hand in solemn procession from cellar to attic. The figures of Mary and Joseph are borne reverently in front, and the worshipers intone the litany as they proceed, pausing at doors to beg admittance just as Joseph and Mary did over nineteen hundred years ago. When the litany is finished a few enter a room and the others sing to an ancient chant:

"In Heaven's name I beg for shelter,
My wife to-night can go no further."

This is supposed to be Joseph's plea, and those within the room answer:

"No inn is this, begone from hence,
Ye may be thieves, I trust ye not."

After knocking at many doors and chanting this indefinitely the party at midnight reaches a room chosen for the conclusion of the ceremony. Often this is the roof, for Mexicans learned to use that part of the house long before we had roof gardens. Here is a sort of stable and in it the images of Joseph and Mary are reverently deposited. Care is taken that this part of the posada takes place just as the bells of the churches begin to ring in Christmas morning. All the ramifications of a family are bidden to this semi-religious festival, and each year one house of a family circle is chosen for the celebration. The ceremony is the same, no matter what the station of the people.

Mexico City has another *fiesta* at Carnival time, which, while it cannot compare with those in Rome and New Orleans, is well worth going to see. On Ash Wednesday every good Catholic woman wears somber black, which is at all seasons the favorite church costume. At this time devout people have a cross marked in ashes on their foreheads, and as this is done in the early morning by the priest and is seldom washed off, it lingers for some time as a sort of humiliation. The Saturday before Easter all this penance vanishes and students and young people parade the *paseo* or avenue dressed in old Spanish costumes and as clowns. A most curious custom takes place on this same day, for Judas is burned in public. It is said this strange performance is peculiar to Mexico, and at any rate it seems unique to strangers.

All over the streets of the large cities and villages are hideous paper dolls from two to five feet in height, stuffed with straw and containing coins, fireworks, and bread in their stomachs. These images are strung across the street, in courtyards, in parks and any convenient place and present a remarkable sight. They are homely and crude and are supposed to represent Judas ready for punishment. When all is ready the bells of the cathedral, which can be heard for miles around, peal forth, the other churches take up the chimes, and by 10 o'clock Saturday morning the whole town is ready to turn out to burn the numerous effigies and in this way punish Judas for his treachery in betraying Christ. As soon as the figure begins to ignite, the poor who have taken their station underneath rush forward for the coins and bread, and a great scramble ensues. Sometimes Judas represents an unpopular man and it seems a great relief to burn his effigy. Free fights ensue for the contents of Judas's stomach and the carnival ends in a small riot.

The Jockey Club of Mexico City is the richest and most exclusive club in the republic. It is housed in a dwelling made of tiles, designed by Count Orizaba, who brought the glistening bricks from Spain, and the fashionables of the city belong to it. For many years they had the most elaborate Judas in town. On one occasion it was mounted on a horse whose accouterments, saddle, stirrups, etc., were made of embossed leather. Judas was dressed in an expensive and gaudy suit, with tight fitting trousers decorated with silver coins up the side, and gold-embroidered felt sombrero that cost in the neighborhood of fifty dollars. Of course the populace went nearly wild over such an exhibition, and when the match was lighted and it was discovered that Judas's interior anatomy consisted of fireworks that exploded with a terrific noise and made the sky lurid for miles around, the peons started such a free fight that the police were obliged to ask the Jockey Club to discontinue such exhibitions.

Another *fiesta* day is All Saints', when the cemeteries are filled with people who camp out, put flowers on the graves of their dead, and eat picnic lunches on "the dead tables" spread for the occasion. In some places ices are molded in the shape of skulls, and though the people do not intend to appear festive the occasion seems somewhat like a party to the bewildered outsider.

Dates Thrive on Colorado Desert.

Recent experiments made at the government farm at Mecca, Arizona, with the date palm have proved that dates can be cultivated on the Colorado desert with equal the facility reached in the Sahara desert, from which the palms for the 15-acre Mecca farm were brought.

Although this farm has been in cultivation for only three years, already the palms are bearing well; and this season contain from one to three branches of dates, each bearing upward of twenty pounds.

A year ago it was believed the Salton Sea was to

overflow and submerge the Mecca farm, and the government officials purchased ten acres of land near Indio, to which the Mecca palms were to be removed. The water was stopped, however, and now the two farms will be utilized, suckers from the Mecca farm plants being transplanted at Indio.

Of the ten or more varieties there, some are very rare, and as soon as they come into their full bearing it is proposed to establish a packing house, and experiments with packing and shipping the fruit will be conducted on an extensive scale.

THE DETROIT RIVER TUNNEL.

BY JAMES COOKE MILLS.

In a very little while, measured by the swift flight of time in this era of rapid solution of transportation problems, the huge railway car ferries on the Detroit River will have passed from the traffic life of the busy stream. For many years these powerful steamers have transported the enormous freight tonnage and millions of travelers across the border between the two countries. The five trunk lines—the Michigan Central, the Grand Trunk System, the Wabash, the Père Marquette, and the Canadian Pacific—operate no less than ten of these car floats.

When the Detroit River tunnel, one of the most important railway enterprises of the present time, is completed, the through "limited" and express trains and the long heavy freights of all the trunk lines will pass below the bed of the river, and rise to the surface of another country in six to seven minutes. By the present system, about thirty minutes is lost in ferrying and switching each express train, and from four to seven hours in handling through freights; while perishables, which are given the preference over all other classes in quick ferriage, do not get under way again within three hours. In winter, when the ice floes, brought down from Lake St. Clair by the swift current, often jam the river from bank to bank, the big steamers frequently become fast in the stream; and the delay from this cause to fast passenger service between the East and the West sometimes amounts to from three to twelve hours.

The saving in time and expense of operation in moving the heavy traffic across the river through a double-tracked tunnel, over the slow and uncertain ferry system, is deemed by the Michigan Central officials, in view of the ever-increasing tonnage of the road, of sufficient moment for the expenditure of \$10,000,000 in the construction of the international tunnelway. About three years ago the project was taken up by Mr. Henry B. Ledyard, then president of the Central, and through his untiring efforts the board of directors authorized the construction of the tunnel, and also the organization of the advisory board of engineers to carry out the great undertaking. The advisory board was appointed in June, 1905, and was composed of W. J. Wilgus, then chief engineer of the New York Central and in charge of the electrification of the New York city terminals; H. A. Carson, consulting engineer, who designed and built practically all of the Boston subways; and W. S. Kinnear, chief engineer of the tunnel in charge of construction.

Instead of digging parallel bores through the tough blue clay far below the bed of the river, by means of shields driven by hydraulic rams, a great trench has been dredged out of the bottom of the river, in which are being sunk successive tubes of steel, 23 feet in diameter and 260 feet long, secured together by transverse stiffening diaphragms of steel at every eleven feet of their length. These tubes form the waterproofing of the tunnel proper, which consists of a solid ring of concrete, two feet in thickness, formed within the tubes. The width of the river between dock lines is about half a mile, and the subaqueous section of the tunnel, or part entirely under the river, will consist of ten of these twin tubes with a total length of 2,622 feet. Along the bottom of the trench, rows of piles have been driven and capped, to form a bearing for the tubes.

The tubes are built at the shipyard of the Great Lakes Engineering Company at St. Clair, forty-eight miles away. The ends of the tubes are "plugged" with stout wood bulkheads, to render them watertight. Then they are launched into the river sideways, very much as lake ships are launched. Floating lightly on the water, and drawing no more than six feet, the tubes are towed by a tug down the river to the place where they are to be sunk. On top of the tubes and near each end are two air cylinders, ten feet in diameter and sixty feet long, strapped securely to the tube diaphragms, and these serve to regulate the settling of the tubes, as they slowly fill with water, which is admitted at the will of the engineers through gate valves in the bulkheads. There is also provided at each end a detachable upright, firmly braced to the section and of sufficient length to indicate the position of the tubes when they have been entirely submerged. These uprights also show the engineers the exact position of the tubes when they are resting on the piling, eighty feet below the surface of the river, and act in adjusting them in their position laterally, so as to

bring the sections into alignment. The uprights extend about ten feet above the water when the section is in place. After all is prepared and proper precautions have been taken to check the least deviating movement, the gate valves are opened, and the tubes slowly settle into position.

Each tube as constructed in the shipyard is provided at one end with a sleeve, which is slipped over the end of the adjoining tube already sunk and in position. The sleeve is fitted with a flange, which is bolted to a corresponding flange of the other tube, a rubber gasket being placed between the two. A similar gasket is slipped in at the inner end of the sleeve, bearing up against the edge of the other tube. When the bolts are in place and all is ready, divers turn up the nuts, thus squeezing the rubber gaskets together between the ends of the tubes to form a tight joint. An annular space of three inches by eighteen inches is thus formed all around the tube at the joint, which is then filled with a grout of pure cement. To this end each sleeve is provided on the top with two small pipes, flexible at the joints and leading up to the cement scow floating above. The water in the space is then pumped out, and if the least leak occurs in the main joint, there is more work for the divers in bolting up. When the joint is absolutely watertight, pure cement is pumped into the space through one pipe and continued until it comes out through the other, which is evidence that the space is completely filled.

The water in the tubes is now pumped out and the inner bulkheads removed, leaving the space clear and dry to the outer bulkheads. Concrete gangs now come on the scene, and, pushing their big half circular wood forms along into the new tubes, proceed to build up the tunnel itself, which is of solid concrete varying in thickness from two to five feet. The concrete tube is calculated to be of sufficient strength to withstand all strains and vibrations of the heaviest trains, the steel tubes serving as waterproofing protection, while the outer covering of concrete in turn is the steel tube preservative. On each side of the lower section of the tubes there are benches of concrete four feet high and two and a half feet wide at the top, to serve as passageways and places of refuge for the trackmen. When the concreting is completed there is a clear head room of eighteen feet from the tops of the rails to the center of the arch.

Out in the stream are the cement scows, fitted out with the latest concrete mixers and with huge cranes and other devices for the rapid handling of the material from the lighters alongside. The scows are anchored as immobile as is possible in the swift current of the river, which is constantly churned into choppy waves by hundreds of passing freighters and excursion and ferryboats plying the busy stream. By means of hoppers placed at the top of long vertical delivery pipes, the concrete, as it is prepared, is deposited in the trench exactly where it is needed, and comes in contact with the water only when it is spread over the surface of the gravel bed which was prepared for it. As the work goes on, the concrete is held in proper form about the tubes by three-inch oak planking, firmly braced and backed up with clay and river slime from the dredges, working in the trench farther out in the river. Concrete is also chuted down between the tubes and continued up over them for five feet, thus encompassing them in a solid monolithic mass. The trench is then filled around the tunnel, and the top is covered with riprap.

The construction of the approach tunnels is proceeding on lines well established by the best engineering practice; and this part of the undertaking is a huge task of itself. Two shafts were first sunk at the river banks, one on each side, and from these excavating for the center wall was carried on inland as far as other shafts, and from them to the portals. Concrete gangs followed, building up the center wall, and when this was completed, the bores were pushed forward by a modification of the shield methods of the New York tunnel work, the change being necessary because of the tough clay of the under stratum. The shafts near the river will be permanent, and they are lined with double walls of concrete. They will serve to ventilate the tunnel, and as trains move in each tube only in one direction, a constant circulation of air will be maintained.

Electricity will be the motive power used in hauling trains through the tunnel, and current from the power plant of a local concern has been arranged for. Only a small transforming station will be needed to convert the alternating current, commercially supplied, to direct current for the locomotive motors. For the operation of the tunnel eight powerful electric locomotives are being constructed. It will be brilliantly lighted with electric lamps, and the walls will be clean and bright, for there will be none of the gas and soot that fill tunnels operated by steam locomotives. A system of block signals will be installed, and so arranged that no train or locomotive will enter either tube until the train ahead of it has passed beyond the summit on the other side.

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From Left to Right Are Shown the Floating Dredge for Excavating the Trench in the Bed of the River; the Scow File-Driver for Driving Piles in the Bottom of the Trench; a Section of the Double Tube in Position for Sinking; the Floating Concrete Mixer from Which the Concrete is Distributed Around the Sunken Tubes; and the Barges Carrying the Sand, Broken Stone, etc., for the Concrete. The Lower Left-Hand Cut Shows a Length of Tubes Being Sunk Into Position in the Excavated Trench.

NEW METHOD OF CONSTRUCTING A SUB-AQUEOUS TUNNEL.—[See page 458.]