
SMITHSONIAN INSTITUTION—BUREAU OF ETHNOLOGY.

NAVAJO SILVERSMITHS.

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NAVAJO SILVERSMITHS.

BY WASHINGTON MATTHEWS.

Among the Navajo Indians there are many smiths, who sometimes forge iron and brass, but who work chiefly in silver. When and how the art of working metals was introduced among them I have not been able to determine; but there are many reasons for supposing that they have long possessed it; many believe that they are not indebted to the Europeans for it. Doubtless the tools obtained from American and Mexican traders have influenced their art. Old white residents of the Navajo country tell me that the art has improved greatly within their recollection; that the ornaments made fifteen years ago do not compare favorably with those made at the present time; and they attribute this change largely to the recent introduction of fine files and emery-paper. At the time of the Conquest the so-called civilized tribes of Mexico had attained considerable skill in the working of metal, and it has been inferred that in the same period the sedentary tribes of New Mexico also wrought at the forge. From either of these sources the first smiths among the Navajos may have learned their trade; but those who have seen the beautiful gold ornaments made by the rude Indians of British Columbia and Alaska, many of whom are allied in language to the Navajos, may doubt that the latter derived their art from a people higher in culture than themselves.

The appliances and processes of the smith are much the same among the Navajos as among the Pueblo Indians. But the Pueblo artisan, living in a spacious house, builds a permanent forge on a frame at such a height that he can work standing, while his less fortunate Navajo *confrère*, dwelling in a low hut or shelter, which he may abandon any day, constructs a temporary forge on the ground in the manner hereafter described. Notwithstanding the greater disadvantages under which the latter labors, the ornaments made by his hand are generally conceded to be equal or even superior to those made by the Pueblo Indian.

A large majority of these savage smiths make only such simple articles as buttons, rosettes, and bracelets; those who make the more elaborate articles, such as powder-chargers, round beads (Pl. XVI), tobacco cases, belts, and bridle ornaments are few. Tobacco cases, made in the shape of an army canteen, such as that represented in

Fig. 6, are made by only three or four men in the tribe, and the design is of very recent origin.

Their tools and materials are few and simple; and rude as the results of their labor may appear, it is surprising that they do so well with such imperfect appliances, which usually consist of the following articles: A forge, a bellows, an anvil, crucibles, molds, tongs, scissors, pliers, files, awls, cold-chisels, matrix and die for molding buttons, wooden implement used in grinding buttons, wooden stake, basin, charcoal, tools and materials for soldering (blow-pipe, braid of cotton rags soaked in grease, wire, and borax), materials for polishing (sand-paper, emery-paper, powdered sandstone, sand, ashes, and solid stone), and materials for whitening (a native mineral substance—almogen—salt and water). Fig. 1, taken from a photograph, represents the complete shop of a silversmith, which was set up temporarily in a summer lodge or *hogan*, near Fort Wingate. Fragments of boards, picked up around the fort, were used, in part, in the construction of the *hogan*, an old raisin-box was made to serve as the curb or frame of the forge, and these things detracted somewhat from the aboriginal aspect of the place.

A forge built in an outhouse on my own premises by an Indian silversmith, whom I employed to work where I could constantly observe him, was twenty-three inches long, sixteen inches broad, five inches in height to the edge of the fire-place, and the latter, which was bowl-shaped, was eight inches in diameter and three inches deep. No other Navajo forge that I have seen differed materially in size or shape from this. The Indian thus constructed it: In the first place, he obtained a few straight sticks—four would have sufficed—and laid them on the ground to form a frame or curb; then he prepared some mud, with which he filled the frame, and which he piled up two inches above the latter, leaving the depression for the fire-place. Before the structure of mud was completed he laid in it the wooden nozzle of the bellows, where it was to remain, with one end about six inches from the fire-place, and the other end projecting about the same distance beyond the frame; then he stuck into the nozzle a round piece of wood, which reached from the nozzle to the fire-place, and when the mud work was finished the stick was withdrawn, leaving an unflammable tweer. When the structure of mud was completed a flat rock about four inches thick was laid on at the head of the forge—the end next to the bellows—to form a back to the fire, and lastly the bellows was tied on to the nozzle, which, as mentioned above, was built into the forge, with a portion projecting to receive the bellows. The task of constructing this forge did not occupy more than an hour.

A bellows, of the kind most commonly used, consists of a tube or bag of goatskin, about twelve inches in length and about ten inches in diameter, tied at one end to its nozzle and nailed at the other to a circular disk of wood, in which is the valve. This disk has two arms: one above for a handle and the other below for a support. Two or more



OBJECTS IN SILVER.

rings or hoops of wood are placed in the skin-tube to keep it distended, while the tube is constricted between the hoops with buckskin thongs, and thus divided into a number of compartments, as shown in Pl. XVII. The nozzle is made of four pieces of wood tied together and rounded on the outside so as to form a cylinder about ten inches long and three inches in diameter, with a quadrangular hole in the center about one inch square. The bellows is worked by horizontal movements of the arm. I have seen among the Navajos one double-chambered bellows with a sheet-iron tweer. This bellows was about the same size as the single chambered one described above. It was also moved horizontally, and by means of an iron rod passing from one end to the other and attached to the disks, one chamber was opened at the same time that the other was closed, and *vice versa*. This gave a more constant current of air than the single-chambered implement, but not as steady a blast as the bellows of our blacksmiths. Such a bellows, too, I have seen in the Pueblo of Zuñi.

For an anvil they usually use any suitable piece of iron they may happen to pick up, as for instance an old wedge or a large bolt, such as the king-bolt of a wagon. A wedge or other large fragment of iron may be stuck in the ground to steady it. A bolt is maintained in position by being driven into a log. Hard stones are still sometimes used for anvils and perhaps they were, at one time, the only anvils they possessed.

Crucibles are made by the more careful smiths of clay, baked hard, and they are nearly the same shape as those used by our metallurgists, having three-cornered edges and rounded bottoms. They are usually about two inches in every dimension.

Fig. 1, Pl. XVIII represents one of ordinary shape and size, which I have in my collection. The Navajos are not good potters; their earthenware being limited to these crucibles and a few unornamented water-jars; and it is probably in consequence of their inexperience in the ceramic art that their crucibles are not durable. After being put in the fire two or three times they swell and become very porous, and when used for a longer time they often crack and fall to pieces. Some smiths, instead of making crucibles, melt their metal in suitable fragments of Pueblo pottery, which may be picked up around ruins in many localities throughout the Navajo country or purchased from the Pueblo Indians.

The moulds in which they cast their ingots, cut in soft sandstone with a home-made chisel, are so easily formed that the smith leaves them behind when he moves his residence. Each mould is cut approximately in the shape of the article which is to be wrought out of the ingot cast in it, and it is greased with suet before the metal is poured in. In Figs. 2 and 3, Pl. XVIII, are represented pieces of sandstone, graven for moulds, now in my possession. The figures are one-third the dimensions of the subjects. In the middle cavity or mould shown in Fig. 2, Pl. XVIII, was cast the ingot from which was wrought the arrow-shaped

handle of the powder-charger shown in Pl. XIX; in the lower cavity depicted in the same figure was moulded the piece from which the bowl of this charger was formed. The circular depression, delineated in the lower right corner of Fig. 3, Pl. XVIII, gave form to the ingot from which the sides of the canteen-shaped tobacco-case (Fig. 6) was made.

Tongs are often made by the Navajo silversmiths. One of these which I saw had a U-shaped spring joint, and the ends were bent at right angles downwards, so as more effectually to grasp the flat-sided crucible. Often nippers or scissors are used as tongs.

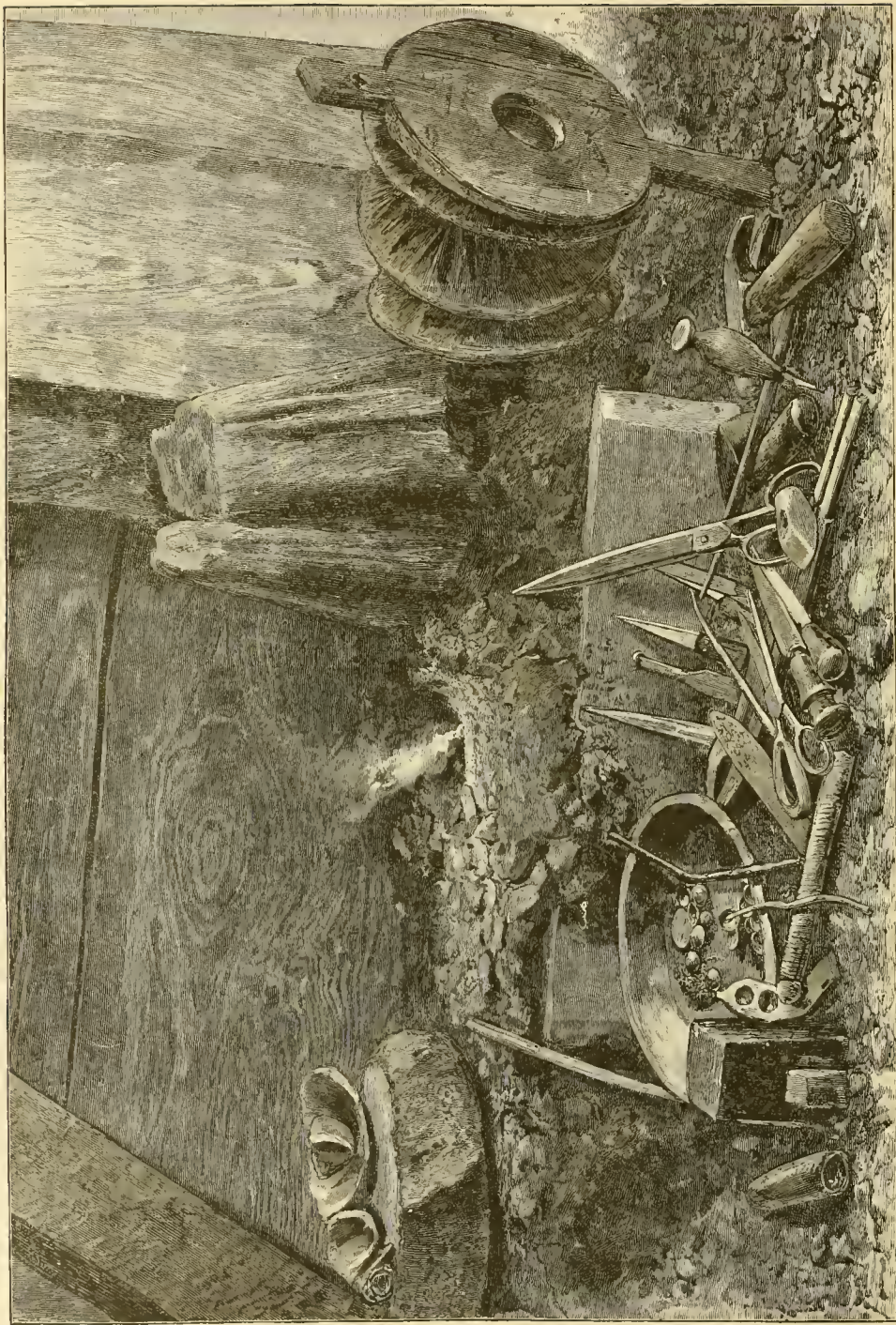
Ordinary scissors, purchased from the whites, are used for cutting their metal after it is wrought into thin plates. The metal saw and metal shears do not seem as yet to have been imported for their benefit. Some of the more poorly provided smiths use their scissors also for tongs, regardless or ignorant of consequences, and when the shears lose their temper and become loose-jointed and blunt, the efforts of the Indian to cut a rather thick plate of silver are curious to see. Often, then, one or two bystanders are called to hold the plate in a horizontal position, and perhaps another will be asked to hold the points of the scissors to keep them from spreading. Scissors are sometimes used as dividers, by being spread to the desired distance and held in position by being grasped in the hand. By this means I have seen them attempt to find centers, but not to describe circles. It is probable that had they trusted to the eye they might have found their centers as well.

Their iron pliers, hammers, and files they purchase from the whites. Pliers, both flat-pointed and round-pointed, are used as with us. Of files they usually employ only small sizes, and the varieties they prefer are the flat, triangular, and rat-tail. Files are used not only for their legitimate purposes, as with us, but the shanks serve for punches and the points for gravers, with which figures are engraved on silver.

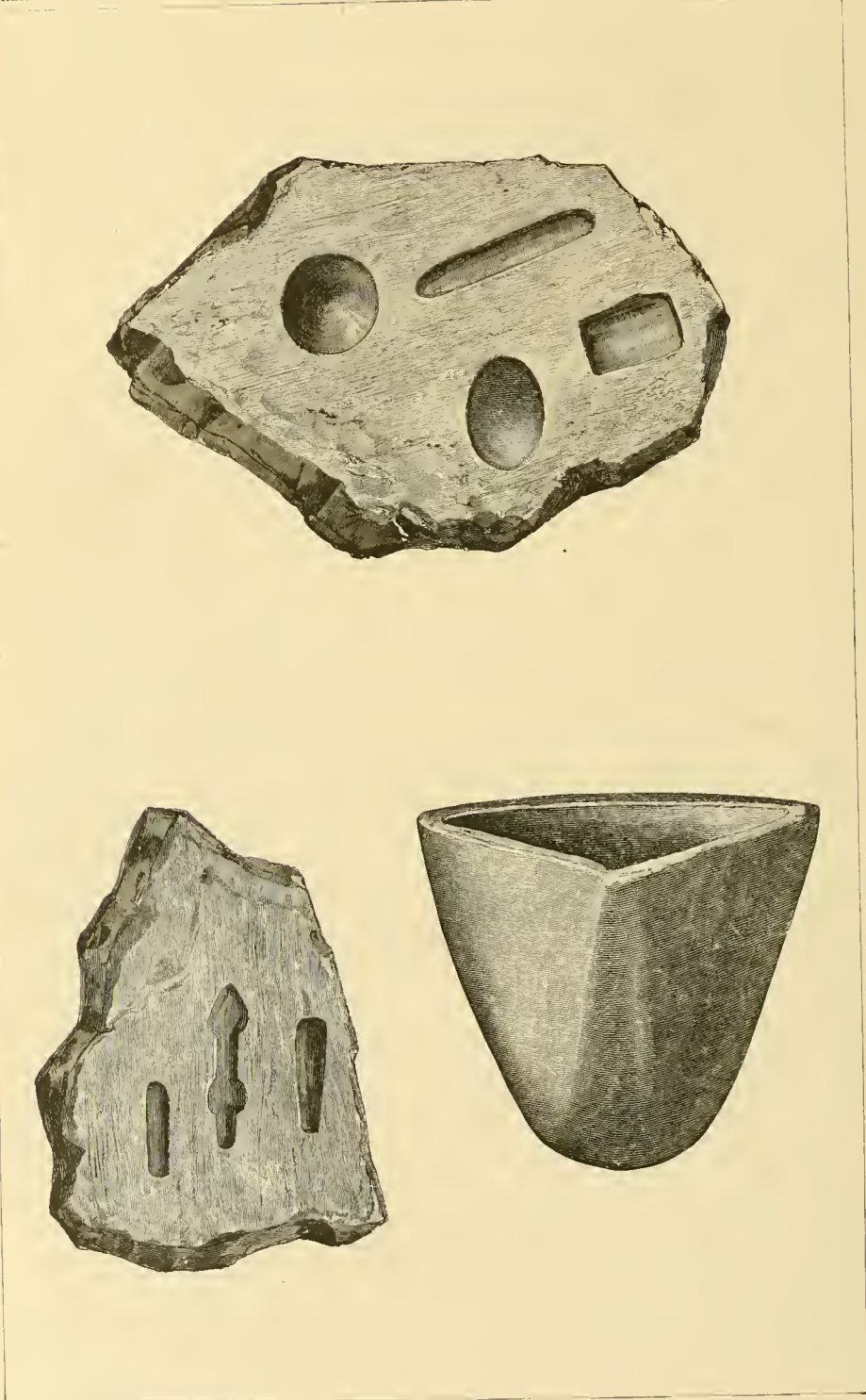
The Indians usually make their own cold-chisels. These are not used where the scissors and file can be conveniently and economically employed. The re-entrant rectangles on the bracelet represented in Fig. 4, Pl. XIX, were cut with a cold-chisel and finished with a file.

Awls are used to mark figures on the silver. Often they cut out of paper a pattern, which they lay on the silver, tracing the outline with an awl. These tools are sometimes purchased and sometimes made by the Indians. I have seen one made from a broken knife which had been picked up around the fort. The blade had been ground down to a point.

Metallic hemispheres for beads and buttons are made in a concave matrix by means of a round-pointed bolt which I will call a die. These tools are always made by the Indians. On one bar of iron there may be many matrices of different sizes; only one die fitting the smallest concavity, is required to work the metal in all. In the picture of the smithy (Pl. XVII, in the right lower corner beside the tin-plate), a piece of an old horse-shoe may be seen in which a few matrices have been worked, and, beside it, the die used in connection with the matrices.



WORKSHOP OF NAVAJO SILVERSMITH.



CRUCIBLE, AND SANDSTONE MOLDS FOR SHAPING SILVER OBJECTS.

A little instrument employed in levelling the edges of the metallic hemispheres, is rude but effective. In one end of a cylinder of wood, about three or four inches long, is cut a small roundish cavity of such a size that it will hold the hemisphere tightly, but allow the uneven edges to project. The hemisphere is placed in this, and then rubbed on a flat piece of sandstone until the edges are worn level with the base of the wooden cylinder. The uses of the basin and the wooden stake are described further on.

Their method of preparing charcoal is much more expeditious than that usually employed by our charcoal-burners, but more wasteful; wood, however, need not yet be economized on the juniper-covered *mesas* of New Mexico. They build a large fire of dry juniper, and when it has ceased to flame and is reduced to a mass of glowing coals, they smother it well with earth and leave it to cool. If the fire is kindled at sunset, the charcoal is ready for use next morning.

The smith makes his own blow-pipe, out of brass, usually by beating a piece of thick brass wire into a flat strip, and then bending this into a tube. The pipe is about a foot long, slightly tapering and curved at one end; there is no arrangement for retaining the moisture proceeding from the mouth. These Indians do not understand our method of making an air chamber of the mouth; they blow with undistended cheeks, hence the current of air directed on the flame is intermitting. The flame used in soldering with the blow-pipe is derived from a thick braid of cotton rags soaked in mutton suet or other grease. Their borax is purchased from the whites, and from the same source is derived the fine wire with which they bind together the parts to be soldered. I have been told by reliable persons that it is not many years since the Navajos employed a flux mined by themselves in their own country; but, finding the pure borax introduced by the traders to be much better, they gradually abandoned the use of the former substance.

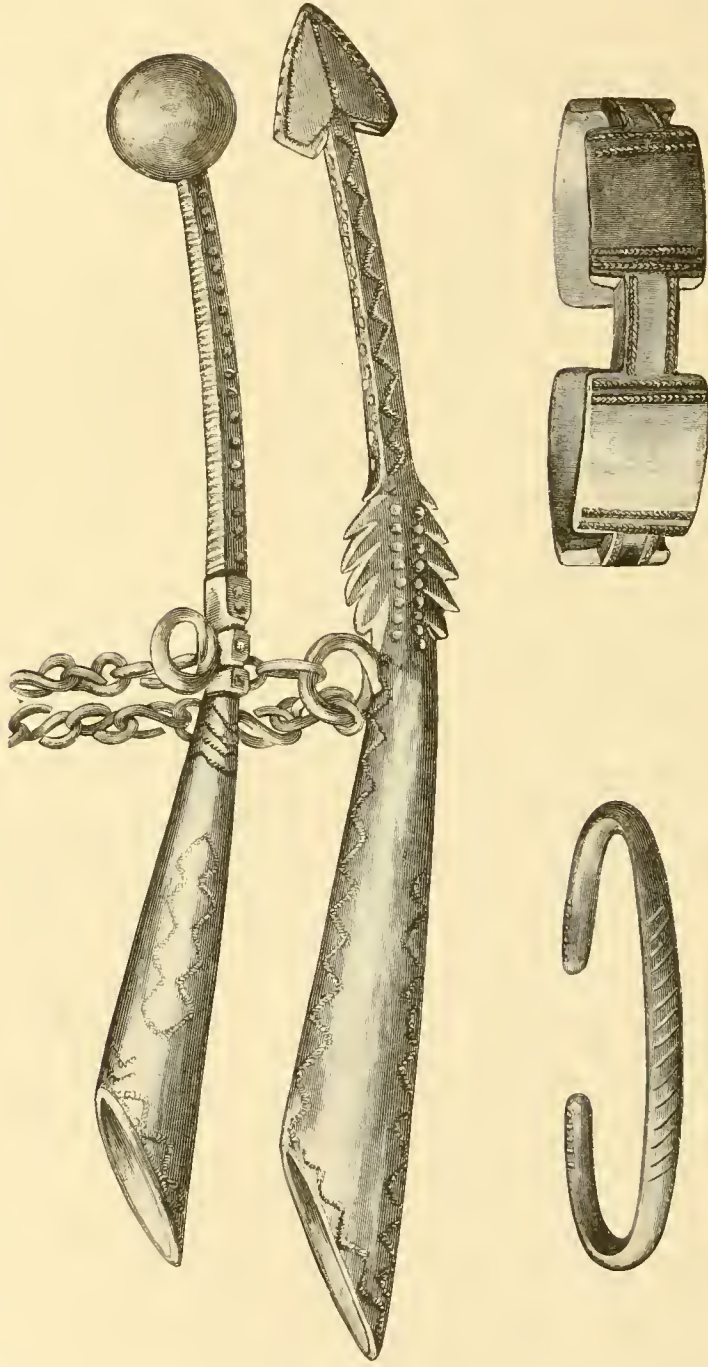
For polishing, they have sand-paper and emery-paper purchased from the whites; but as these are expensive, they are usually required only for the finishing touches, the first part of the work being done with powdered sandstone, sand, or ashes, all of which are used with or without water. At certain stages in the progress of the work, some articles are rubbed on a piece of sandstone to reduce the surfaces to smoothness; but the stone, in this instance, is more a substitute for the file than for the sand-paper. Perhaps I should say that the file is a substitute for the stone, for there is little doubt that stone, sand, and ashes preceded file and paper in the shop of the Indian smith.

For blanching the silver, when the forging is done, they use a mineral substance found in various parts of their country, which, I am informed by Mr. Taylor, of the Smithsonian Institution, is a "hydrous sulphate of alumina," called *almogen*. This they dissolve in water, in a metal basin, with the addition, sometimes, of salt. The silver, being first slightly heated in the forge, is boiled in this solution and in a short time becomes very white.

The processes of the Navajo silversmith may be best understood from descriptions of the ways in which he makes some of his silver ornament. I once engaged two of the best workmen in the tribe to come to Fort Wingate and work under my observation for a week. They put up their forge in a small outbuilding at night, and early next morning they were at work. Their labor was almost all performed while they were sitting or crouching on the ground in very constrained positions; yet I never saw men who worked harder or more steadily. They often labored from twelve to fifteen hours a day, eating their meals with dispatch and returning to their toil the moment they had done. Occasionally they stopped to roll a cigarette or consult about their work, but they lost very few moments in this way. They worked by the job and their prices were such that they earned about two dollars a day each.

The first thing they made was a powder charger with a handle in the shape of a dart (Fig. 2, Pl. XIX). Having cut in sandstone rock (Fig. 2, Pl. XVIII) the necessary grooves for molds and greased the same, they melted two Mexican dollars—one for the bowl or receptacle, and one for the handle—and poured each one into its appropriate mold. Then each smith went to work on a separate part; but they helped one another when necessary. The ingot cast for the receptacle was beaten into a plate (triangular in shape, with obtuse corners), of a size which the smith guessed would be large enough for his purpose. Before the process of bending was quite completed the margins that were to form the seam were straightened by clipping and filing so as to assume a pretty accurate contact, and when the bending was done, a small gap still left in the seam was filled with a shred of silver beaten in. The cone, at this stage, being indented and irregular, the workman thrust into it a conical stake or mandrel, which he had formed carefully out of hard wood, and with gentle taps of the hammer soon made the cone even and shapely. Next, withdrawing the stake, he laid on the seam a mixture of borax and minute clippings of silver moistened with saliva, put the article into the fire, seam up, blew with the bellows until the silver was at a dull red-heat, and then applied the blow-pipe and flame until the soldering was completed. In the meantime the other smith had, with hammer and file, wrought the handle until it was sufficiently formed to be joined to the receptacle, the base of the handle being filed down for a length of about a quarter of an inch so that it would fit tightly into the orifice at the apex of the receptacle. The two parts were then adjusted and bound firmly together with a fine wire passing in various directions, over the base of the cone, across the protuberances on the dart-shaped handle, and around both. This done, the parts were soldered together in the manner already described, the ring by which it is suspended was fastened on, the edge of the receptacle was clipped and filed, and the whole was brought into good shape with file, sand, emery-paper, &c.

The chasing was the next process. To make the round indentations on



OBJECTS IN SILVER.

the handle, one smith held the article on the anvil while the other applied the point of the shank of a file—previously rounded—and struck the file with a hammer. The other figures were made with the sharpened point of a file, pushed forward with a zigzag motion of the hand. When the chasing was done the silver was blanché by the process before referred to, being occasionally taken from the boiling solution of allogen to be rubbed with ashes and sand. For about five hours both of the smiths worked together on this powder-charger; subsequently, for about three hours' more, there was only one man engaged on it; so that, in all, thirteen hours labor was spent in constructing it. Of this time, about ten hours were consumed in forging, about one and one-half hours in filing and rubbing, and about the same time in ornamenting and cleaning.

In making the hollow silver beads they did not melt the silver, but beat out a Mexican dollar until it was of the proper tenuity—frequently annealing it in the forge as the work advanced. When the plate was ready they carefully described on it, with an awl, a figure (which, by courtesy, we will call a circle) that they conjectured would include a disk large enough to make half a bead of the required size. The disk was then cut out with scissors, trimmed, and used as a pattern to cut other circular pieces by. One of the smiths proceeded to cut out the rest of the planchets, while his partner formed them into hollow hemispheres with his matrix and die. He did not put them at once into the cavity from which they were to get their final shape, but first worked them a little in one or more larger cavities, so as to bring them gradually to the desired form. Next the hemispheres were leveled at the edges by a method already described, and subsequently perforated by holding them, convex surface downwards, on a piece of wood, and driving through them the shank of a file with blows of a hammer. By this means of boring, a neck was left projecting from the hole, which was not filed off until the soldering was done. The hemispheres were now strung or, I may say, spitted on a stout wire in pairs forming globes. The wire or spit referred to was bent at one end and supplied with a washer to keep the heads from slipping off, and all the pieces being pressed closely together were secured in position by many wraps of finer wire at the other end of the spit. The mixture of borax, saliva, and silver was next applied to the seams of all the beads; they were put into the fire and all soldered at one operation. When taken from the fire they were finished by filing, polishing and blanching.

These Indians are quite fertile in design. In Pl. XIX are shown two powder-chargers, which I consider very graceful in form. I have seen many of these powder-chargers, all very graceful, but no two alike except in cases where duplicates had been specially ordered. Their designs upon bracelets and rings are of great variety. Ornaments for bridles, consisting of broad bands of silver, sufficient in size and number to almost entirely conceal the leather, are not particularly handsome, but

are greatly in demand among the Navajos and are extensively manufactured by them. Leather belts studded with large plates of silver are favorite articles of apparel, and often contain metal to the value of forty or fifty dollars. Pl. XX represents an Indian wearing such a belt, in which only three of the plates are shown. Single and double crosses of silver are represented attached to his necklace. The cross is much worn by the Navajos, among whom, I understand, it is not intended to represent the "Cross of Christ," but is a symbol of the morning star. The lengthening of the lower limb, however, is probably copied from the usual form of the Christian emblem. These savage smiths also display much ingenuity in working from models and from drawings of objects entirely new to them.

They are very wasteful of material. They usually preserve the clippings and melt them in the crucible, or use them in soldering; but they make no attempt to save the metal carried off in filing, polishing, and by oxidizing in the forge, all of which is considerable. In one article of silver, for which, allowing for clippings saved, 836 grains were given to the smith, and the work on which I watched so closely throughout that I am certain none of the material was stolen, there was a loss of 120 grains, or over 14 per cent.

The smiths whom I have seen working had no dividers, square, measure, or any instrument of precision. As before stated, I have seen scissors used as compasses, but as a rule they find approximate centers with the eye, and cut all shapes and engrave all figures by the unaided guidance of this unreliable organ. Often they cut out their designs in paper first and from them mark off patterns on the metal. Even in the matter of cutting patterns they do not seem to know the simple device of doubling the paper in order to secure lateral uniformity.

Here ends my description of the smithcraft of a rude but docile and progressive people. I trust that it may serve not only to illustrate some aspects of their mental condition, their inventive and imitative talents, but possibly to shed some light on the condition and diffusion of the art of the metalist in the prehistoric days of our continent, notwithstanding the fact that some elements of their craft are of recent introduction and others of doubtful origin.



NAVAJO INDIAN WITH SILVER ORNAMENTS.