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REPAIR AND RESTORATION
OF TUMACACORI-1921

BY

FRANK PINKLEY

DEPARTMENT OF THE INTERIOR
NATIONAL PARK
SERVICE

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REPAIR AND RESTORATION OF TUMACACORI—1921

By Frank Pinkley,

(Ed. Note: While going through the old files the other day on some other matter we ran into the old report of the work done on the Tumacacori Mission in 1921. The original of this report was filed with the Washington Office, but in reading it over we thought it was of sufficient general importance and has enough historical value to incorporate it here.)

Early in the year it was decided to restore the roof over the nave of the church and arrangements went forward so that the work started the latter part of April.

Our fund for the protection of national monuments being so small as to preclude the allotment of an amount sufficient to complete this work, and there being no way of putting half a roof on this year and another half later on, recourse was had to local aid.

Too much credit cannot be given to the local organizations who contributed funds for this work. The National Park Service allotted \$800; the Knights of Columbus of Tucson gave \$100; The Arizona Archeological and Historical Society gave \$160; the Chamber of Commerce of Nogales gave \$600; and the Knights of Columbus of Phoenix gave \$100; making a total of \$1,760 on hand when the work started. In July and August further allotments of \$395 were made from Service funds, so the total amount expended came to \$2,155.

The roof was partly a restoration and in part a modern weather-proof construction. Special sizes of bricks were manufactured and burned and with them the badly eroded walls were carried up to their original height. This included raising the front wall ten or twelve feet in the restoration of a semi-circular pediment which originally formed the upper part of the facade.

Logs were brought out of the mountains, hand hewn, stained to give the appearance of age, and put in the places of the old beams. Ocotillos were brought in from the desert, cut to fit, and placed on top of these beams, forming the ceiling.

Viewed from the interior of the church, the roof is a perfect restoration. A complete restoration would not, however, have been so satisfactory from the weatherproofing standpoint, so above this restored portion we built a modern roof, from which the drainage is cared for through the restored downspouts of the old construction. This modern roof does not show from below, being hidden by the parapet walls of the nave, which extend above the roof line.

Aside from work on the roof, the tower stairs, running from the ground level to the bell arches in the third story, were entirely restored, they having been dug out long ago by treasure hunting vandals.

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (Cont.)

Many other smaller places too numerous to mention were patched and filled wherever it was considered necessary to strengthen walls or remove traces of vandalism.

General Conditions

It must be remembered that the Tumacacori Mission is 18 miles from the nearest town and that, although we had a good motor road to Nogales, railroad shipments were out of the question.

The amount of work to be done precluded the use of labor-saving machinery as the expense of buying or renting it and bringing it out would have more than offset the saving gained by using it.

We were thus forced by circumstances to do the thing which our logic suggested; follow as nearly as possible the methods of the builders in making our repairs. This line of reasoning applied to the men to be used in the work as well as to the methods.

We had the choice of bringing high priced workmen out from town and boarding them in a camp, or of using the workmen of the locality who could live at home while the work was going on. We chose the latter course for several reasons, and while there were times when we were discouraged and thought maybe we had not made the wisest choice, we were at least wise enough not to change horses in the middle of the stream, but carried through the original plan to the end of the work.

The high-priced expert workman would have meant a heavy pay roll over a short period of time and our funds were not arranged so that we could secure them so freely as that would demand. That part of the money contributed by bodies outside our Service could not be obtained on short notice in every case, so it was considered wise to proceed with the work by easy stages rather than to crowd it to a quick conclusion.

Another objection to rushing work of this kind lies in the need of time to note and digest the many points which come up as the work proceeds. Haste would cause many problems to be slurred over, wrong solutions applied to others, and a general tangling of affairs, due to the fact that we were under a heavy daily expense and could not hold up the men to obtain the right solution.

Another factor with us was that the expert workman, be he brick man, cement man, plasterer or carpenter, is not inclined to brook much interference with his methods and more or less friction will be started when one tries to experiment and adapt present day methods to hundred-year-old results.

By using local workmen we reduced our amount of work done per day about

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (Cont.)

20% as compared with the same number of expert workmen; but since our cost per day was reduced about 50%, the net result was a gain, the amount of extra time used in making the repairs not being a serious factor.

I was unable to be on the ground all the time when the work was going on and this was a decided disadvantage. My other duties kept me going back and forth and it was only the last five or six weeks of the work that I was able to be with the boys practically all the time. Questions arise from day to day which need the decision of some person who knows the causes, history, and environment which led to the construction of these walls. In some of these cases, unless the leader is present, the men must choose between delaying the work for a decision or making a guess which may be the wrong one.

We experienced the usual troubles which a Government man on a small job in a semi-isolated position like this will generally find. Since it was a Government job we were expected to pay high wages and be generally generous and easy. The hardest single phase of running a small Government job is in meeting the payroll. So far as possible local funds were used for this purpose so we could draw checks on local banks and pay off Saturday night or Sunday morning for the week just closed; but toward the end, we had to put the men on the Government payroll, which meant a two or three weeks' delay in getting the pay checks. This caused a good bit of dissatisfaction as these men live from hand to mouth and had no means of bridging this gap and feeding their families unless, as in one or two cases, temporary loans were arranged.

The summer rains caused some trouble although they did no serious damage other than flood our storage room in one case and slack two or three sacks of lime for us, and wet and spoil some cement on its way out from town in another.

There is no intention here to point out only those general conditions which were not favorable to us. Many things worked together for our good, but it is human nature to note and remember those things which cause delay and trouble.

We had, as has been stated, a splendid wagon road from Nogales to the mission over which we could bring in material and supplies regardless of the weather. The matter of drayage over this road developed a peculiar twist which puzzled me for some time before I settled on its cause. It was only 18 miles to town, and a man with a two-horse team could have made the round trip in a day, bringing out a 2000-pound load, but I could never get it done that way. The freighter, a Mexican, would hook up a four-horse outfit, drive down to town the latter part of one day, stay overnight and come home the next day with the load. He thus put in two long half days rather than one long day. It took me some time to figure out that a generation or so ago, when this freighter was

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (Cont.)

a young man, the roads in that part of the country were none too good and this trip from the mission to town and back was too much to be made in a single day or with less than a four-horse outfit. This man's mind has not changed with the changed conditions and he still thinks that it is the proper way to get a load from town and far be it from him to depart from the ways of his fathers! Since I was paying for the drayage by the hundred pounds, I didn't consider it worth while to try to uproot this local belief in the old customs in this particular case, so the freighter had his way and used all the time and horses he wanted.

The Bricks

In the restoration of the walls we were to use two classes of bricks; the adobe and the burned brick.

The adobes presented no particular problem excepting that the Mission adobe is much longer and thinner than the common size in use today, being $11\frac{1}{2}$ inches wide, $25\frac{1}{2}$ inches long and $2\frac{1}{4}$ inches thick.

The adobe is a sun-dried brick in common use all through the Southwest for building purposes and perhaps a little description of the method of its making might be interesting. Fortunately we had water near at hand in a little ditch about a hundred yards east of the Mission, which, by the way, must be running on almost the exact line as the one the padres used during the ancient days to irrigate their garden and field. The boys dug a pit a few feet to one side of this ditch, removing and discarding the surface dirt as not fit for adobes. The surface soil at this point had been built up a couple of feet in the last century and it was only after going through this accumulation of past generations that the men pronounced the material good 'dobe dirt. About a wagon load of this dirt was then loosened up in the pit and worked over with the shovels until it was fairly well pulverized. Stones and sticks of any size were picked out during this working. Water was then led from the irrigation ditch by a small trench and allowed to run into the pit while the dirt was turned with the shovels until the boys had constructed a magnificent mud pie. The water was then shut off and some refuse straw was worked into the mud. This straw was to bind the mud together when it was dry and to help absorb the rain when it falls on the face of the brick after it is placed in the wall. The men at this stage prefer to work barefooted with their trousers rolled up above the knees and it is a real athletic exercise to mix a wagon load or so of mud while standing on such insecure footing.

When the mixing is finished, one man in the pit shovels the mud up into a wheelbarrow and a second man wheels it away to the moulding ground. This is a level piece of ground which has been raked and dragged flat with a board. The moulder has his mould ready on the ground and the barrow man wheels his barrow up and empties it directly into the mould which is simply a frame without top or bottom having three

REPAIR & RESTORATION WORK AT TUMACACORI in 1921 (CONT.)

or four compartments the size of the prospective adobes. The moulder then gets down on his knees and rams the mud into the frames with his hands until all the frames are full, when he 'strikes' them by raking the surplus mud off at the level of the top of the frames. The two men then pull the frame up, leaving the newly moulded bricks, like so many cakes of black jelly, lying on the ground. While the barrow man goes back after another load of mud the moulder washes his frame off in a bucket of water and lays it out on the ground ready for the next load.

A couple of days after moulding the bricks are dry enough on top to turn up on their edge. Another two or three days and they are dry enough to stack, or, if they are wanted for immediate use, to be hauled to the job and placed in the wall.

This method of manufacture leaves finger and hand prints on the bricks which dry and become lasting impressions, so that the sign manual of our boys went into the walls in the bricks they made. In tearing some of the top material off the walls to start the reconstruction we often saw these handprints left there by the people who laid the bricks more than a century ago. In one case we found a perfectly preserved cockleburr in a brick when we broke it in two, and in another a little blue bead which had probably once been part of a necklace around some dusky throat.

The burned bricks caused us quite a bit of worry before we finally arranged for a supply of them. Seven sizes of burned bricks have so far been identified in the walls of the mission and I would hesitate to say that these were all that were used.

The most interesting size to us, because it was the hardest to manufacture and to lay, was the one we called indifferently the cornice or moulding brick. It is represented by Figure 1, Plate I, is 22 inches long over its greatest length, $13\frac{1}{2}$ inches wide at its greatest width, and is 3 inches thick. In other words it is the size of seven or eight of our common bricks of present day manufacture. One end of this brick is moulded in a scroll shape and a line of the bricks, standing side by side with this scroll end projecting over the wall, forms the cornice.

When we went to a brick man in Nogales and asked him to quote us a price on 1500 of these bricks, he said they couldn't be made; that they were so big that they would not hold together through the drying and burning processes but would crack and go to pieces. When we pointed out that they had been made by the padres out at the mission, he said maybe they could make them but he would hesitate to do so with the soil he had at Nogales. We finally persuaded him to say he would try 1500 of them at 10 cents each. We were not satisfied with this deal but kept looking for some one who would come out to the mission and burn the bricks right on the ground, for the wagon haul of 18 miles out from Nogales, no matter how good the road, meant a heavy loss in breakage.

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

At last we were able to find a Mexican by the name of Lopez who had had experience in building kilns and burning bricks, who agreed to come out and build us a kiln if we would make up a total of 6,000 bricks. We decided we needed two other sizes besides the cornice bricks to make the proper restorations and, while we would not need as many as 6,000 bricks for this present work, it would be no loss to have some bricks left on hand for future repair and restoration work. The other two sizes decided upon were the wedge shape and the 8 by 16.

The wedge shape brick shown at Figure 2, Plate I, gave us considerable cause for study and it was the better part of two months before we finally decided upon the reason for its shape. Architects, engineers, and contractors, all declared it was built for an arch brick, but all the arches in Tumacacori are built of the plain mission adobes. The wedge shape brick was found too in places where its shape could not be accounted for. It was used on the shoulder or offset of the outside walls, in the pediment on top of the front wall, and one or two other places where the 8 by 16 brick would have given more satisfaction.

The explanation finally arrived at was that it was a dome brick put to a secondary use in all the places we had been finding it. Upon this theory we experimented and found that the bricks laid flat, side by side, with the small end of the wedge pointing inward, formed a circle about seven feet in diameter. Smaller or larger circles could be made by making the cracks between the bricks wedge shaped, at the outer side for smaller circles and at the inner side for larger circles, so that a dome of any size could be started and gradually drawn in at the top without using false work underneath to support it during construction.

This explanation of these bricks checks out with a historical note in Bancroft's Arizona and New Mexico, (Page 385, footnote) where he says: "In 1822 a new church was in process of construction or extension, but work was for a time suspended on account of trouble about the pay for 4,000 head of cattle that Padre Estelric had sold to obtain funds."

Padre Liberos, who was in charge of the Tumacacori Mission from 1822 to 1824 was delayed in his work by lack of funds. He had used up all his standard sizes of bricks in the walls and could not get the necessary funds to burn another kiln. In this extremity he realized that the first thing to consider was protection, and to get protection from the weather for his exposed walls and offsets, he decided to use up the wedge shaped bricks which had been made for the domes over the bell tower and mortuary chamber. He expected, as soon as his funds were available, to go on and burn another kiln of bricks in which he would include another supply of dome bricks, and finish his church, but the church was abandoned before the work was completed.

PLATE I - Brick Sizes Used at Tumacacori

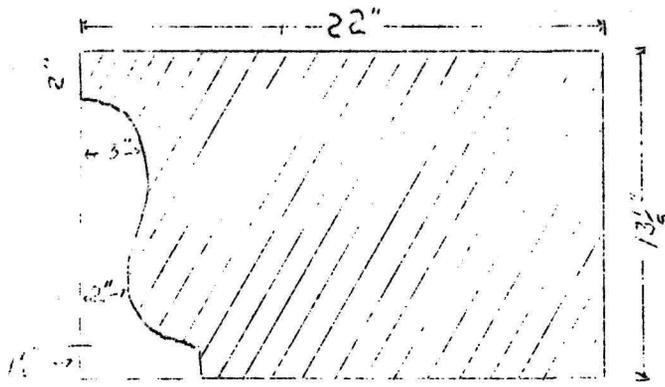


FIG. 1 - Cornice Brick
3" Thick

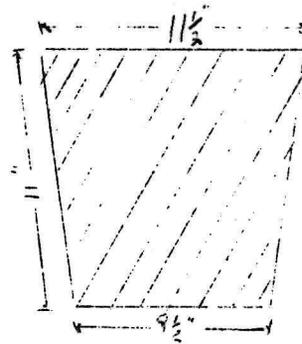


FIG. 2 - Wedge Shape
Scant 3" Thick

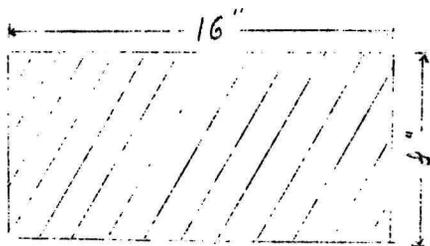


FIG. 3 - The 8x16
3" Thick

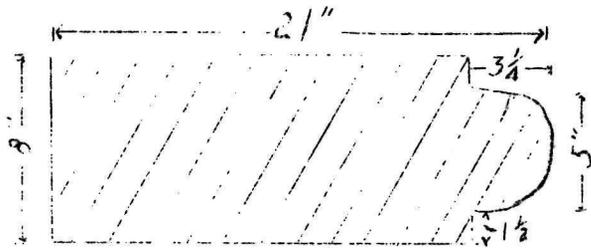


FIG. 4 - Tower Moulding Brick
3" Thick



Present Commercial Brick

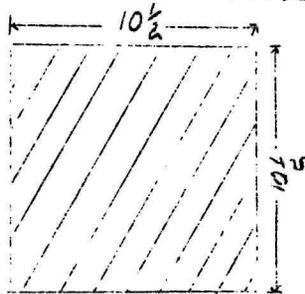


FIG. 5 - Moulding Brick
1 1/2" Thick



FIG. 6 - Floor Brick
2 1/4" Thick

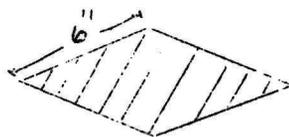


FIG. 7 - Dome Step Brick
2 1/4" Thick

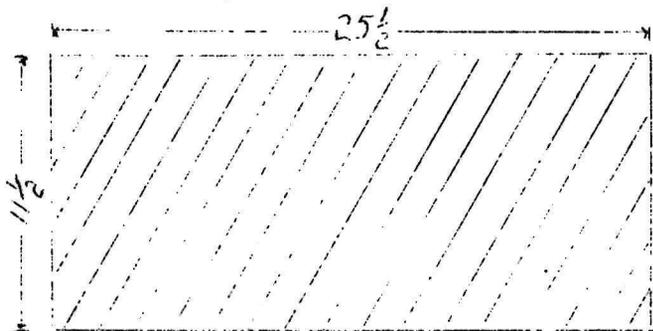
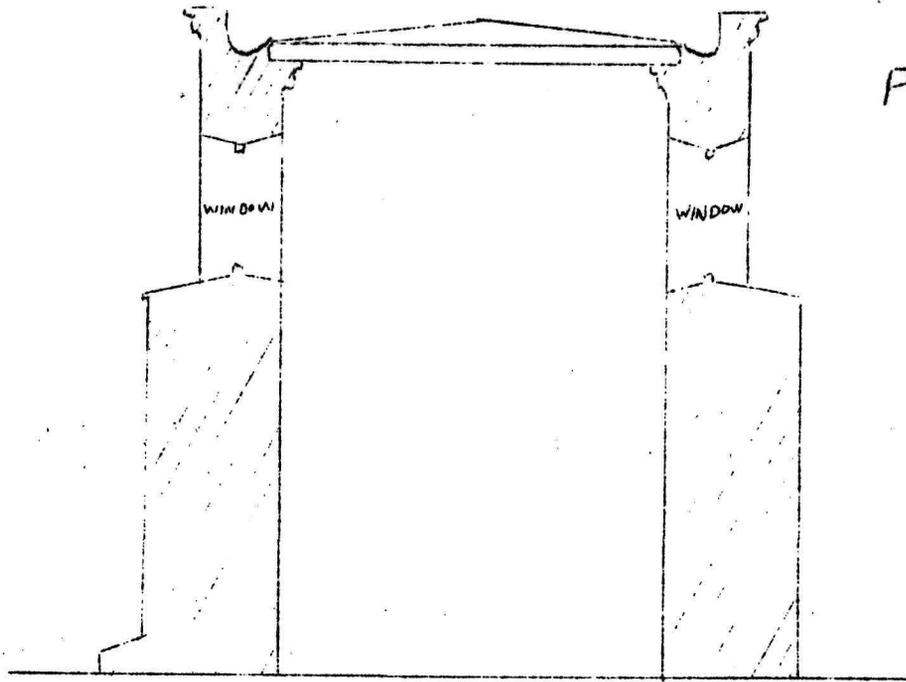
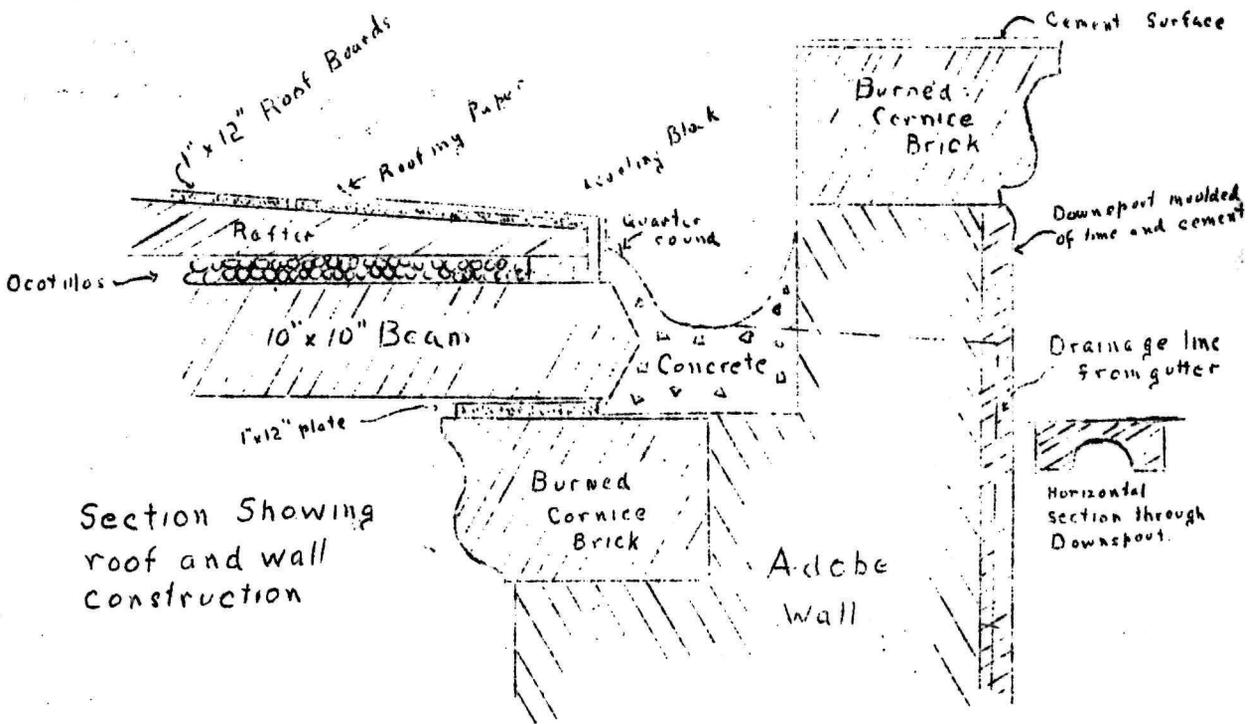


FIG. 8 - Mission Adobe
2 1/4" Thick

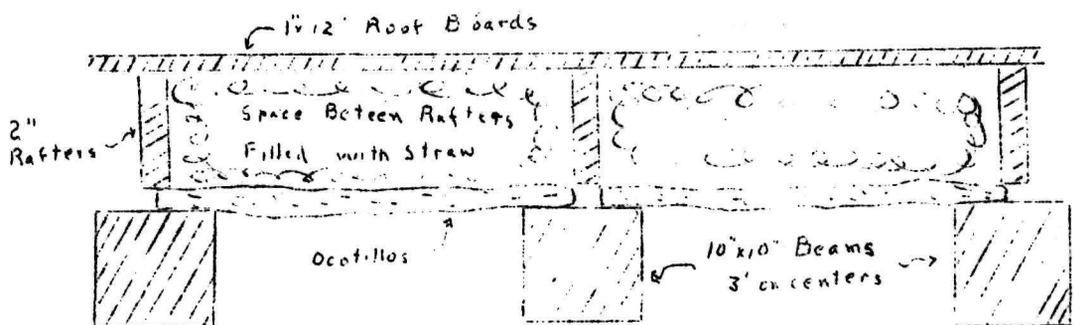
PLATE
II



Cross Section, Tumacacori Mission



Section Showing
roof and wall
construction



Section Through Beams and Rafters

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

We arrived at this solution of the problem of the wedge shaped brack too late to keep us from burning a supply of them, so while it was not really necessary, we restored the wedge shaped brick where we found it had been used with the exception of the pediment at the top of the front wall where we considered the 8 by 16 size stronger for the purpose.

A few words of explanation may be in order about the other sizes of the burned bricks.

Figure 4, is a special moulding brick used in the bell tower, the half round projection forming the moulding which can be seen near the corners of the tower, and the frame which can be seen around the bell arches, are made of this brick. Figure 5, is a thin square brick. A line of these bricks was left projecting at the spring of the arches, just under the bell beams, in the bell tower. They project a little over an inch and were to be covered with plaster, forming a neck mould at the spring line of the arch.

Figure 6 shows what seems to have been intended primarily for a floor brick, although it has been found in one case, at least, in a wall, and in another as a capping for a bench. Figure 7 is the dome step brick. Photographs show a series of 12 steps leading up to the cupola on top of the sanctuary dome. These were for the practical purpose of getting up to the cupola to make repairs should the occasion arise, and for the artistic purpose of breaking the monotonous line of the dome. For a long time I thought these bricks were simply cut to shape out of the 8 by 16 size, but upon close examination they prove to be special diamond shaped bricks made for this particular purpose; only twelve of them were ever used!

The methods used in mixing and moulding the burned bricks did not differ essentially from those described above used in making the adobe bricks. We had to experiment with various amounts of sand and finally mix in a little straw to keep the large cornice bricks from cracking while drying.

After the bricks were well dried they were built into a kiln and burned, nine or ten cords of wood being used in the burning. Their quality, we found when we came to using them, was not so good as the old bricks of the padres. I think this was partly due to the burning; that they would have been better if we had burned them longer, and partly due to the fact that the material we had to use was more or less mixed with the loam of a century's use of the surrounding soil, probably reducing the clay content of our brick as against those of the padres. However they served the purpose for which they were designed and cost us less than they would if we had bought them in Nogales, aside from the saving of the drayage in transporting them and the loss in breakage.

REPAIR AND MAINTENANCE WORK AT TUMACACORI IN 1921 (CONT.)

The Timbers

Feeling pretty well satisfied that we had conquered the question of bricks herewith to bring our walls up to the proper height, we next began to consider where we were going to get the timbers for the roof which was to cover the nave. The original roof was of pine timbers brought from the Santa Rita Mountains, at the nearest point about 20 miles away to the east across the Santa Cruz River.

I went over and looked out the country on the side of the mountains nearest to us, going up the White House Canyon as far as it was navigable for a Ford, and going into consultation with a Mexican up there who had lived in those parts about thirty years. He assured me that the timbers could not be brought out that way. There were some large enough for our purpose up near Old Baldy, but it would be a question of snaking them two or three miles over canyons and washes to a point where our wagons could get to them. Before this I had sent a Mexican over who had spent a day and a half looking out the country and he had come to the same conclusion. I believe we looked over the ground where the padres got their pine timber, but all the large trees have been cut out of that part of the mountains in the last two or three generations.

Balked on this line, we had recourse to some Mexicans who had mined around on the south and southeast slopes of the Santa Ritas and assured me we could get trees of the size we wanted around there. This meant a matter of snaking the trees from the point of cutting some distance to the wagons; a wagon haul of about 12 miles down to the railroad; a rail haul of about 30 miles around to Tubac station; and then bringing them across the sandy Santa Cruz River to the mission on wagons. All this was finally done and we landed 20 sticks of timber eighteen feet six inches long, with an average diameter of about fourteen inches, on the ground.

We could, of course, have purchased timbers of the size we wanted at the lumber yard in Nogales; but there is a certain amount of sentiment to be taken into consideration in work of this kind, and I wanted, as far as we reasonably could, to use the materials and methods of the original builders.

I am sure the original timbers were pine because I have talked with two different men who claim to have seen the mission when a few of the rafters were yet in place and both men agreed they were pine. Not satisfied with this, we traced down a story to the effect that some of the timbers were taken out of the roof by Mr. King in the 60's or 70's and built into a house across the river. We found that the railroad, in building from Tucson to Nogales several years ago had condemned the land this house stood on for a right-of-way, destroyed the house, but had left one timber lying along the right-of-way. This timber laid there until a couple of weeks before we got interested in it when a clean-up gang of

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (Cont.)

section men set fire to the weeds and grass on the right-of-way at that point and burned the timber. We were still able to get our evidence however for, although we lost the pleasure of being able to restore an original timber to the roof, we were able to tell by an unburned portion of one end that it was pine, to get the approximate size of the rafters, and, by measuring the ashes on the ground, to get its length, which checked with the width of the nave of the church.

After getting our timbers on the ground we had our work cut out, so to speak, to get them hewn square and get them up on top of the 24-foot walls of the nave. We were all new to this work but by this time we were getting the habit of developing our own methods as the various needs arose so we got an axe and an adze and experimented until we were able to square up timbers which are passing inspection today by hundreds of visitors as a first-class job.

One day as I was squaring one of the pine timbers with an adze and thinking how, just about a hundred years ago, on this same plot of ground, a priest with his robe tucked out of the way was swinging a similar adze on another pine log from these same mountains, I was called back into the present by the drone of an airplane and, leaning a few minutes on the handle of my adze, I watched the silver glint of the sun on the wings of the plane as the man on fire patrol over the Santa Rita Forest Reserve went off duty and flew home to Nogales, making the 18 miles from our place to town, which would have cost Padre Liberos a weary half day, in about 10 minutes.

We spoke often while we were at work of what the padres would think could they revisit today these scenes of their labors.

When the timbers were squared out we devised our own tackle methods for getting them on top of the walls and succeeded in a couple of days' hard work in lifting them up safely without damaging the walls or breaking any heads. Here they looked entirely too new and white, so we decided to darken them a little to give them the appearance of age. We experimented with some crude oil diluted with kerosene and after painting and repainting some sample beams two or three times, attained what we considered the proper shade and went over all of them. The proper shade was largely a matter of guess-work for we were using the stain in the open air and bright sunlight and it would be seen against the semi-dark ceiling of the roof from the interior of the church, so we had to make it several shades lighter than we expected it to look later on. We were very fortunate in hitting upon the correct shade, and many visitors, looking at the roof now upon entering the church, think the beams are the original ones and are a hundred or so years old.

The Ocotillos

The construction used in the original roof was to set the main

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

beams about three feet on centers and then crosswise over them put on a layer of ocotillo stems, ribs of the sahuaro cactus, or small brush. On top of this second layer was a layer of grass and above this, either dirt, with a lime surfacing in which bits of bricks were bedded to give strength, or the lime may have been put on the grass without the intervening dirt. By a process of elimination we decided the padres must have used the ocotillo stems. The sahuaro cactus does not grow in the vicinity of the mission and the ocotillo stems would have been much better for the purpose than the more crooked mesquite or the small reeds or brush which might be found along the river.

The ocotillo is confused by the average desert visitor with the cactus family, but it belongs to a very small family of its own, Fouquieriaceae, having only one genus and a very few species. Armstrong in "Western Wild Flowers", gives the following description:

"A magnificent desert shrub, when in full bloom, but strangely forbidding in aspect in spite of its beauty. Its many stiff stems, from six to twenty feet tall, entirely without branches, stand up stiffly from the root, like a bunch of wands, and are armed their whole length with terrible thorns, which in the spring are masked with beautiful foliage, like little apple leaves. From the tip of each wand, springs a glorious cluster, from six to ten inches long, and crowded closely together, suggesting a flame and waving to and fro in the wind with a startling effect against the pale desert sand. When the flowers and leaves are gone, the clumps of dry, thorny sticks look quite dead and it is hard to believe that they were so splendid early in the season."

Having decided to use the ocotillos to cover our beams, we began looking for an available supply and seeing what they would cost us. They grew rather sparsely on our side of the river and were back up on a mesa where we could not get to them easily with the wagons, so we decided to bring them over from the other side. This we found to be quite a little job, and before we had brought over as many as we needed, the river got up and cut us off from that supply and we were forced to get the remainder on our side. It was fortunate that we only needed part of a wagon load to complete the work, for it took two or three days persuasion to get the Mexican to go out and gather them on the rough mesa.

Other Materials

Sand was obtainable in two or three washes a short haul from our work, and toward the end of the job an obliging young cloudburst washed down a plentiful supply about thirty yards from our mixing box.

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

Lime and cement were purchased in Nogales as was lumber, roofing paper, and like materials. We found we could not make a straight lime mortar which was strong enough to suit us, so we put cement enough in to make it the strength we wanted.

The Need of Protection

Having explained the sources of our materials, we are now prepared to take up the need of protection and the work itself.

The need of protection, and the primary cause of the restoration done in this work was protection, was very great. Destruction at the Tumacacori Mission has occurred from two main sources; the elements; and treasure seeking vandals.

A century of storm and sun had disintegrated surface in many places and eaten into the adobe walls. Settling cracks occurred in some places, due I think rather to the weight of the walls than to any earthquake, such as destroyed the towers of Cocospera in 1886 or 1887. The tops of the walls of the nave had worn down two to four feet and in some places we had to cut another foot or two off to get down to a solid footing so we could begin to build up the new wall.

The Treasure

Almost all the vandalism can be traced to the treasure hunters. For generations tales of buried treasure have hung around the Tumacacori Mission. If one is to believe all these tales, the padres spent all their time in mining and reducing immense amounts of gold and silver and the church was rich beyond computation.

Most of the vandalism has been done, not on any system but on 'hunches.' A scoundrel with a pick and shovel seems to have felt free to walk into the church any day and dig here, there and yonder without rhyme or reason. It never seemed to dawn on his dull brain that if the padres were hard-pressed and decided to abandon the mission in haste, they would hardly try to secrete any valuables by tearing up a perfectly good cement church floor where the soft earth and broken material would be sure to tell the tale to the first visitor, when they could go out into the garden and dig a hole in the freshly turned earth where a newly covered hole would merge into the rest of the soil and would not be noticed twelve hours after the work was completed.

One school of treasure seekers are trying to use some system in their work, but, so far at least, have not attained any success. In my work as custodian of the Tumacacori I have happened upon four copies of a document in the hands of different treasure hunters, from which they were constructing charts with which they were expecting to find the mines and treasure of the padres.

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

While it is not exactly germane to our subject of the repair and restoration of the Tumacacori Mission, a copy of this manuscript might be of interest, and I will insert a fairly accurate translation here, leaving the distances blank at the request of the person who allowed me to transcribe this copy.

The Manuscript

"One document which dates of the years 1558 to 1668. It expresses as follows:

"The mine which is called 'Virgin of Guadalupe' close to Tumacacori, it will be found at -- leagues, measured from the great door of the church to the south, and from the waters of San Ramon measured to the left---varas to the north. About --- varas before arriving at the mine is a black rock engraved with a chisel. On the rock you will read the inscription CC D and --- varas from the cross you will find the treasure and that is what the letters signify.

"At --- varas after you pass the black rock you will find a small monument in the direction of southwest. It is two peaks which were demolished by powder and fell over the mine in great masses. Without more testimony than the powder put in the cliff the place was abolished forever so people could pass over it and it would never be seen.

"In a certain place exists one square of --- varas in a square inside and outside the mine and the treasure is in the middle of the square. In the mouth of the mine there is silver and gold and white silver. The gold was brought from the mountain of Guachapa close to Tubac. The silver consists of 2050 bars smelted together with 905 of virgin silver. The whole amounts to the value of about 50,000,000 (pesos?).

"Ahead in the same direction to the south at --- leagues from the mine of Guadalupe there is a passway which is called 'Deep Water,' It has at the south, by the road of the passway, a canyon which opens out at the town of Santa Cruz. The mine will be found when you get in the pass. Below the said pass way are 12 arrastas and 12 patios. There is one tunnel of 30 varas which has the name 'Purissima Conception' engraved with a chisel. A tunnel runs to the north and about 20 varas ahead there is another tunnel, small about 100 varas, and it runs to the west. The ore is yellow. It runs 1/2 silver and 1/5 part gold.

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

"At --- varas there is a mine in the direction of north. You will find in this native silver from one pound to at least 5 arrobas, the greatest. This mine will be found covered or hidden by a copper door; it has enormous iron bars, everlasting. The copper was brought from the neighborhood of the mountain of Guachapa in the neighborhood of Tubac, smelted in Tumacacori and was taken with oxen to the mine in the years 1558 to 1658.

"From the mine 'Purissima Conception' to the mountain of Our Lady of Guadalupe there are --- leagues and half way on the road in the same direction there is another mine. It will be found by the name of 'Opata'. It has a tunnel 400 varas long and it runs to the south. The metal of this mine has a lime contact, and about 300 varas from the mouth of the mine there are some inscriptions and furthermore there is a long black mesa from the side where the sun rises and sets. Follow a deep canyon to a rock slide. You will see one inscription made by a bar. Here is a hole 1/2 vara deep and it will last forever. Opposite, to the south of the canyon, you can see the mark of the gold. At the side of the canyon to the north of the mark we have --- leagues from mine Opata to Tumacacori. The mark is to the west.

"On the other side of the mountain you will find the mine of Our Lady of Guadalupe. You will find the letters engraved "P. L. R. 12 Dec. 1508". This mine was found by chance and all her interests remain in charge of Tumacacori. In this mine will be found a copper box. It has a key hanging on one corner. There is a set screw which you open and then there is a rod which you pull out and open the box. There will be all the maps and the great treasure.

"If any one by chance will have the great fortune to find one of the mines he shall be obliged for the good of his soul to give 10% to the mother church.

"In the year 1558 belonging to Tumacacori was a mine by the name of San Pedro which you will find --- leagues from the mine Isabelle. The river is to the north --- leagues and the mine is close to some black rock at the point of the mountains. From this point a trail goes to the mine San Pedro, in a line with a line of the mountains at a point of the bar. The mine is --- leagues from the side door of the church to the west and when the sun rises it is directly in the mouth of the mine, and from this mine you can see the town of Arivaca.

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

"From the Virgin Guadalupe it is --- leagues to the mine San Pedro. There is a landslide of about 1/2 vara from the top to the bottom of the canyon. There is a trail that descends from the mine San Pedro. It comes down to the Virgin Guadalupe in the direction of the south to the mine of San Ramon. The eyes will be engraved in one rock. In the mine of San Pedro will be found enormous slabs of virgin silver, two deposits of virgin silver. There is a wooden door. To the west there is a landslide and in it there is a deposit, and to the east there are others, and at a certain place there are three deposits containing all pure virgin silver.

"And notice is given that any person who finds this mine will be obliged to give to the mother church 10% and repair this church, and the Lord will bless his soul."

(The following notice is appended to the copy of one document which I saw.)

"Notice: The original of this document was in the archives of the parish of Magdalena, Sonora, and from there it was taken by a priest to the museum of Paris."

It will be noticed at once that the dates of 1558 to 1658 given in this document are entirely too early. Tubac, Tumacacori, Arivaca, and several of the names given here, do not appear in history until after Kino's first visit in 1691.

Yet the internal evidence points to the fact that all the copies of this manuscript which I have seen came from some master document. On the face of it it looks like a hoax, yet I know two or three people who believe earnestly that it is an honest document and points the way to real mines and treasure.

The local population felt quite sure we were treasure hunting when we ran some experimental trenches in the odd hours after quitting time in the evenings. The main object of this trenching was to establish, if we could, the location of the older church. We failed in this, but we did pick up a few interesting points in the plan of the quadrangle so the work was not wasted. The trenches were filled up when we were through with our examination, as to leave them open to the elements was simply to invite further destruction. We have two pits still open on an unfinished trail which we hope will uncover one of the bells.

The Lost Bells

That the Tumacacori Mission had a bell in each of the four arches

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

of its bell tower can be seen by an examination of the tower today. It must be remembered that in these missions the bells were not mounted to swing as are our church bells of the present time, but the bell was hung in a stationary position and the rope was attached to the clapper, so the bell was really tolled instead of being rung. A great beam of oak brought out of the Tumacacori Mountains west of the Mission, is still bedded in the walls of the tower at the top of each of the bell arches. The beam in the south arch shows the marks made in it by the rawhide rope by which the bell was hung. Since this was the front arch, and the bell hanging here would be the one most often seen from below, it is reasonable to believe that the largest bell hung in this arch. The person ringing the bells would have stood almost under this south bell, making the pull of the rope here slightly different from the others, probably imparting a slight swaying motion to the bell, which has caused the rope to chafe the beam. A bell hung in the east arch as is proven by the marks left by its ringing rope. The piers of the tower are so large that the rope running from the clapper of the east bell to the place where the ringer would stand in the south arch, cut into the corners of the piers between these two arches, so that today you can see six or eight deep marks, some of them almost a hand's breadth deep, which the rawhide rope cut into the bricks in sawing back and forth whenever this bell was rung. The same marks can be seen where the rope from the bell in the west arch cut into the corners of the southwest pier of the tower. If the bell in the north arch had always been rung by pulling its rope from the south arch, we might now have no evidence of its existence; but for some reason the ringers sometimes pulled its rope over through the west arch, probably while standing on the roof near that arch, and so the rope left its story on the northwest pier of the tower. It may be taken then as a fact that at one time four bells hung in the four arches of the tower.

Legend has it that, shortly after the abandonment of the mission, the bells were buried by the Indian neophytes to prevent their destruction or removal. I am inclined to believe this legend is based on facts. The bells were so heavy that their transfer further south would have been more or less of a problem; they were not needed further south either, for, owing to political disturbances in the period of 1820-1830, the church was having a hard time holding its own without expanding and building new churches which would need new bells; and I think the padres expected, when conditions grew more favorable, to return and re-establish the mission at Tumacacori. The legend was strengthened some years ago when a Mexican or Indian man turned up in Tucson with two bell clappers which he claimed belonged to the bells of Tumacacori. The people connected with the university made up a small purse and purchased them from the man and they are at present in the university museum. They have every appearance of being hand hammered and are crudely shaped. The man claimed that he had dug these up, knowing from the story which had been handed down through his family where they were buried. For some

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (Cont.)

reason, according to this man, the bells and clappers were not buried together, but if the family story was true, then he knew where the bells were.

He was offered a further sum if he would bring in the bells, but he reported afterward that either the story was wrong or he used the wrong landmarks, or some one else had removed the bells, for they were not where he had dug for them and he was unable to locate them.

One day, while we were at work on the repair of the mission, an old Mexican who had been born and raised at Tubac, which is about 3 miles away, came over to smoke and talk awhile and incidentally asked why, since we were fixing the mission up, we didn't hang one of the bells in the arches. Upon our explaining that, like the immortal Barkis, we were "willing" but did not know where the bells were, he said he knew where one of them was. He then went on to say that he had known from boyhood by the local tales, where the bell was buried, but had not dug for it until about 35 years ago when a rumor became current that it had been removed. Upon this, he and another man came down to the mission and sunk a pit about eight feet deep where the bell was supposed to be located, and found it. Having proved that it was still there, and having no reason to remove it, they filled the pit up "And," he very logically concluded, "if no one else has taken it away I suppose it is there yet." He said it was at the foot of the bell tower about three feet out from the wall and he would show us the exact spot some time when no one was around. Upon this offer I told him that if what he said proved to be true I would raise a fund of \$25 to repay him for his care in keeping the secret and delivering it to us.

On the strength of this story we sunk a pit about four feet square and eight feet deep on a spot he pointed out, but the dirt we took out had not the appearance of having been turned before and there was no bell at the bottom of the pit. We then set over about eight feet to the west and started another hole, thinking we would go down on this, run a drift between the bottom of the two pits and explore a little from the sides of both of them before we gave up. So far we have not had time to do this and I am unable at this time to either prove or disprove the old man's tale. This trenching was all done at odd hours and toward the end of the repair work I was working ten or more hours a day on the mission and had no extra time for this bell hunt. We did develop a lead which had us excited for a while. In the second pit, when I had gone down a foot or so, I uncovered a rotted stick standing vertically and axe marks on it proved it was not an old root of some bush which had grown there. The ground, too, had undoubtedly been turned once before. "Ah!" we cried, "the old man, when he found the bell, left a marker which he has forgotten to speak of." Needless to say, we worked quite earnestly after this and were soon down to a depth of about four feet when the shovel grated on a metal object!

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

It proved to be an old bucket.

I know now that a couple of the Alegria boys had prospected for this bell in that pit about 16 years ago, but, becoming discouraged, had laid this joke which took so long to come to light. It was a good joke on us. However, they had stopped at a depth of four or five feet and the old man was quite sure his pit was over his head when his shovel touched the bell. So this old prospect hole didn't go deep enough to prove that the bell is not there.

The Pilar

A very heavy rain during the rainy season sent a large amount of water down past the mission and the erosion caused by this exposed a brick wall about 21 feet south of the southeast corner of the bell tower.

We examined this wall with some trenches and found it was built of the 6 x 12 burned bricks (see Fig. 6, Plate I), was about 12 feet long and turned south at both ends but, owing to its badly broken condition after it turned the corners, we gave it up. The wall which we developed was beautifully finished on the south side with a hard plaster resembling cement, and the floor, which we found about two and a half feet lower than the entrance threshold of the door of the church, was finished with the same material.

We decided this could not be the wall of a house because it was of burned brick and no other house on the grounds has brick walls; the floor of this structure was too low to have been on the ground level and not low enough to have been part of an underground room; and a house here would have destroyed the view of the facade of the church as one approached from the south. We pitched upon the explanation that this was a reservoir in which water could be stored. A day or two later a Mexican who had been born and had lived all his life near the mission happened along and confirmed our supposition. He said he remembered when he was a small boy he had visited the mission many times and at that time two of these reservoirs, which the Mexicans call a pilar, were in evidence. They occupied the plaza just in front of the church, were not very far apart, and between them was the evidence of a round well which had been lined with burned brick. We never got time to check this story up with trenches, but I believe it is substantially correct. It is to be hoped that we will at some time later be able to uncover and reconstruct this portion of the plaza, as it will make a pleasing foreground to the pictures of the facade of the church.

The Bench

At another time we opened a trench at a point about 14 feet north and 25 feet east of the southeast corner of the tower. It must be remembered that a row of rooms ran east from the tower, and this point

we opened was the junction of a wall running north from the back, or north side of this row of rooms. We afterward found that the wall running north was the east wall of a row of rooms, so this corner which we went down on was a corner of the quadrangle.

Along the walls forming this corner we found a bench or seat formed of adobe bricks built up some 16 inches and then capped with the 6 x 12 burned bricks and then finished off with a beautiful hard, red plaster. On the floor level we found a floor of the 6x 12 burned brick, several square feet of which was still in good condition.

Here again we were unable to continue our work and make a thorough examination, but I am sure this was part of a seat which ran along the house walls on the inner side of the quadrangle, and on this very part which we were examining Padre Liberos may have sat down to rest after a weary day spent with his neophytes in the village and field and garden, and watched the unpacking of a newly arrived pack train from far to the south bringing in material and supplies which he needed so badly to continue his work. The brick floor at the foot of the bench is a part of the corridor floor and one looked across it, through the sweeping arches into the sunshine of the quadrangle and felt that here was a mass of buildings, built at an immense expense of time and labor, but fit to endure for centuries. Little did he think as he listened to the clatter and jingle of the harness and the chatter of the Mexican and Indian attendants, that a scant hundred years later we would be opening trenches here in the debris of his walls in an attempt to discover the use of the various buildings!

Assembling the Materials

The actual work of rebuilding the walls and restoring the roof went along very slowly. The walls were so thick that it took a surprising amount of time and material to make such of a showing. At first we tried out the method of carrying all material up by hand, but this consumed so much time that we afterward put in a rope and pulley. We had to work out a special method of handling the cornice brick when we came to that point in the construction. It will be seen by a study of the cross-section sketch of the nave given in Plate II, that a row of these bricks come just under the roof beams on the inside of the church.

These cornice bricks, you will remember, were about 13 x 22 inches in size. We found that the simple method of laying the brick flat, covering it with mortar and then turning it up into place, would not work at all. The common run of mortar was too stiff to work down between the bricks if we stood them in position and then tried to fill the cracks. We next mixed the mortar to the consistency of a thin slop and tried pouring it between the bricks after they were set in position. Being so thin, the mortar promptly ran out of the crack at both ends of

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

the brick. We finally found that two men could work best on this job. The mason would set up the fresh brick at the proper distance. The helper then held a board over the crack at the back end and a special mould cut to fit the front curve, over the front end of the crack, while the mason upset half a bucket of mortar into the crack. In less than half a minute the mortar was set enough to allow the boards to be removed and the process could be repeated on the next brick. Since each of the bricks had to be lifted, carried, set and lined up, separately, it will be readily understood that a good bit of time was consumed in laying these cornices.

After laying the inner cornice, we stopped the brick work two or three days until we could get the beams up on the walls. These beams do not rest directly upon the brick cornice but upon some one inch board plates which we put upon top of the bricks. Our idea in this was that if a beam warped or twisted after being laid, these plates would distribute any strain from falling directly on the noses of the cornice bricks and breaking them off.

The beams were unequal in size, running from about nine to about twelve inches square. The problem raised by this was whether we were to let the bottoms of the beams remain even and let the unevenness all fall along the top line of the beams, or whether to cut some sockets for the large beams and distribute the unevenness between the top and bottom lines. We decided on the first method and it proved very satisfactory. The bottoms of the beams fall evenly along the line of the noses of the brick cornice or moulding and the irregularities of the tops are not noticeable because there is no regular or even line there to force a comparison.

We did another good stroke in the distribution of these beams when we began at the entrance and of the nave with the smallest and ended at the sanctuary end with the largest, grading them larger and larger as we went forward.

The idea in doing this was that the visitor will almost invariably examine the roof construction as soon as he enters the church and will not pay attention to its details afterward. Now the nave is 73 feet long and this method of putting the larger beams at the far end makes all of them appear about the same size, while if we had put in any small beams toward the front of the nave, at that distance they would have had a sort of pipe-stem effect.

We had decided as soon as we hewed the beams out that they looked entirely too fresh and new for our purpose, so we looked around for some method of aging them in the wood, so to speak. For this purpose we used common crude oil, cutting it to the shade we desired with kerosene. We did not dare apply this stain until the beams were up on the wall because it did not dry very fast and we were afraid the handling

and the hoisting tackle might leave marks on them. After the beams were on the wall and before we had built the bricks in between them to hold them solidly in place, we applied the stain. The work of this was not hard, being simply a matter of brushing the stain on with long handled brushes, rolling the beam a quarter turn at a time until we had covered all four sides; but the mental strain of deciding out in the bright white sunlight under an Arizona sky what shade to apply to give the best result in the semi-dark interior of the church under the completed roof, nearly wrecked our force. We worked one beam over three times before we thought we had the shade and then after painting four or five beams that shade, decided to darken it a little. The boys considered this 'piddling' all foolishness, but the result when the roof was completed is fine.

We set these beams three feet apart on centers. We did not need such heavy beams nor need them so close together to support the weight we had to carry, but at this point the roof is a restoration of the original which did carry heavy construction above it.

Having the beams stained and finally bedded down, we next set the roof rafters above them. The roof must have a pitch as low as we could give it and get drainage, for it must not show over the low parapets of the side walls of the nave. To get this result we used 2 x 12 timber laid on edge sawing them to a ten inch fall in a nine foot run. One of these rafters was set on top of each beam, and, since the tops of the beams were uneven, each in itself as well as with its next neighbor, it cost us two or three days' work to get the rafters lined up.

Having our beams and rafters in position, we were then ready to lay our ocotillos. These had been cut into fairly straight sticks 38 inches long, and were laid from one beam to the next on top of the beams between the 2 x 12 rafters. We did not lay these ocotillos straight with the longer axis of the nave, but laid those in the first row, that is between the first beams, slanting to the right, the next row slanting to the left, and so on. Viewed from the floor of the church, this gives a pleasing effect, and we have good precedent in that several of the old churches are so roofed.

The intention was to use the ocotillos alone for this ceiling effect, but when we came to put them in, we found that if we laid them two layers deep, as we had decided to do, one might, in places, still be able to see up between them and discover the modern board roof we were going to put on the rafters above. This caused us some worry but we solved the difficulty by going out to one of the neighbors and buying a ton of hay which we put on top of the ocotillos. Some showers came along at an opportune time and settled this hay down close before we put the roof on, so the reconstruction from the under side of the roof is perfect.

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

Finishing the roof was simply a matter of nailing 1 x 12 boards on on the rafters and covering them with a good grade of roofing paper.

While we were working with the beams and ocotillos, the walls of the nave had been brought up to the original height and the parapets had been finished off with a course of cornice brick. The top of this parapet was flushed over with a mixture of lime and cement to prevent erosion and this was carried down the back of the parapet to the gutter.

The cornice brick around the sanctuary walls, which are still in place, were tilted outward so that the rain drains off over the nose of the bricks and follows the face of the cornice down, causing erosion of the wall just under the cornice. We were careful to drain our parapet walls to the inside so that the rain will not run outward over the nose of the bricks but back and down the parapet into the gutter.

The gutters were made of a rubble of lime, cement and rocks. This was poured into place and shaped with trowels and a half round wooden float which we made for the purpose. We took great care to make the joint between the wooden roof construction and the cement gutters absolutely water tight. For this purpose we used a special plastic roof cement which is laid with a trowel. We used this plastic cement under the roofing paper, on top of the paper, and on top of a piece of quarter round moulding which we nailed into the angle where the paper and cement meet. I think the roof will leak any other place before it leaks at that joint.

As is stated on page 10 the roof drainage was handled by means of 18 downspouts. Nine of these took care of the water from the roof of the nave, five on the west side and four on the east side. These drains were all in bad condition and we had to repair what was left of them as well as extend them up over the new wall which we had built. They were originally made of lime but we used cement for restoring them. The water comes into these drains from the bottom of the gutter by means of openings just under the cornice of the parapet as is shown in the detailed drawing of the roof and parapet construction in Plate II.

In repairing these drains we opened the debris lying against the base of the west wall of the church to get at the foot of them and found a rock abutment wall running along the base of the church wall. The drains ran down to this and the water must have run on over this abutment wall and made its own path away from the church as we could find no signs of open drains on the original ground level. The rock abutment is not an integral part of the church wall but has been built after the church wall was completed and plastered. It is carried back along the west side of the church and the north and west sides of the cemetery. Evidently, since the west is the high side of the building, the water coming down off the mesa has given the padres some concern for fear it would wash the walls on that side and they have taken this means to

protect their construction.

Rebuilding the pediment was the most interesting single piece of work we did. The pediment was broken off at the line of the lintel which crosses the facade over the choir loft window. We had two pictures to work from which were taken before the fall of the original pediment. One of these was a direct front view and the other was taken from a point about 200 feet southwest of the building. These views are published in a recent book on Mission Architecture by Mr. Duell, as having been taken in 1880, but this is a mistake. The pictures were taken by Mr. George Roskruge, of Tucson, on July 3, 1889. I was glad to get this point cleared up very recently, for two interior pictures taken at the same time, show no beams over the nave. Now two men have assured me they saw some of the roof beams in position, one in 1882 and the other in 1886 or 1887. If the Roskruge pictures had been taken in 1880 they would have proved the men to be in error, but since they were taken in 1889, not only does the evidence of the two visitors stand, but we can date the fall or removal of the last beams of the roof of the nave between 1886 and 1889.

We were able to locate the footings of the gables which are attached to the face of the pediment quite accurately by the brick sockets which still remained in the lime plaster on top of the lintel. The diamond-shaped figure above the ends of these gables is in its proper place but we will not know until next July, when we can compare the shadows of the real diamond with the one in the picture, whether or not it projects far enough from the wall. If we find it is not far enough out, we can build it up with plaster.

To get the curve line of the pediment I sat at the point where the Roskruge picture was taken and had the boys experiment with different lengths of sticks, swinging them in the plane of the proposed pediment and using the center of the line across the shoulders of the facade as the center of the pediment, until the end of the stick covered the proper bricks on the tower in the background. We then used this stick as a radius in building the pediment.

The ball on top of the pediment, which carries a cross, is partly original. In the excavations a couple of years ago, when we cleaned the debris out of the nave of the church, we found about a quarter of this ball. It had a socket running from top to bottom, and when I saw it I remembered a plate in Hinton's Handbook to Arizona, 1878, made from an artist's drawing, which showed a cross mounted in a ball on top of the facade. So this portion of the ball is again resting in its original place.

Minor Repairs

The stairs in the tower, described on page 9, are completely a

REPAIR & RESTORATION WORK AT TUMACACORI IN 1921 (CONT.)

restoration of ours. Vandals had not only torn out the old steps, but had dug several wagon loads of material out and thrown it back into the baptistery. Evidently they thought the treasure was buried under the steps.

We made no attempt to put these steps in with accurate workmanship. The effect we were striving for was the old stairs after some use and a hundred years of abandonment but without the touch of a vandal pick. That we succeeded pretty well is shown by the fact that more than half the visitors who had not seen the mission before we started our work, thought the steps were the original ones, two weeks after we had completed them.

A large hole in the back wall of the sanctuary was closed up. Many visitors thought this hole was originally a window. I knew it was not for it showed no marks of lintels to support the wall over the opening, and, although the padres were sometimes faulty in their construction, they would not put an opening in the back wall of the church directly over the high altar where it would make a glare of light to blind the eyes of the neophytes in the nave as they tried to see the ceremonies in the sanctuary. The Mexican who had visited the mission in the 80's told me there was a niche for a statue there over the high altar, and I am inclined to think his memory is correct. Vandals probably dug through the wall back of the niche looking for treasure.

The lighting of the sanctuary was wonderfully improved by closing this hole. I had many times tried to imagine what the interior would look like with a roof over the nave and this hole in the sanctuary wall stopped, but the effect was better than I had imagined.

There are five windows in the nave of the church, two on each side and one in the choir loft over the entrance. These windows light a space 17 feet wide by 73 feet long. There are two windows in the sanctuary which light a space 17 feet square. It will be seen at once, then, that the sanctuary is better lighted than the nave, and this is as it should be. Furthermore, the sanctuary windows, being higher up in the walls, give a sort of overhead lighting which must have brought out the decorations on and around the high altar. The quiet, the restfulness, the coolness, and the softened light of the nave, tended to center the attention down through the great arch, to the high altar in the sanctuary.

Tumacacori is not the most spectacular mission in this chain which Padre Kino founded, but its interior was well designed and very effective.

CONCLUSION

I wish to say in conclusion that the repair and restoration work at the Tumacacori Mission is by no means finished. The work will be

carried on as funds permit until we have this monument in condition to stand the erosion of the elements without serious deterioration. It is to be hoped that before many years we will be able to keep a custodian in charge under full pay, who can live at the monument and prevent vandalism and give the information to visitors which they desire so much.

MUSEUM CIRCULATION By Frank Pinkley, Supt.

Because our proposed museum at Tumacacori National Monument is a comparatively small one, and because we have some individual problems in that installation, we have had some very interesting discussions regarding the plan. The building is planned around a patio and we want to open the rooms out into the loggia so that visitors will go into a room, turn to the right, go anti-clockwise around the room and come out by the door by which they entered, go along the loggia to the next room and repeat the process there. The other method is to open the rooms one into the other in series by connecting doorways. We do not like this method so well because few visitors will circle a room which has an outlet at the far end. We have argued that the visitors will enter room 1, turn to the right, go down the right hand wall to the far end, and will then go through the doorway into room 2. Since, in an archaeological or historical museum the material on display must be presented in some sequence from case to case, wall to wall, and room to room, it is pretty clear that this trick of passing down the right hand side of your rooms and leaving the left side unnoticed is going to wreck your chances of getting your material examined in the sequence in which you had planned.

I wish here to quote from pages 105-06-07 and 108 of Problems of Installation in Museums of Art, by Arthur W. Melton, Instructor in Psychology in Yale University. This is one of the Publications of The American Association of Museums, New Series No. 14, Washington, D. C., 1935.

"As previously mentioned, we have records of the exact routes taken by the visitors in going through the Flemish-Dutch gallery. In Figure 21 we have shown the types of routes taken by those visitors who turned to the right on entering the gallery, and the frequency of occurrence of each type. In Figure 22 we have given a similar schematic presentation of the routes of the visitors who turned to the left on entering the gallery. In both instances the representation is of the records of Sunday and week day visitors observed during the first installation of the paintings, and all proportions are based on the total number of visitors observed, regardless of the direction of the first turn.

