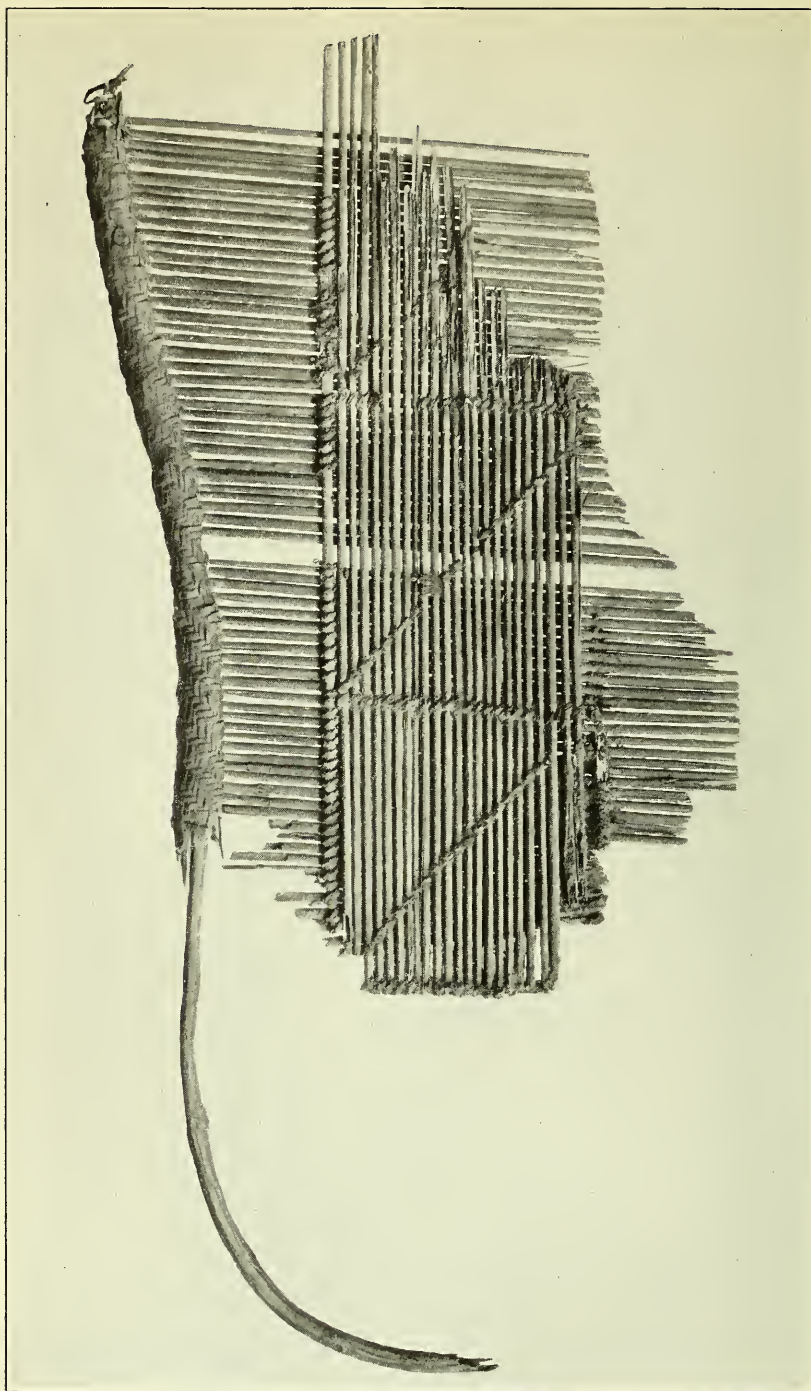
2

BASKETS

FOR DESCRIPTION SEE TEXT.

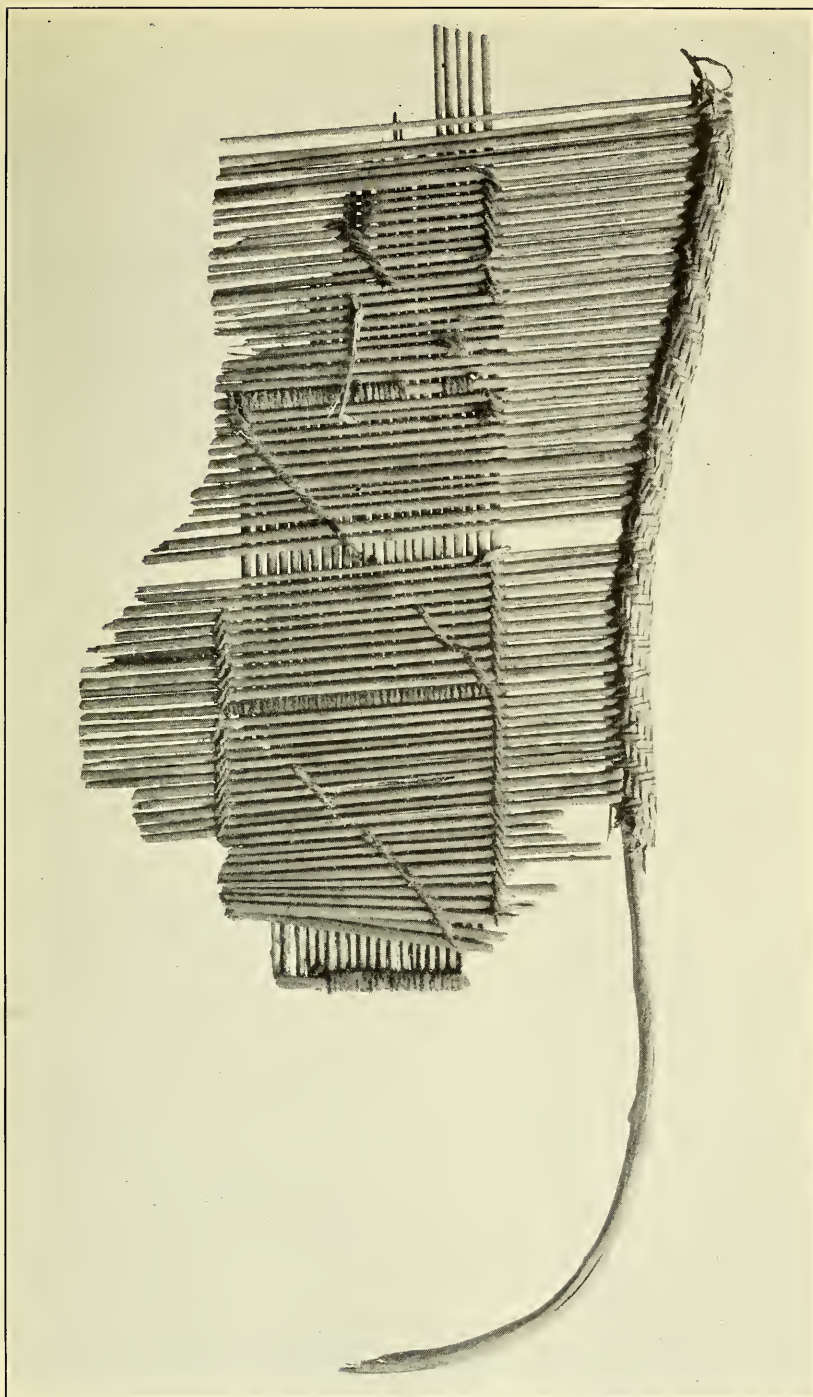


TWILLED BASKETS
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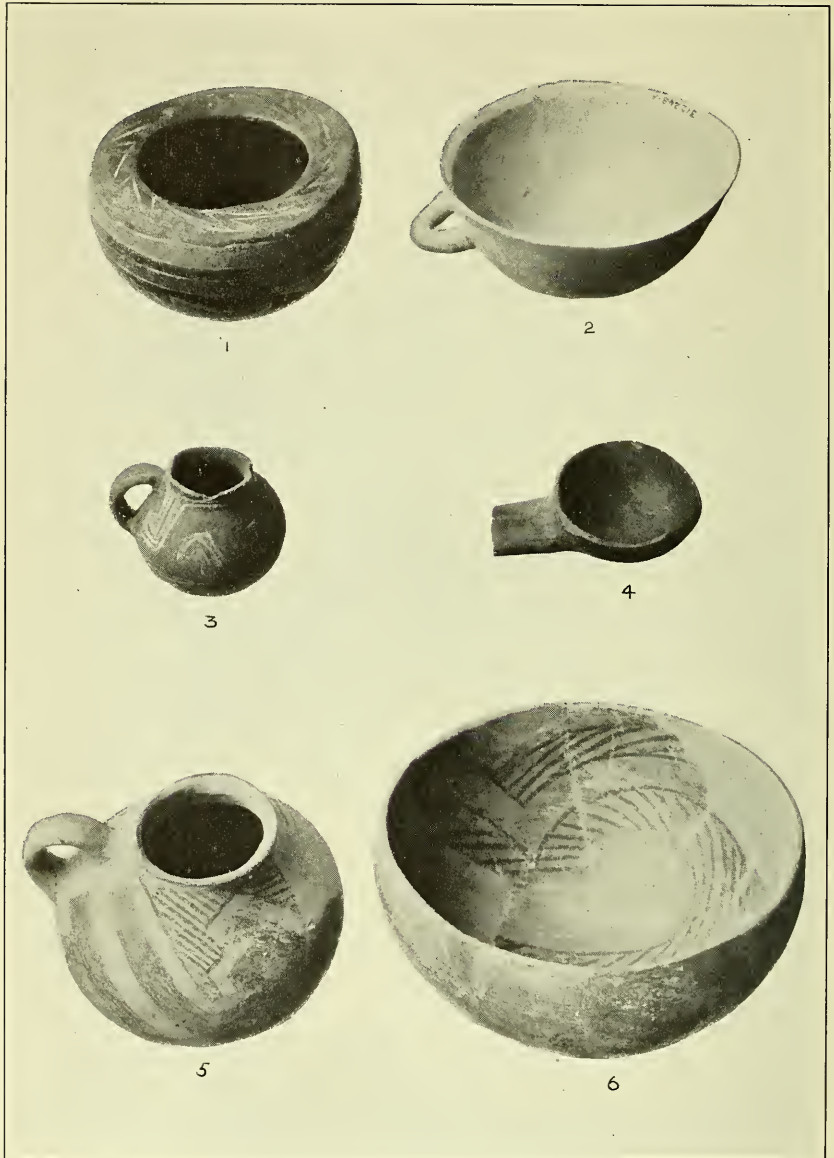
CRADLE—FRONT VIEW

FOR DESCRIPTION SEE PAGE 65.



CRADLE—BACK VIEW

FOR DESCRIPTION SEE PAGE 66.



EARTHENWARE VESSELS

FOR DESCRIPTION SEE TEXT.