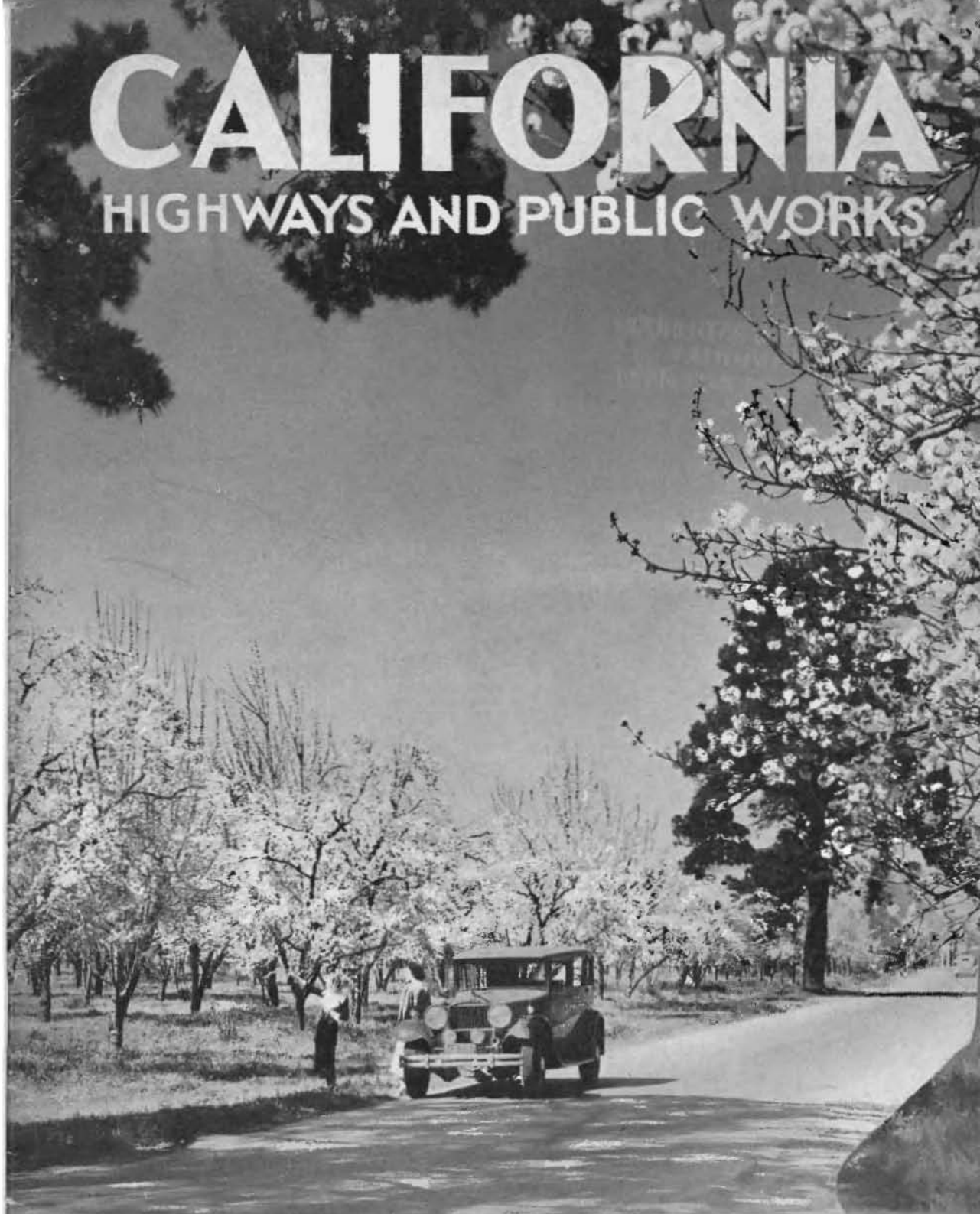


CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



Spring Beautifies the Highways

Official Journal of the Department of Public Works

APRIL 1936



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New Era in Design and Construction of Highways Being Developed By Varied Demands of Modern Traffic Conditions

By JUSTUS F. CRAEMER, Assistant Director, Department of Public Works

THE END of the first quarter of the year 1936 finds the planners and builders of highways throughout the nation facing the realization of the fact that we are entering upon a new era in highway designing and construction.

Since the advent of the automobile, development of construction fundamentals for building durable and suitable roads for the new form of transportation has mainly engrossed the engineering minds of Federal, State and industry highway agencies.

The results of years of research, experimentation and experience are represented in the modern high type standard highways.

The utilitarian and economic values of these modern highways have been firmly established, as well as the need for thousands of additional miles of them all over the country in farm and suburban areas "still in the mud."

But in the past few years other fundamental factors have been thrusting into the foreground to develop in the engineering mind a new picture of the highway of the future.

These factors shift the responsibility, in a large degree, from the field of construction into the field of designing, planning, financ-

ing and traffic control, an important and comparatively new field in its larger aspects.

Major compelling factors are: ever increasing demands of modern transportation for more spacious highways adequate to accommodate multiple lanes of traffic; provision for

free and safe movement of slow and fast traffic; separation of railway and highway grades at intersections; grade separation of through and local motor traffic at major arterial intersections; more safety features in design and equipment; separation of opposing traffic on all multiple lane highways and reasonable application of the principle of a pay-as-you-ride-per-mile tax upon highway users as represented by the gasoline tax when expended solely for highway purposes and not diverted to other governmental agencies.

Having gradually emerged from the experimental stage of road building, and realizing that less than one-third of our highway mileage in the State, considering all public roads, is surfaced, it is not enough that we proclaim our present and future needs. We must have an intelligent and scientific approach to the problem, with due regard to all interests involved.

There must be a definite relationship



JUSTUS F. CRAEMER

State Building Highway Link to Site of 200-inch Telescope on Palomar Peak

By E. E. WALLACE, District Engineer

CONSTRUCTION by the State Division of Highways of an essential link in the road to the summit of Palomar Mountain in San Diego County, the contribution of the California Department of Public Works toward increasing scientific knowledge of the universe, and which will make possible transportation to the peak of the famous 200-inch telescopic mirror and thousands of tons of material and equipment for the world's largest astrophysical observatory, now is under way.

The observatory site is at an elevation of 5568 feet and at present is accessible only over a tortuous trail from a road being built by the county of San Diego. The work undertaken by the State will, when completed, provide the final connection with the site and also furnish an approach to the Palomar Mountain State Park.

More than eight years ago the Rockefeller

road, designated as San Diego County's Feeder Road Project, is being financed with Federal funds, which have been apportioned to the State of California under the Emergency Relief Appropriation Act of 1935, and is being constructed under the supervision of the Division of Highways.

PROVIDING RELIEF EMPLOYMENT

The Feeder Road Project involves the construction of 3.3 miles of mountain road with a 28-inch roadbed which will be surfaced with local materials. Approximately 150,000 cubic yards of excavation, mostly rock, will be moved under this contract. One of the purposes of the undertaking is to provide employment and the specifications call for 237,370 man-hours of employment.

Because of the unusual loads which will have to be hauled over the road, a rather high standard was required.

HEAVY OBSERVATORY EQUIPMENT TO BE MOVED OVER ROAD

| Part | No. to be shipped | Width | Length | Height | Weight |
|----------------------|-------------------|--------|--------|--------|--------------|
| Mirror and Cell..... | 1 | 22 ft. | 22 ft. | 8 ft. | 100,000 lbs. |
| Tube | 1 | 23 ft. | 48 ft. | 23 ft. | 125,000 lbs. |
| Girders | 4 | 10 ft. | 65 ft. | 14 ft. | 140,000 lbs. |
| Horseshoe | 2 | 20 ft. | 45 ft. | 5 ft. | 100,000 lbs. |
| Lower Grillage..... | 1 | 23 ft. | 30 ft. | 6 ft. | 75,000 lbs. |
| Cage | 1 | 23 ft. | 23 ft. | 16 ft. | 50,000 lbs. |

Foundation appropriated funds for an observatory intended to eclipse any in existence. Five years were devoted to the task of selecting a site. The location on Palomar Mountain, comprising 720 acres, finally was chosen as the most suitable.

In order to secure the observatory, San Diego County authorities agreed to provide a road to the site, and the work of improving adjacent county roads has been in progress for the past year. A new road connecting with the secondary State highway to Ocean-side is being constructed by San Diego up the south side of Palomar Mountain and a total length of 11.8 miles of maintained road must be completed in order to provide proper access to the site.

This obligation placed quite a burden upon San Diego County and so the last link of the

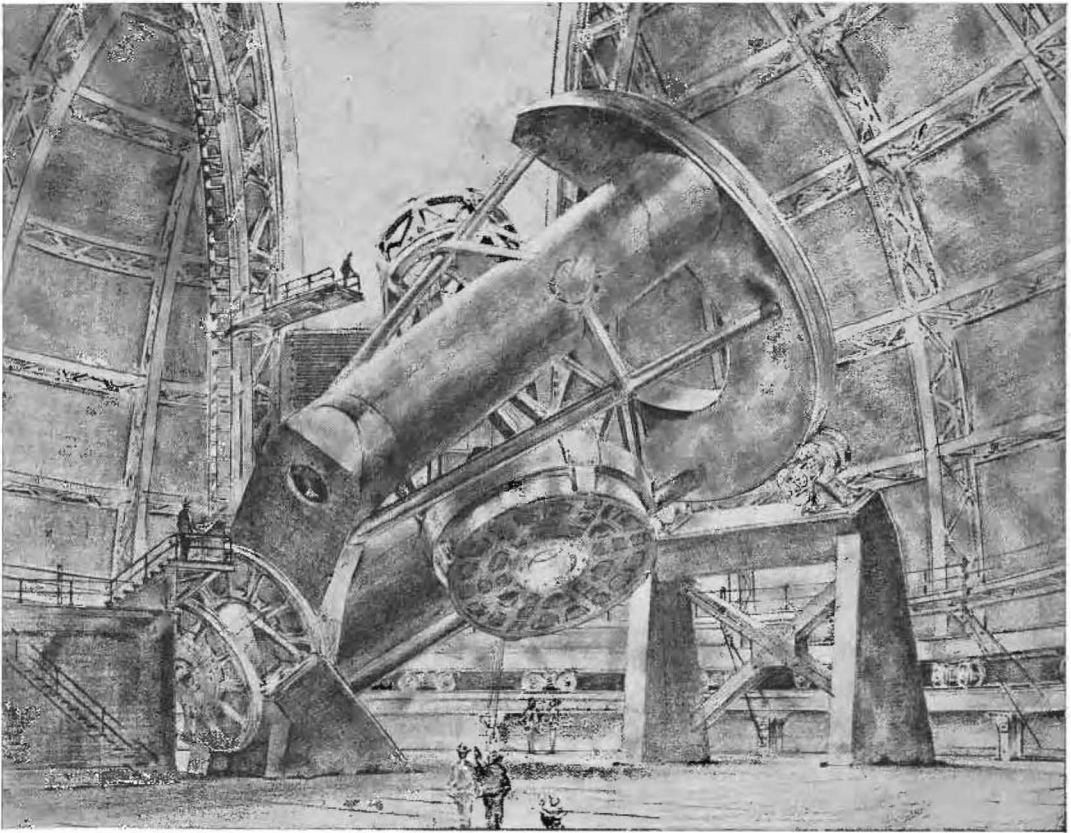
The road has been located so that traffic using it will not interfere with the observatory work. The route traverses some heavily timbered country and approaches the easterly side of the Palomar State Park, which is a beautiful tract including 2.5 square miles on the top of Palomar Mountain.

AIRPORT TO BE BUILT

From the observatory site a wonderful panoramic view of the surrounding valleys and mountains, as well as of celestial bodies, is available.

An airport will be built adjacent to the observatory which will provide for plane landings for official visitors. Necessary buildings will include at least five cottages to house the observatory staff and provide quarters for visiting scientists; the observatory housing

(Continued on page 4)



THE 200-INCH TELESCOPE as it will appear when completely assembled and mounted in the observatory on Palomar Mountain is shown in this picture supplied by the California Institute of Technology. The 200-inch mirror pierced with a central hole is shown in position at the base of the telescope tube.



PALOMAR MOUNTAIN OBSERVATORY SITE is at an elevation of 5568 feet. San Diego County is building a road 11.8 miles long up the south side of the mountain to connect with a State road to the site.

How 200-inch Mirror Will Function

(Continued from page 2)

for the 200-inch telescope and for the 18-inch telescope, the power house for the large telescope, a million-gallon water reservoir and a 75-foot water tower to provide adequate pressure for the entire site. The cottages will be termite, fire and earthquake proof and all other structures will be designed with equal precaution.

Work on the 18-inch Schmidt telescope observatory was started this month. The small telescope is to be a permanent addition to the 200-inch mirror telescope and will be used principally as a scouting instrument.

MIRROR HAS ARRIVED

Early this month the 200-inch mirror on which the eyes of the scientific world are now centered arrived in Pasadena from Corning, New York, on special cars. Three years will elapse before completion of the polishing and grinding of the mirror and before it is ready to mount in the observatory of the California Institute on Palomar Mountain.

The mirror is now at the California Institute of Technology at Pasadena where a special optical laboratory has been constructed in which the mirror will be ground. This building is lined with cork and is so constructed that no sunlight will be permitted to enter.

The three years during which the grinding and polishing are under way, the temperature within the laboratory will be controlled within very slight variations.

Recently a contract was let for the construction of the support for the world's greatest telescope to cost \$1,750,000. The office of Dr. Robert A. Millikan of the California Institute of Technology forwards the following interesting information:

TOTAL WEIGHT 425 TONS

"The tube of the telescope, about 20 feet in diameter and 60 feet long, will weigh about 125 tons. This includes the 200-inch mirror, lying on a special support system at the lower end of the tube. The glass disc will weigh about 16 tons after it has been ground and polished.

The telescope tube must be rigid enough to carry an observer in the cartridge-shaped house at its upper end without flexure. It must also be mounted so as to turn freely to all parts of the heavens and to follow the

stars automatically with great precision in their apparent motion from east to west. The total weight of the moving parts of the telescope, including gears and accessories, will be about 425 tons.

"Other optical combinations will enable the observer to photograph celestial objects or to study them with spectroscopes, photo-electric cells and special auxiliary apparatus at several different points. One of these is at the base of the telescope tube, below the 200-inch mirror, which will be pierced with a central hole 40 inches in diameter.

"Another point of observation will be in one of the cylindrical tubes which form parts of the fork within which the telescope tube hangs.

FIXED TEMPERATURE CHAMBER

"Still another arrangement will permit the observer to work in a fixed constant temperature chamber at the south end of the polar axis. At this point the largest and most powerful spectroscopes will be mounted on a massive concrete pier.

"The entire telescope will stand within a dome 135 feet in diameter. By opening the shutters of this dome an aperture 30 feet wide, extending from the horizon to beyond the zenith, will provide a large window for observation. The lower cylindrical part of the building, fixed in position, will contain many rooms, laboratories and photographic dark rooms for various kinds of work. The dome will rotate on the circular rails at the summit.

"Contrary to many incorrect reports, the magnifying power of the 200-inch telescope will always be low or moderate. The advantage of this instrument will be its great light concentrating power. This will enable it to detect very remote celestial objects, and thus to increase our knowledge of the constitution of the universe and the nature of its apparent "expansion." The increased brightness of the images of stars and nebulae already known will permit their spectra to be photographed with spectrographs of higher dispersion than those now employed."

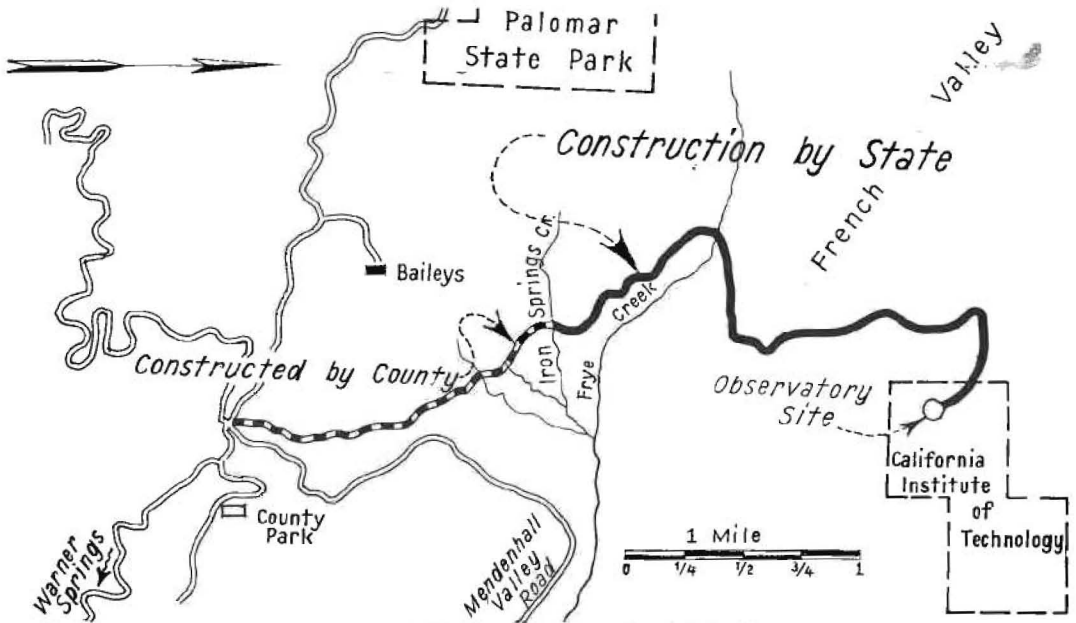
"Is this the Fidelity Insurance Company?"

"Yes, ma'am, it is. What can we do for you?"

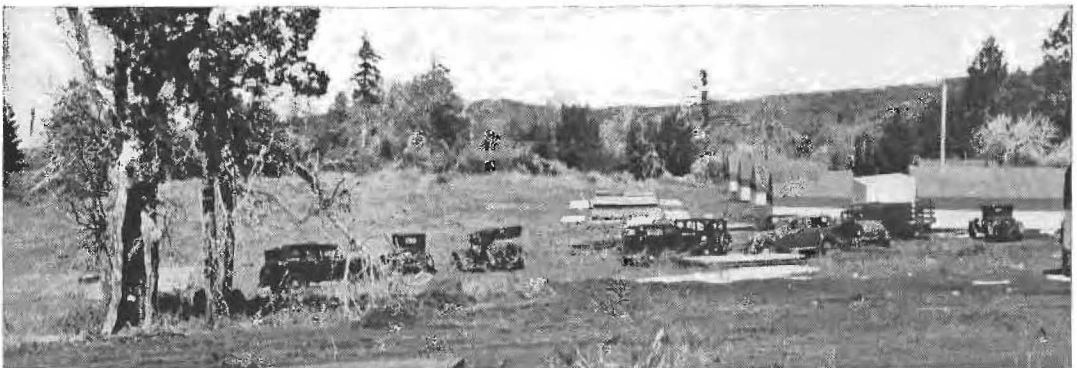
"I want to arrange to have my husband's fidelity insured!"



TOUGH GOING on existing trail road to camp and observatory site on Palomar Mountain.



MAP SHOWING county road and portion being constructed by State Division of Highways.



CONTRACTORS' CAMP near mountain observatory site is a rapidly growing community.

1400 Miles of Highways Damaged by Storm Conditions of Past Winter

By W. A. SMITH, Assistant Maintenance Engineer

RECORDS of the Division of Highways reveal that the unprecedented storms of the past winter months caused more extensive damage to the highways than has occurred in any similar period in the history of the division.

Snow removal, slide removal, slipout replacements and repair of flood and storm damage during the four months from November 1, 1935, to April 1, 1936, have placed a severe drain upon maintenance funds, exceeding in cost any comparable five months' experience, and extensive repairs must be made, as funds become available on many of the damaged sections.

Heavy snowfalls were to be expected in the regular course and, with winter conditions, a certain amount of surface failures. The main, immediate concern, however, was and is the extent of land slides and slipouts throughout the state.

EXTENT OF DAMAGE

Roughly, about 10 per cent, or 1400 miles, of the State system was damaged and in a few cases completely destroyed. The cost of opening, refilling and replacing this mileage, in even fair condition, will exceed the total average amount provided for upkeep purposes.

The most severe storms have occurred in the central coast and valley sections. Unusual snow removal was necessary over Donner Summit, on U. S. 40, and from Bishop north to the State line on U. S. 395. During February, 161 inches of snow fell at Donner Summit and 159 inches at Crestview. In the southern part of the State, snowfall has, fortunately, been light and storm damage nominal, although even there the work of clearing the roads was a considerable item.

In the snow areas, damage to road surfaces and to cut and fill slopes was more severe than last year, due to relatively mild temperatures. While frost heaving of frozen, saturated subgrade is a source of serious damage to road surfacing, this action is intensified so far as cut and fill slopes are concerned during a comparatively mild winter. The ground is more completely saturated and there is a

greater sloughing, with repeated freezing and thawing.

Under such conditions, the heavy snow removal equipment, which ordinarily would be supported by the frozen ground, considerably damaged the road surface and shoulders in clearing the roads east of the Sierras. This action, further intensified by the traffic, has caused failures, particularly along the pavement edges.

Extensive surface failures have occurred on State Highway Route 29, between Red Bluff and Susanville; on U. S. Route 299 between Redding and Alturas and on U. S. 395 between Litchfield and New Pine Creek, as well as many other locations. Expensive repairs must be made, as funds become available, on all of these sections.

For several years prior to 1934-35 and 1935-36 winter seasons, rainfall had been relatively light or occurred late in the season so that the new cuts and fills had not weathered and seasoned and damage was accordingly severe.

The areas where extensive slides and slips occurred follow:

SLIDE DAMAGE AREAS

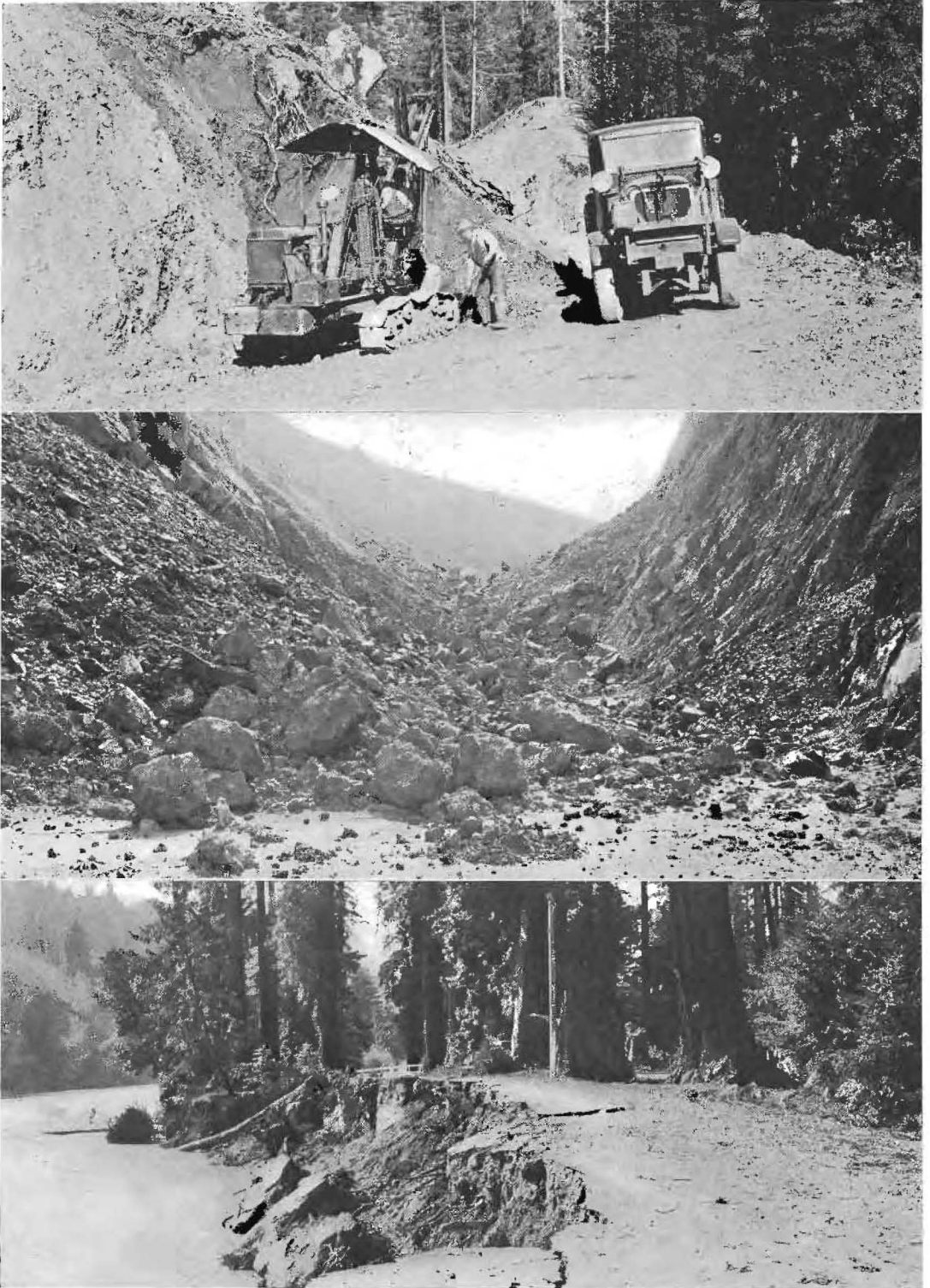
In the San Gabriel Canyon, 20,000 cubic yards of rock slides closed the road for a short period. North of Pasadena, on the scenic Angelus Crest route, 16,000 yards has been moved. In Ventura County, the Casitas Pass route and the Ventura-Maricopa Highway, U. S. 466, were closed to traffic at various times. Between San Juan Capistrano and Lake Elsinore, a mud flow from a side canyon made the road impassible on several occasions.

In the San Luis Obispo district, several routes were closed. State Highway Route 80, through San Marcos Pass northwest of Santa Barbara, was closed for three weeks. On a three-mile section, the slide yardage averaged 6600 cubic yards per mile. On Route 56, between San Simeon and Carmel, in a distance of 30 miles 175,000 cubic yards of material either moved into the road or slipped out to destroy considerable distances. Of this quantity, 50,000 yards was concentrated in a three-mile distance, or 16,500 yards per mile. On Route 10, between San Lucas and Coalinga, the same conditions obtained.

TWO MAJOR SLIPOUTS

In the San Francisco district, there was 110,000 cubic yards of material on twelve State highway routes which it was necessary to move to protect the traffic and the highways. This does not include

(Continued on page 8)



SLIDES AND WASHOUTS of the past winter. At top—A typical slide removal job in Trinity County. Center—Rock slides closing San Marcos Pass. Bottom—Washout on Van Duzen River, State Route 35.

Major Damage Due to Slides and Slips

(Continued from page 6)

an entire cleanup but represents only the minimum to keep the roads open and in safe condition. Nor does this include the slipout at Inspiration Point on Route 5 near Santa Cruz and one on the Skyline Boulevard, Route 55, which are of major proportions. These two locations will require special study and financing. For the time being, traffic is taken care of satisfactorily by short detours.

A slipout on the All Year Highway, Route 18, closed the road west of Mariposa for a time and the same route was closed by slides near El Portal. Extensive damage occurred on the Mother Lode Highway between Mariposa and Bagby. During the time the All Year Highway was closed, flood conditions existed at Merced where U. S. 99, the main valley route, was under water both north and south of town to a maximum depth of 36 inches. Two floods occurred within a few days' time. Each flood considerably damaged the shoulders south of the city and made it necessary each time to detour traffic for many miles. One employee of the division was killed in flagging traffic.

On the Mother Lode, between Sonora and Placerville, the roadway was washed out at two locations and closed temporarily by slides, with many small slides which blocked drainage, and one slipout above Melones'. The same conditions were encountered on the road from Angels Camp to Dornington, from Jackson to Pine Grove and west of Martell. There was considerable damage by high water south of Lone at Sutter and Jackson creeks, as well as between Lone and Waite's Station on Route 97.

FLOOD DAMAGE

In District III, slides on U. S. 50 above Placerville, a slipout near Baxters on U. S. 40, slides on Route 21, the Feather River route, and damage to the bridge across Cache Creek, and extensive slides on Route 50, as well as flood conditions between Sacramento and North Sacramento, and in the vicinity of Butte City, all taxed the resources of that organization.

In the Redding territory, damage was sustained throughout the district, with the worst slide conditions on the Weaverville and Peanut laterals, routes 20 and 35. Damage to road surfaces, particularly from Red Bluff to Susanville, Route 29; Redding to Alturas, Route 28; and Litchfield to New Pine Creek, Route 73, was more severe than in any of the other districts.

The Eureka District is organized to handle extensive slides each winter, but the 23 days of practically continuous rain in January caused more severe damage than usual. This damage was quite general on U. S. 101, with 350,000 yards of slides and slipouts, and an additional 300,000 yards on ten other routes in the district.

When storm conditions obtain, the maintenance organization is on duty twenty-four hours a day so that warning signs, lights and barricades may be placed to warn traffic, and the roads repaired so that the motorist may pass in safety.

This necessity is accepted by every man as a matter of course. It is not possible to give individual credit, but the public generally little realizes the long hours of hard and sometimes hazardous work which these men put in during storm periods, that traffic may be served.

The most severe damage occurred on newly constructed roads and the cost of replacement, although necessary to keep traffic moving, is in the nature of delayed construction. On construction of the type, now standard practice, it is impossible to foresee the effects heavy fills or deep excavation will have.

In the long run, therefore, it is perhaps more economical to meet the damage as it occurs rather than to spend large sums to insure that all cut slopes are stable and all fills on ground which will furnish support when saturated with water. In any case, it must be realized that a large sum must be set up each year to meet such emergencies, as a single slide or slipout may entirely close a road without warning.

INVOLVES EXTENSIVE REPAIRS

Under the conditions encountered, repair work involves much more than the simple replacement of a fill or removing a slide. In many cases, an investigation must be made to determine the underlying cause of the failure and measures adopted to correct such condition.

In one case, to protect a bridge, it was necessary to excavate a trench thirty feet in depth, place perforated pipe, backfill with rock and excavate an outlet tunnel under the road. Drainage of the slide area by cutting channels to insure quick runoff, excavating below the slip plane and placing of perforated pipe, construction of bulkheads, and similar measures are taken.

In some cases, control work is not possible where extensive volumes of earth are moving on a plane too deep to be accessible, but, in general, slide and slip conditions can be controlled by proper drainage.

In the past, it has been possible to secure considerable benefit through use of slide material in widening the fills, but widening has now reached the ultimate desirable in many places.



STORM DAMAGED HIGHWAYS. At top—Typical surface failure at mud slide on Coast Highway in Mendocino County. Center—Mountain stream diverted by blocked culvert wrecking highway. Bottom—Shoulder of Golden State Highway washed out by flood near Merced.

Trees on State Highway Saved From Destruction by Western Pine Beetle

By E. L. STUMP, Maintenance Superintendent, District II

THE destructive effect of the activities of the Western pine beetle (*Dendroctonus Brevicomis*), commonly known as the yellow pine beetle, had been noted for many years by the writer, principally on State Route 29 (Red Bluff-Susanville lateral), in the vicinity of Mineral.

Experiments in treating infested trees were begun in 1931 and have advanced far enough, I believe, for us to draw some valuable conclusions as to effective methods for coping with this devastating insect pest.

Data as to whether this particular area is abnormally infested is not available, but I believe not. Bulletin No. 7 of the State Department of Natural Resources estimates the annual destruction of yellow pine stumpage in California as 200,000,000 board feet of the highest quality timber.

TAKING HIGH TOLL

Our experiments were confined, of necessity, to the State right of way and maintenance yard sites and the toll taken of adult yellow pine was found to be extremely high, in some areas as high as 20 to the mile in 60 and 80 feet right of way. The dead trees become a menace to traffic and are removed by the maintenance crews so that in their gradual elimination the loss is not apparent. However, our rights of way in the yellow pine belt are gradually being stripped of the finest specimens.

A brief life cycle of the Western pine beetle quoted from Circular No. 143, U. S. Department of Agriculture, follows:

"The beetles begin to fly and attack the trees in June and continue the attack until October or November. The first generation develops and emerges in August to November and the second generation passes the winter in the trees that are killed by it in the summer and fall. The foliage of the infested trees begins to fade and turn yellow in a few weeks after being attacked. The summer broods of the first generation leave the trees by the time the foliage is reddish brown, but the overwintered broods do not emerge until the following May or June, in some cases several months after the foliage is brown."

FIRST METHOD EFFECTIVE

Further seasonal history may be found in Bulletin No. 83, U. S. Department of Agriculture, "The Western Pine Beetle."

In 1931 two infested yellow pine trees on State right of way near Mill Creek, Route 29, were treated. The methods used consisted of drilling in at the pitch tubes (entrance holes) with hammer and chisel, then tracing the egg galleries by chipping through the outer bark and destroying all borers found. The egg galleries were then disinfected with fly spray to kill the eggs and the chipped out galleries sealed with tar or asphalt.

This method proved effective in saving the two trees but was very expensive (about \$13.50 for a 5-foot diameter tree) and was also very disfiguring to the tree.

From that date thought was given to the development of some less expensive and less mutilating method of combating the beetle.

CIRCUMFERENTIAL BORINGS TRIED

The first experiments undertaken consisted of circumferential borings at the base of the tree through the outer bark and cambium layer and one-half inch into the sap. Half-inch pipes were placed in the borings at an angle of 45° from the vertical and the pipes filled with a 10 per cent solution of "Black Leaf 40" by means of a funnel.

It was believed that action of the sap would carry the poisonous solution up through the cambium layer, on which the beetle feeds, thus causing an internal poison to the pest.

In the spring of 1934 in conjunction with Mr. Whittaker, Assistant State Aboriculturist, areas of bark on trees under treatment since 1933 were removed and many dead beetles found which were subsequently taken to the State laboratory and identified as Western pine beetle. Of the 12 trees under treatment at that time none have died to date. Ordinarily a tree will be girdled and die in one season or two at the most.

COST GREATLY REDUCED

Although the circumferential borings gave better results when placed close together this method proved somewhat cumbersome.

(Continued on page 25)



HAMMER AND CHISEL method used in 1931 to destroy pine beetle borers left tree mutilated.



PIPE INJECTOR METHOD for poisonous liquid tried in 1933 reduced cost from \$13.50 to \$3 a tree.



CORK METHOD of circumferential borings filled with solution adopted in 1935 is less cumbersome.

New Bridge Supplants Span Where Only Woman Ever Hanged in State Met End

PROGRESS and the State Division of Highways, marching together into the historic mining town of Downieville in Sierra County, have relegated to minor importance the famous pioneer bridge across the North Fork of North Yuba River, gateway to the mountain hamlet for traffic from Truckee, Sierraville and Sierra City, and scene of the lynching of the only woman ever hanged in California.

Since early days, Jersey bridge has afforded ingress to Downieville for travelers coming from points east. For 85 years it has been pointed out to tourists as a landmark of rather unenviable history, as the spot where on July 5, 1851, following an hilarious Fourth of July celebration, a Mexican woman, known only as Juanita, met death at the end of a rope for the killing of Jack Cannon, popular citizen of Downieville.

The original Jersey bridge was partially destroyed by a flood that swept down the North Yuba River in the early 80's, but, nevertheless, to the people of Downieville the present ancient, rebuilt structure is a connecting link with the romantic, glamorous and turbulent past of Sierra County.

OLD BRIDGE INADEQUATE

Now its importance as a vital part of Primary State Highway Route 25 between Nevada City and Downieville has been usurped by a modern reinforced concrete bridge constructed by the Division of Highways. This improvement was necessary to eliminate dangerous curves on the highway within the confines of the town, and at the approaches at both ends.

The line change on the highway was graded to a 24-foot standard roadbed and will be surfaced 20 feet in width. The new bridge is a reinforced concrete girder type, 160 feet long, with a 24-foot roadway and 4-foot sidewalks on each side.

An interesting feature of the construction was the selected stone embankment placed along the exposed sides of the fill between the bridge and the easterly end of the project. The material for the protection was obtained by widening and easing the alignment of the

highway at Cannon Point, one of the worst of the many curves on the highway.

While the line change is only 0.4 of a mile in length, it removes a dangerous traffic hazard and replaces a bridge inadequate for modern traffic. The old route passed through the main street of Downieville, which is extremely narrow and further constricted by parked cars. Three sharp turns were necessary in traveling the former route, besides a crossing of the river over the old Jersey timber truss, which permitted of one-way traffic only and was posted for maximum loads of 8000 pounds.

FEDERAL RELIEF FUNDS USED

The total cost of the project, including the estimate of surfacing and oiling to be done this spring, is \$59,330, of which \$35,000 was financed from the 1935 apportionment of Federal Employment Relief funds, and the balance from the budget item of \$75,000 for the 87th-88th fiscal year construction listed as "Nevada City to Downieville, portions."

G. A. Crayton was resident engineer in charge.

The hanging of the woman, Juanita, aroused a storm of protest back in 1851, newspapers throughout the civilized world editorially condemning the affair. Even the *London Times* of that period had a scathing article on the subject. In this state the controversy raged for several years, the issue became a political one because of the presence at the lynching of John B. Weller, afterwards Governor of California, and the state was long divided into two camps composed of those who held the hanging justified and those who denounced it.

The official history of Plumas, Lassen and Sierra counties in the State Library after describing the hilarious Fourth of July celebration of 1851, says:

"Later in the night these jolly spirits became mischievous, and some of the rougher sort went around breaking open doors of houses, among others the domicile of the ill-fated Juanita. In the crowd was Jack Cannon, a Scotchman of magnificent physical strength and herculean proportions. When the hilarious band broke up at a very early



New reinforced
concrete girder
bridge on
realigned State
Highway across
the North Fork
of North Yuba
River at
Downieville.



Old Jersey
Bridge at
Downieville,
scene of the
hanging of
Juanita, the
only woman
ever hanged in
California.



State Using Divided Highway Design

(Continued from page 1)

between necessary roads and ascertained present and future traffic needs. Road building must be based on economic justification. Here, indeed, is a proper and logical place for planning. This emphasizes the importance of planning surveys we already have conducted and are continuing, in cooperation with the United States Bureau of Public Roads.

If this course is followed we can proceed with the assurance that every mile of new road and every mile of new surface will earn a fair return. That is the basis on which we now are proceeding with our highway construction.

TASK BEFORE US

The immediate concerns of the California Department of Public Works are:

- 1** To bring up to adequate standards our present highway system which includes approximately 7,600 miles of county roads added by legislative enactments since 1931.
- 2** To satisfactorily serve the traffic which has developed on these highways and to protect the State's investment in this system amounting to some \$300,000,000 by adequate maintenance.
- 3** To develop our highway system to meet the increasing traffic and safety demands of automobile and motor truck transportation.

In order that these objectives may be satisfactorily and economically accomplished, planning of future highway development will be predicated upon facts revealed by the present and continued extensive traffic surveys which we are conducting, and upon exhaustive studies of the causes of highway accidents.

The demand for adequate traffic facilities and for increased safety for such traffic presents immediately the necessity of conserving the funds now provided for highway improvement because, aside from the betterment and improvement which may be applied to the large mileage of secondary roads on our State highway system, many sections of our main trunk lines are urgently in need of reconstruction, widening, and resurfacing to bring them to a status which will properly serve even present traffic needs.

MEANS ADDITIONAL EXPENDITURE

To include in our designs additional safety factors beyond those which are now provided by high standard alignment and grade, as well as width of roadway, we must also be prepared to face additional expenditure.

This may be illustrated by a design feature which is now receiving greater attention and is being urged for consideration, namely the divided roadway design providing separated lanes of traffic in opposing directions.

A properly functioning road of this design would be a four-lane road in which a center strip or parkway is introduced, dividing the road into two two-lane roads and eliminating the opposing traffic hazard.

It is obvious that such design would immediately involve additional cost, first, in additional width of right of way, second in additional width of grading, and in several other features involving construction.

EXAMPLES IN CALIFORNIA

This type of roadway is not of recent conception but has been gradually developed, some instances of it dating back in individual installations for a number of years. There are several examples now existent on the State highway system in California; two sections in San Diego County, on the Torrey Pines mesa and north of Encinitas, having been in use for a number of years.

Other installations are either now in progress of construction or contemplated in the near future, as on the East Shore Highway through Oakland, Berkeley, Emeryville, and Richmond, from the San Francisco-Oakland Bay Bridge distribution structure northerly to San Pablo Avenue in Richmond and on the east bridge approach itself.

More important, perhaps, than the immediate installation of such a type road is our economic study and development of road designs which will permit the progressive expansion of our highways, in conformity with the traffic demands made upon them, so that we may ultimately achieve this type of divided roadway when traffic volume justifies it, without loss of initial investment. Such studies are now in progress and such designs are being placed under construction at the present time.

(Continued on page 18)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY-----Director
JOHN W. HOWE-----Editor

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Vol. 14 APRIL, 1935 No. 4

GAS TAX DIVERSION

The Hayden-Cartwright Act provided that "Federal aid for highway construction shall be extended only to those states that use at least the amounts now provided by law for such purposes in each state from state motor vehicle registration fees, licenses, gasoline taxes, and other special taxes on motor-vehicle owners and operators of all kinds" for highway purposes, except that no state shall receive less than two-thirds of what it otherwise would receive in Federal funds. The effect of this provision was to "peg" diversion of highway funds at the mark existing when the law became effective.

This left the states that were diverting portions of their highway revenues to other purposes free to continue such diversion at the level then prevailing. It is now apparent that the motoring public is resentful that the guilty states are continuing to divert portions of their highway revenues and a nationwide revolt has developed from a spontaneous sentiment existing among all who are being "short changed" on their highway revenues.

There is an abundance of evidence to prove that a considerable portion of the highway traffic accident toll is due to this diversion of highway revenues. Many roads that are unsafe because of lack of improvement to meet modern traffic conditions could be made safe if all money collected from gasoline taxes and motor vehicle license fees were used for road construction and maintenance. There is a growing demand that safety be built into highways to the fullest possible extent.—*American Road Builders Association.*

British Psychologist Ascribes Accidents to Split Consciousness

THE British are also wrestling with the problem of highway accidents and the following discussion of a psychological theory advanced as a possible solution is made in an editorial article in the magazine *Roads and Road Construction* published in London:

The theory has long been held that certain people, by reason of innate clumsiness or some other mental abnormality, are more subject to accidents than others. In a few branches of human activity it is susceptible to proof. Whether a similar phenomenon exists in relation to road accidents is a question which has often been debated. Personally we are inclined to doubt it.

TERRIFYING ASPECT

But a new and more terrifying aspect of the subject is opened out by the latest theory of psychologists as put forward by one of them in a recent letter to the "Times." According to this theory, "there is a very large range of individuals for whom accidents can be regarded as symptoms of a temporary dissociation or splitting of consciousness—a condition against which very few minds are absolutely secure."

So far, so good; for in plain English we take this to mean that everyone loses his head occasionally. What follows is more startling. "Quite often these accidents are so accurately timed to accompany an impending subjective crisis that they can only be described as unconscious suicidal attempts." In other words, if you have just been sacked by your boss or lost heavily on the Stock Exchange—well, just be careful how you cross the road.

The correspondent goes on to say that the normal response to this condition is to exact from oneself a higher degree of caution, but that certain individuals react with an increased recklessness born of a headstrong belief in their complete rightness and security.

RECKLESS COURT ACCIDENTS

We have always urged strongly the application of science to the study of road accidents, but we confess we are disappointed if this is the best that psychology can do. It does not require profound wisdom to see that the reckless driver courts disaster and the cautious one avoids it. Nor is it any less plain that the majority of accidents are due to a momentary loss of judgment on the part of one or both of the victims. It is interesting to note, however, that psychologists are on the track of the causes of this loss of judgment; if they can follow up this line of investigation and determine the condition under which it is most likely to occur they will perform a real service to the cause of road safety.

Meanwhile the road engineer is left with the baby; for it is his duty to discover the means by which road users can be saved in spite of themselves.

Traffic Cop: "Lady, don't you know this is a safety zone?"

Woman Driver: "Don't be silly! Of course, I know. That's why I drove in here."

Dramatic Operation Marks Closure of Final Bay Bridge Cantilever Gap

By C. H. PURCELL, Chief Engineer

THE LARGEST cantilever bridge in the United States—third largest in the world—was closed late last month. And with its closure, two of the most populous centers in the far west were joined by a chain of steel—San Francisco and the east bay empire. The Victory Highway (U. S. No. 40) technically, if not yet practically, now stretches from the Atlantic to the Pacific.

The San Francisco-Oakland Bay Bridge is a reality, and an 80-year old dream has been fulfilled.

Next to the sinking and anchoring of the caissons for tower foundations on the west bay crossing, the closing of the cantilever of the east crossing was probably the most ticklish job in the construction of this world's largest bridge.

WEATHER LENGTHENED MEMBERS

First, it was the longest cantilever to be suspended, and the heaviest; 1400 feet in its total length, it weighs 21,000 tons. Second, changing weather and tidal conditions made the closing of the gap difficult to calculate to a nicety.

At one time during the closing, for instance, with a cold wind blowing through the Golden Gate on the west and a warm sun on the east, one side of the structure was as much as four inches longer than the other.

From Tower E-2 near Yerba Buena Island and from Tower E-3 east of it, traveling derricks had moved slowly toward each other, lifting steel members from barges approximately 195 feet below. Week after week bridgemen fitted these steel members and bolted them into place, until about 625 feet of steel, weighing around 10,000 tons, were suspended from each tower.

It remained now to close the gap of 96 feet.

And one morning, while commuters looked on, the eyebars of the lower chord were lifted and slipped into place and the first juncture completed.

Not so spectacular but even more exacting was the completion of the final closure which was accomplished on March 25.

Following the placing of the lower eyebars and steel members (such as horizontals) sufficient to give the structure support, but the minimum weight, four steel pins, about one-half ton in weight and three feet in length, were to be driven and the upper chords placed and bolted.

Here the eight giant hydraulic jacks, each exerting a "push" of 500 tons, which had been temporarily installed for just this purpose, came into play. Four of these jacks were located at the top of the split steel bent on Tower E-4. With these it was possible to push or pull an entire half of the bridge east or west. It was these horizontal jacks, 1200 feet away, that jockeyed the eyebars into position so that the steel pins could be driven through, thus securely fastening the lower chords.

BRIDGE CLOSED BY JACKS

The four remaining jacks with a longitudinal action had been placed at each end of the upper chords of the cantilever arms.

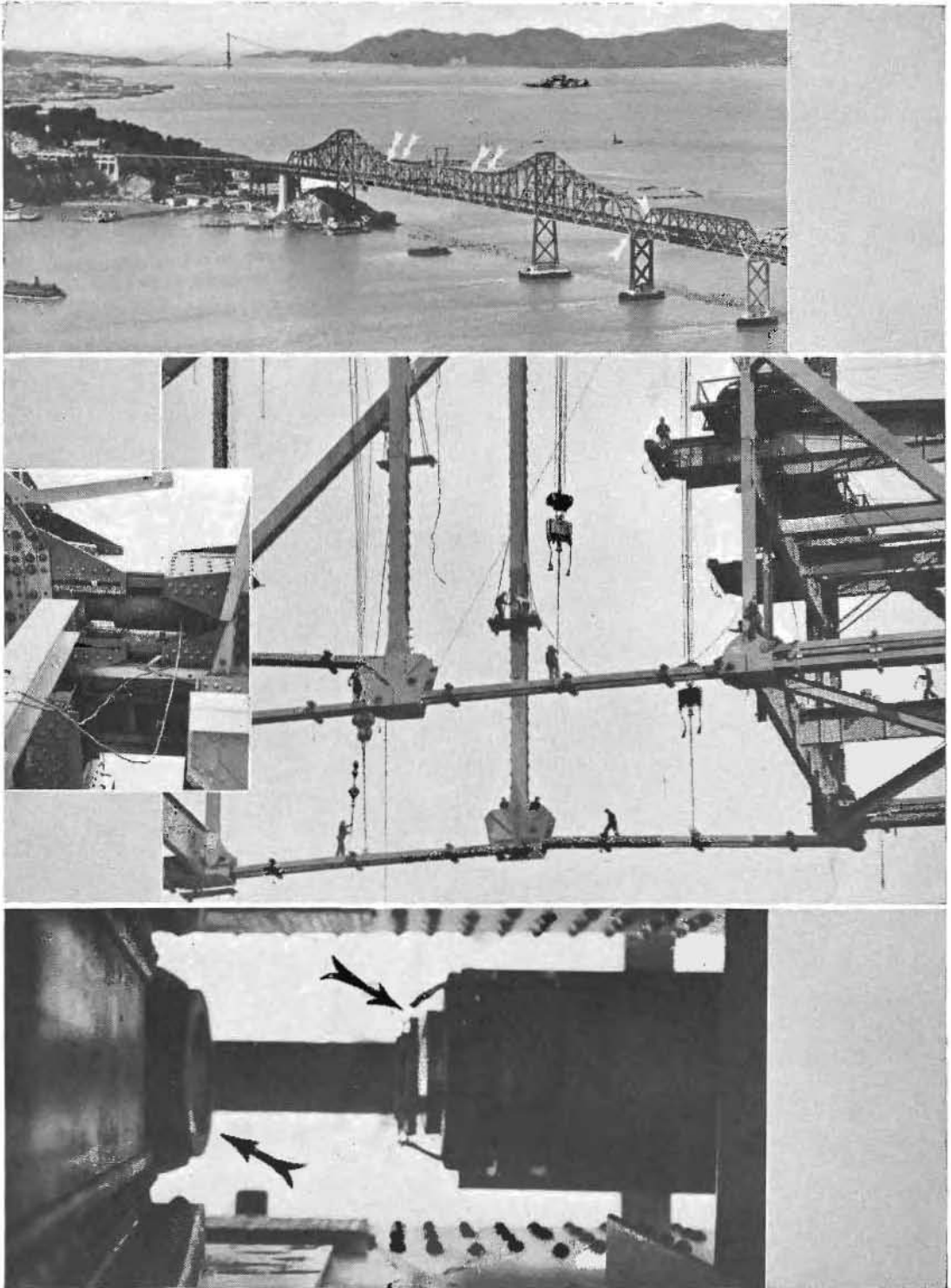
It was now necessary to bring these into operation to adjust the arms of the cantilever so that the upper chord could be slipped into place and bolted. This was done just as we had calculated, and not until then, to the engineers, was the bridge closed.

Operations during the procedure of this final and delicate work, were directed by engineers stationed with a full view of the project, through telephone communication to operators on the jacks several hundred feet away.

Remains now the placing of additional steel members, the installing of the floor steel and the paving. And it will not be long before the entire cantilever section can be pronounced completed.

ST. LAWRENCE CANTILEVER LONGEST

Other cantilever bridges longer than that of the San Francisco-Oakland Bay Bridge are the 1800-foot span built for railroads and a highway across the St. Lawrence River near Quebec, Canada, and the Firth of Forth Bridge in Scotland, which has two cantilevers each 1710 feet in length.



Center Photo Courtesy San Francisco Examiner

JACKS DID IT—The first steel to close the gap of the Bay Bridge 1400-foot cantilever span were the eyebars on the lower chord shown in the center picture and the steel worker on what appears to be the lower bar was the first man to walk across. The bars were fastened after they were jockeyed into position by powerful jacks shown in insets and located as marked in upper picture.

Gas Tax Regarded as Tax by the Mile

(Continued from page 14)

The State highway system in California includes approximately 14,000 miles of roads. Originally, state highway work was financed by bond issues and motor vehicle registration fees. The three bond issues voted by the people aggregated \$73,000,000. Since 1923 construction and maintenance operations have been paid for by gas tax and registration fees on a pay-as-you-go basis.

Present sources of revenues for State highway work in addition to federal aid are: One-half of the net revenues from motor vehicle registration fees after funds for the support of the Motor Vehicle Department and the California Highway Patrol have been deducted, and two cents of the three-cent State gas tax after deduction of the cost of collection and refunds made for exempt gasoline tax uses.

One-half cent of the two cents of State highway gas tax revenues must be expended within incorporated cities on the basis of the population which each city has to the total city population in the State. One-quarter cent is for use on State highway routings within the cities and one-quarter of a cent is for streets of major importance within cities.

The net gas tax revenue of 1½ cents is all that is left for application to State highways outside of incorporated territory.

The revenue derived from one cent of the gas tax raises approximately \$12,000,000 per year. The approximate amount at this time of State highway funds which are expended within cities is \$6,000,000 per year, or \$12,000,000 per biennium.

MATCHING FEDERAL AID

Regular Federal aid is a contribution from the Federal government, depending upon appropriations made by Congress and requiring matching of Federal moneys by State moneys. These funds are applicable only to a system of roads included in a Federal Aid system, agreed upon between the State and the national government. It is not extended to a State until it is earned and can only be collected after the work has been done with State funds. In California the approximate cooperation amounts to 50%, or dollar for dollar matching.

Admittedly, the gasoline tax is a fair tax. It is a just tax for highway purposes. Its diversion for any other governmental function manifestly would be unjust not only to those who pay it, but to the State which would be deprived of all future Federal aid, and to all the voters of the State who have twice voted overwhelmingly against diversion in two successive elections.

Concerning the fairness of the gas tax and the indefensibility of any proposal to divert it to purposes other than highway construction and maintenance, Roy F. Britton, Director of the National Highway Users Conference, Washington, D. C., has this to say:

TAX BY MILE

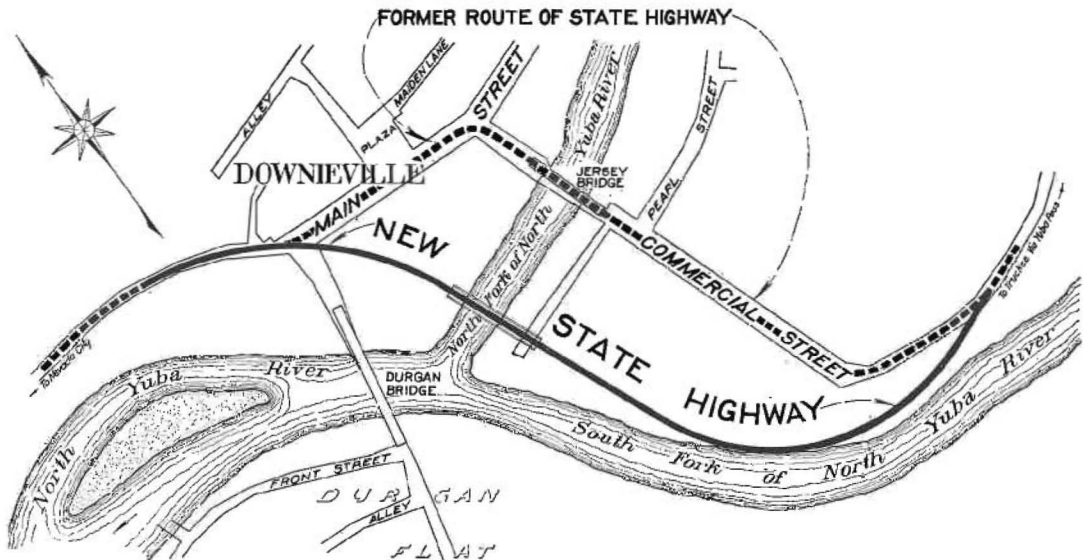
"The gas tax can be looked upon, in reducing it to its lowest common denominator, as a tax by the mile. You pay as you ride. When first imposed it was assumed you would ride as you pay; that's the theory of it.

"Measured by these standards it would be hard to point to taxes that are sounder or more defensible in theory than the two principal motor vehicle tax levies—registration fee and gasoline tax.

"The principle of the motorists' taxes by the mile is sound. It is my contention that there is no sounder tax that could be devised than a levy predicated on the theory that you pay for the facilities which you use as you use them; that you pay as you travel. These taxes are entirely proper for road construction, maintenance and administration, but they are entirely improper and indefensible as a source of revenue for general governmental needs, however urgent those needs may be.

"Whenever diversion occurs, taxes by the mile becomes the sales tax on a special class—a discrimination and a mockery."

If the plans of the Department of Public Works and the Division of Highways for the future are to be successfully carried out there can be no diversion of gas tax funds, for, in addition to providing adequate transportation facilities, the department feels a pressing responsibility to help by every means in its power in reducing the number of traffic accidents and fatalities which today have reached a high figure in California.



MAP SHOWS HOW new State route avoids narrow congested city streets in Downieville.

Woman Hanged in Early Days at Downieville

(Continued from page 12)

hour the next morning, Cannon went back to the Mexican house. His purpose in returning thither is, of course, unknown. Many persons say he intended to apologize and pay for the damage done by himself and fellows."

V. C. Murray, who witnessed the killing of Cannon, is quoted in the history as saying that Cannon entered into an argument with the woman and a Mexican companion. Juanita drew a knife from the folds of her dress and stabbed Cannon to the heart. There was high excitement when news of his death spread. A judge and jury were hastily appointed and two attorneys named for the "prosecution" and "defense." A young lawyer who pleaded for Juanita was man-handled by the mob. The woman was found guilty.

Continuing the account of the hanging, the history says:

"The woman was taken to her cabin and given one hour to prepare for death. Confronting with an unflinching, steady gaze the angry crowd surrounding her, she sat the whole time. When her hour was up, she was called forth and passed fearlessly down the street, chatting and smiling with as much ease as anyone there.

"From the top of the Jersey bridge a rope dangled over the side, while beneath it a timber six inches wide was lashed to the bridge

and swung out above the stream. Three thousand excited spectators were present, many of whom now live to tell the tale.

"On the plank Juanita stood, quietly surveying the crowd. Perceiving a friend, she took off her Panama hat and gracefully flung it to him, bidding him good-bye in Spanish. She took the rope in her own hands, placed it about her neck and adjusted it beneath her beautiful black hair with her own fingers. A white handkerchief was thrown over her face, her hands tied behind her, and at each end of the plank, ax in hand, stood a man ready to cut the lashings. Another fired a pistol as a signal, and the axes fell. She dropped three or four feet, meeting death with scarcely a struggle."

George Barton of Downieville, who witnessed the hanging, wrote of the incident in verses which in part read as follows:

"Gayly she climbed the fatal pile;
To one she knew, with graceful bend,
Flung him her hat, and with a smile,
'Adios, amigo'—good bye, friend;
And pressed the noose beneath her hair,
And smoothed it down with steady palms;
Life making up her toilet there,
Ere death embraced her in his arms."

Concluding his poetical story, he wrote:

"Stern winter brought its angry flood
That madly rushed towards the sea;
That bridge went down, and yet the blood
Stain lingers; it will ever be
A mark—no matter where the blame—
To point the finger toward the spot,
When every witness, aye, each name,
Are unremembered, all forgot."

Ground Broken for Drawbridge on Proposed Lodi-Rio Vista Cut-off Link

By C. J. TEMBY, District Office Engineer

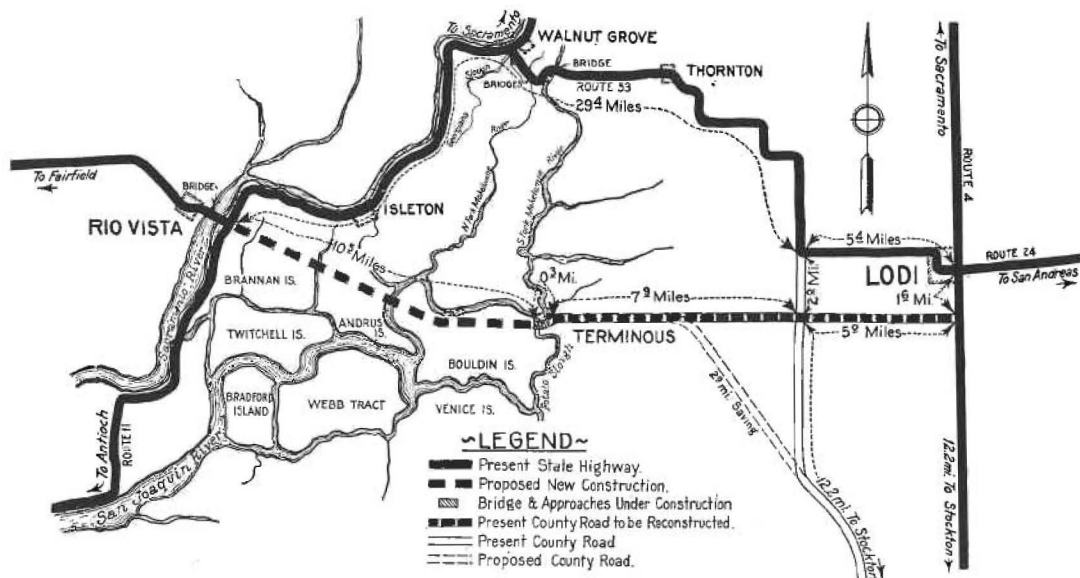
HERALDING construction of a proposed new state highway, to constitute a direct route from Cherokee Lane near Lodi to Rio Vista, passing through Terminous and crossing Bouldin, Andrus and Brannan islands, ground formally was broken at Terminous on Thursday, April 2, for construction of a drawbridge across Potato Slough, with FWP funds, which will be the first unit of work undertaken on this delta land cut-off project.

Groundbreaking ceremonies were attended by Earl Lee Kelly, Director of the Depart-

Approximately 15 miles of it is on top of the Sacramento River levee.

SAVES ELEVEN MILES

The proposed cut-off route will be about 23.7 miles in length, or about 11 miles shorter than the present highway between Lodi and Rio Vista, which is considerably out of direction, deviating about 8 miles from a true line between the two terminal points. Because of its poor alignment and the fact that a large portion of it lies on the river levee, only minor improvement and



SKETCH MAP SHOWS route of proposed cut-off highway route from the vicinity of Lodi to Rio Vista across three delta islands, saving 11 miles in distance.

ment of Public Works; Harry A. Hopkins, chairman of the California Highway Commission, and officials of the Lodi Chamber of Commerce and San Joaquin County.

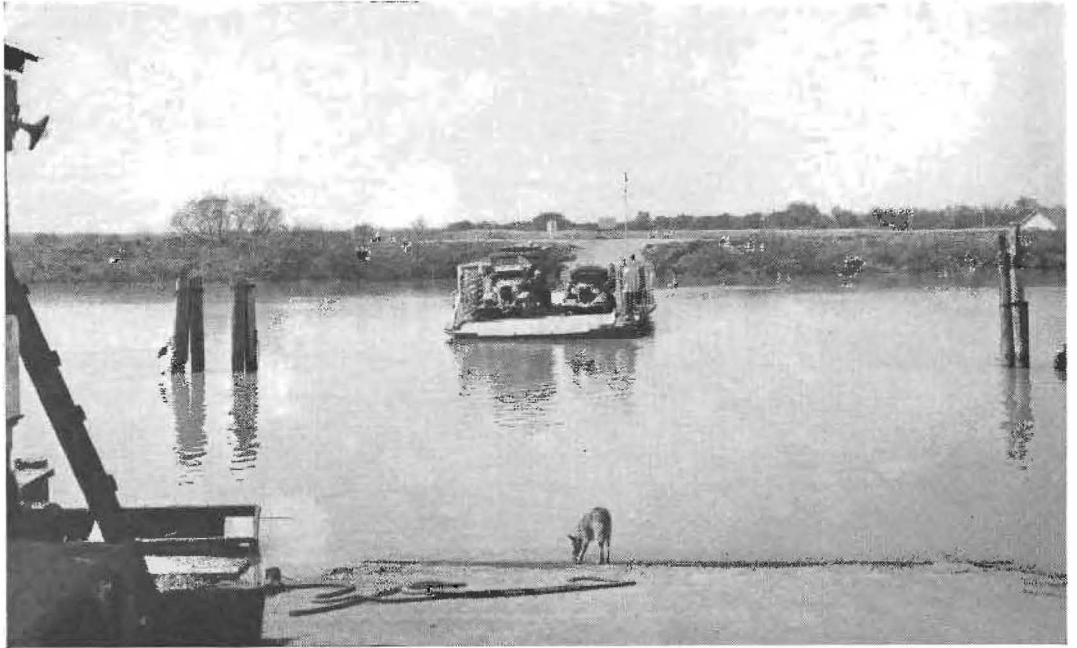
The new highway is planned to replace the present one between Lodi, in San Joaquin County, and Rio Vista, in Solano County, via Walnut Grove, designated as State Highway Route 53. This winding road is 34.8 miles in length, is constructed on very low alignment standard and has several right angle turns with very short radius curves.

general maintenance funds have been expended on this road.

At present there is no direct travelable road between Rio Vista and Terminous. Vehicle traffic through the islands is on narrow levee roads, necessitating several ferry crossings.

In addition to the bridge and approaches now under construction at Terminous, the proposed highway will require about 10.5 miles of new road between Terminous and

(Continued on page 32)



FERRYBOAT ON POTATO SLOUGH soon to be eliminated by modern drawbridge.



TURNING THE FIRST SHOVELFUL of earth in the groundbreaking ceremonies for the new drawbridge is Harry A. Hopkins, chairman of the California Highway Commission. Others are: Commissioner T. A. Reardon; Director of Public Works Earl Lee Kelly, who also did some shoveling, and District Engineer R. E. Pierce.

State Cooperating in Geodetic Survey to Bring Topographic Maps Up to Date

Foreword by **FRED GRUMM**, Engineer of Surveys and Plans

In the accompanying article Mr. Bowie describes the work of the U. S. Coast and Geodetic Survey, with special reference to California. The horizontal and vertical control surveys of the Geodetic Survey, are the basis for the topographic mapping of the country. Many engineering activities, including those of the State Division of Highways, find these surveys very valuable. The level lines and bench marks established on these lines have afforded benefits which more than justify any expenditure the State has made in cooperation with the Survey. The topographic maps developed on and from these surveys are decidedly useful in highway work and save the State considerable expense which would have to be incurred in preliminary surveys and investigation were they not available.

We have found our cooperation with the U. S. Coast and Geodetic Survey, through Mr. Bowie and Commander T. J. Maher, the Surveys Inspector at San Francisco, not only beneficial but pleasant.

By **WILLIAM BOWIE**, Chief, Division of Geodesy, U. S. Coast and Geodetic Survey

IN the extension of a great network of lines of first and second-order levels over the United States by the U. S. Coast and Geodetic Survey, California has not been neglected. There are now approximately 250,000 miles of lines in the net, and 13,500 miles of these lines lie within the State of California. This represents 6 8 0 0 miles of first-order and 6700 miles of second-order lines.

Of the 6800 miles of first-order lines completed, between three and four hundred miles were run by the Metropolitan Water District of Southern California. Of the 6700 miles of second-order leveling, approximately



WILLIAM BOWIE

1350 miles were run in Southern California to subdivide certain 25-mile areas to approximately $7\frac{1}{2}$ -mile spacing.

In addition to the above, approximately 1500 miles of first-order lines have been re-run in connection with seismological investigations in Southern California and in connection with the investigation of settlement in and around

San Jose, which city is the county seat of Santa Clara County, California.

TWO FUNDAMENTAL CONTROL NETS

The Coast and Geodetic Survey is charged by law with the extension of the fundamental geodetic control surveys, triangulation and leveling over the entire country. The plan followed at the present time is to have the lines of first-order levels and the arcs of first-order triangulation spaced at intervals of approximately 100 miles and lines and arcs of second-order accuracy at intervals of 25 miles.

With this spacing completed we would have two very strong nets of fundamental control surveys that could be used as the framework for all classes of local surveys and for topographic mapping. The data are valuable for other activities of our people and especially in the location, construction and maintenance of highways.

The data resulting from the control surveys are, of course, of no value in themselves. They are only valuable when used. Much engineering work in this country has been undertaken without adequate survey and map data, chiefly because such data were not available. At present there is a great and growing sentiment throughout the country in favor of completing the standard topographic map within a few years. In the autumn of 1934



GEODETIC SURVEY LEVELING PARTY. The umbrella is to protect the instrument, not the observer.

the Federal Board of Surveys and Maps drew up a plan which, if followed, would provide for the completion of the standard topographic maps, based on adequate geodetic control surveys, for the entire country within the next ten years.

EXISTING MAPS WORTHLESS

At the present time only about 47 per cent of the country has been topographically mapped and at least half of the existing maps are so out of date as to be practically worthless.

There are many engineers and surveyors in the State of California who are very much interested in the results of the leveling operations. In 1932, the Division of Highways of the California Department of Public Works entered into an agreement with the U. S. Coast and Geodetic Survey whereby the State was to contribute one-half of the amount required for the pay of rodmen, etc., on two of the large leveling parties operating in California.

This was done in order to secure additional lines of leveling over routes mutually agreed upon which could not otherwise have been run by the Coast and Geodetic Survey for lack of funds. The total amount contributed by the Department of Highways was \$7,000 and this was used on leveling run from May, 1932, to February, 1933, inclusive.

DETERMINING EARTH MOVEMENTS

The Coast and Geodetic Survey each year for the last twelve years has done some additional geodetic or control surveying in the State of California for the purpose of determining earth movements due to geological processes and to lay the necessary foundation for determining such movements in the future. The work has consisted of the extension across fault zones of closely spaced triangulation stations and bench marks.

By repeating observations over these arcs and lines at intervals in the future, it will be possible to learn whether or not there have been horizontal movements of the triangulation stations or changes in the elevation of the bench marks.

The lines of levels are run with high-grade precision instruments that make it possible to close

circuits with very small errors. As the network of lines is completed and adjusted, any small discrepancies are distributed through the lines in order to make the results consistent. If the closing errors are larger than certain prescribed limits, the faulty lines are rerun in order to detect blunders or to reduce the effect of any aggravated accumulation of the unavoidable accidental errors of observation.

TWO-MILE BENCH MARKS

Substantial bench marks are set along each line of levels at intervals varying from one to three miles. The distance between bench marks on the leveling run during the past few years has seldom averaged as much as two miles. The present instructions call for an average interval not greater than one mile.

The bench marks are placed along highways and railroads and in many cases at road crossings. Invariably bench marks are established at or near railroad stations and in villages, towns and cities. The object in view in running the lines of levels is to establish bench marks and furnish descriptions and elevations of them to engineers and surveyors so that they may be used as starting points or check points for all grades of leveling necessary in carrying on engineering work or detailed topographic mapping.

PRESERVING BENCH MARKS

In spite of the substantial character of the bench marks and the inscribed bronze tablet marking each one of them, some are destroyed through the thoughtlessness of those who are engaged in various activities.

Lately, however, engineers and other officials of some state and county highway departments have instructed their working forces to respect the marks and if possible avoid removing them. The Coast and Geodetic Survey does not have an allotment of funds for the purpose of placing parties in the field to relocate bench marks or triangulation stations which are in the way of construction and that must be moved.

For this reason it is necessary to depend on the cooperation of engineering individuals and organizations throughout the country to assist in preserving the marks from destruction. As these marks are

(Continued on page 24)

Geodetic Survey Reveals Difference in Coast Sea Levels

(Continued from page 23)

placed not only for the use of government organizations but for the use of federal, state, county, city and private organizations and individuals, it is not unreasonable to assume that those organizations will be glad to assist in the preservation of the marks.

In any case where it becomes necessary to move a bench mark or a triangulation station and a field party of this bureau is at work in the locality, this party will make the necessary transfers. If no Coast and Geodetic Survey party should be working in the locality, the bureau tries to enlist the cooperation of the local authorities.

DESIRABLE PROCEDURE

When it becomes necessary to move a bench mark or a triangulation station, the desirable procedure is to inform the Director of the Coast and Geodetic Survey at Washington, D. C., by letter, concerning the necessity for relocating the mark and giving the designation, that is, the letters and numbers found stamped on the bronze tablet with dies and enough of the legend cast in the disk to enable this office to determine definitely the organization by which it was established.

In case the mark is one over which this bureau has jurisdiction, a new disk properly stamped is forwarded together with instructions as to the proper procedure in transferring the elevation, position, or both, as the case demands. With the help of engineers and surveyors, the percentage of casualties resulting from engineering construction will be very greatly reduced.

All elevations of bench marks in the control net are referred to the datum of mean sea level. A theoretical study made of the combined level nets of the United States and Canada, carried out in 1929, indicated that the mean sea level surface as defined by tidal observations at many stations on the Pacific, Atlantic and Gulf Coasts is somewhat warped and that the average elevation of mean sea level of the Pacific Coast is about 1.7 feet higher than the average elevation of mean sea level on the Atlantic and Gulf Coasts.

MEAN LEVEL FIXED

While this may appear to be quite a large difference, the country is also large and therefore it was possible to hold fixed as a zero elevation the plane of mean sea level at each of the principal tidal stations for purposes of adjustment. The distortion of the net caused by holding at zero the observed tidal planes of mean sea level at the principal stations usually did not do violence to any single line of levels. The rate of correction resulting from this procedure was so small that it is not noticeable in local engineering surveys and has no troublesome effect on extensive topographic mapping.

About 1400 more miles of lines will be needed to complete the 25-mile spacing called for by the present plan. However, there may be a few areas in the high mountains where the ideal spacing may not be realized for some time to come but such areas are relatively unimportant and comparatively few in number.

South San Francisco Underpass Widened and Opened to Public

THE NEWLY widened South San Francisco underpass on the Bay Shore Highway was opened to highway traffic on March 12 with a colorful ceremony participated in by the local high school band, State Highway Commissioner Timothy A. Reardon and State Senator Harry L. Parkman.

When the old structure, giving a roadway width of thirty-nine feet, was completed in 1926, it was built with full provision for the widening that was foreseen, although perhaps the increase in traffic has been more rapid than anticipated.

The necessary curved alignment made the negotiation of the old bottleneck a hazardous undertaking. It was accordingly decided in 1934 to provide another full thirty-nine feet of driving surface with a center pier between the new and old roadways. But upon noticing that motorists had a tendency to veer away from the side walls, it was determined not to attempt to call for four lane traffic. Instead, stripes have been painted on the roadway providing a total of six wide lanes of about thirteen feet each, with one-way traffic on each group of three lanes.

LARGE PUMPS INSTALLED

The total cost including the provision of a superstructure carrying the tracks of the Southern Pacific Railroad was \$203,000.

At the lowest part of the subway it was necessary to provide a pavement two feet six inches thick to resist the hydrostatic head of about eight feet. Adjacent pavement was secured against uplift by concrete dowels let into the rock foundation.

Pumps of large capacity were installed in a new pump house, so that a flood of any reasonable intensity can now be cared for adequately, and a complete system of lights has been supplied for pedestrian tunnels and roadway. In addition street lights have been placed on electroliers in the center curb at entrances, so that any hazard from faulty lighting has been removed.

This center curb is a unique safety feature. Recognizing the danger of any center support in an underpass of this sort, thought was given to methods of preventing the unwary motorist from wrecking his car on the center wall, with the result that a center curb four feet six inches wide was built up for nearly three hundred feet on either side of the structure. At the start of this curb, a specially illuminated sign warns motorists: "Keep to the Right." From here the curb is gradually increased to one foot in height, and surmounted by half a dozen 8-inch posts set in concrete and three electroliers.

As rapidly as possible after the field observations have been made, computations and adjustments are carried on in the Washington Office of the Coast and Geodetic Survey and the descriptions and elevations of the bench marks are published first in mimeographed form and later are printed in book form.

Owing to the sudden closing of the field and office work some months ago, when the emergency funds allotted to the Survey became exhausted, much computation and adjusting of field observations on triangulation and leveling remain to be done to obtain final positions and elevations.



SOUTH SAN FRANCISCO UNDERPASS as it appears today after a recent widening operation.



BEFORE WIDENING—Dotted lines show how additional space was provided for traffic and superstructure.



WIDENED TRAFFIC LANES separated by a curbing are shown in view of north side of underpass.

124 Inches of Snow Deposited at Norden in Fourteen Days

IN FEBRUARY a fairly heavy storm was general throughout the State from the 11th to 24th of the month. For the State as a whole, the monthly precipitation was more than double the forty year average, mostly falling within this storm period. The average snowfall for February throughout the State was 200 per cent of normal.

On the 11th there was 81 inches of snow on the ground at Norden, and at the end of the storm, on the 25th, there was 205 inches, which had settled to 184 inches by the end of February.

This storm resulted in fairly high or moderate flood stages in the Sacramento River and its tributaries. The situation in the Sacramento Valley was not serious, since the by-passes carried relatively little water, although all the project weirs were in operation. No real danger existed at any point within the completed portions of the Sacramento Flood Control Project. All parts of the project functioned perfectly.

SAN JOAQUIN AREAS DAMAGED

In the San Joaquin watershed there were quite heavy discharges in a number of the tributaries, including the Mokelumne, Calaveras, Stanislaus and a number of the smaller creeks, including those in the vicinity of Merced. Considerable damage was done in unprotected areas, and several leveed tracts were flooded, including the McCormack-Williamson and Dead Horse Island on the Mokelumne River, Reclamation districts Nos. 2063 and 2064 on the San Joaquin River, and the Franks, Medford, Rhodes and Quimby tracts in the delta.

The Sacramento weir gates were opened at 5 p.m. on February 22d, when the river at Sacramento was at 28.7 feet. The opening of the gates was followed by an immediate drop in stage, and by noon of February 23d it was reduced to 25.0 feet.

A complete estimate of the damage actually done by this storm and flood is not yet available, but it appears that the total will not be excessive. Practically all the damage occurred in unprotected and inadequately protected areas, and in the Yolo By-pass tidal reclamations, which are located on a by-pass dedicated to the passage of flood water and are farmed with the expectation of being inundated during floods.

Beetle Eradication Cost Reduced From \$13.50 to \$3 per Tree

(Continued from page 10)

However, the costs were reduced from \$13.50 per tree by the hammer and chisel method to \$3 a tree per year by the pipe injectors, with no mutilation of the tree. It is believed that one season's treatment will save trees not too badly infested.

Methods were changed in the seasonal treatment of 1935 and 1-inch holes were drilled on an angle of 45° from the vertical, through the bark and into the sap approximately one-half inch. The holes were filled with the "Black Leaf 40" solution and then corked tightly with 1¼-inch corks.

These holes were staggered around the circumference of the tree and additional holes drilled directly under each pitch tube or entrance. The corks prevent evaporation and prevent any pitch from exuding. This is a much faster and cheaper method and I believe more effective than the pipe injectors.

ONE-MAN EQUIPMENT

Equipment consists of a one-inch bit and brace, a bag of corks, a gallon can of solution and some red flagging to mark the trees, all of which may be carried by one man who walks over the section in order to give the trees closer inspection.

While digging into the trees to observe the effect of the treatment a curious thing has been observed. In several cases we found an adult beetle had entered the treated tree leaving a pitch tube entrance, had started an egg gallery, advanced possibly one-half inch or more and then bored out through the bark and evidently left the tree. My conclusion was that they did not like the taste of the nicotine in the inner bark and therefore moved out.

SUGGESTS INOCULATION

If this is the case the question arises, why not inoculate uninfested trees against attack from the beetle? Apparently a 10 per cent solution of "Black Leaf 40" is not harmful to the tree and if it is possible to save adult trees from three to six feet in diameter for say \$3 per tree with the injection and cork method it would seem well worth while. The cost of removing these trees when dead and dangerous will average \$20 per tree not considering the commercial and esthetic loss.

(Continued on page 32)



News of the Irrigation Districts, details of the operation of pumps and repair of bridges in the Sacramento Flood Control Project and applications for construction of numerous dams including one at Long Valley in Mono County are among the activities of the Water Resources Department described in the following monthly report of the State Engineer:

IRRIGATION DISTRICTS

A field investigation and report on work proposed by Naglee Burk Irrigation District was made at the request of the District Securities Commission. The district plans to trim by hand labor 8000 linear feet of canal and place 100,800 square feet of concrete lining on sections of the system where excessive seepage has occurred.

On reference from the Commission, an investigation and report was rendered on application of the recently formed Sutter Water District to issue bonds in the amount of \$87,000 for construction of an irrigation system.

Compilation of statistical matter pertaining to the various irrigation districts in the State has been continued in the office for the purpose of issuing an annual report covering operations during the year 1935.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Routine maintenance work has been continued and the three drainage pumping plants east of the Sutter By-pass have been in operation for a large portion of this period. Repairs are now under way on several timber bridges in the Sutter by-pass which were damaged by the February flood. The three new plants being constructed by the California Debris Commission are approaching completion. The five new pumps in plant No. 3 were in operation during the recent rainstorm.

Relief Labor Work.

The relief workers available for the clearing projects in Sutter and Yuba counties have been gradually decreasing. On February 20th there were approximately 200 at work, on March 5th there were 194, on March 12th there were 163, and at this date there are about 150. No considerable time was lost on account of wet weather.

Sacramento Flood Control Project.

On March 19th a public hearing was held before the

California Debris Commission in Sacramento in connection with a review of the reports on the Sacramento Flood Control Project, with a view to determining whether any modification of the plans in respect to maintenance is desirable at this time. This office assisted in the preparation of the material presented by the State at this meeting.

Application was filed on February 24, 1936, for the enlargement of Kent Dam Number 2, a small dam in San Mateo County near Pescadero. The reservoir is to be filled by pumping from adjacent streams and is to be used for irrigation. The estimated cost of the enlargement is \$1,700.00.

Application was filed on February 20th by the California Water and Telephone Company for construction of the Judson Reservoir in San Diego County. The structure is to be a rolled earthfill 55 feet in height and storing 652 acre feet of water for domestic and irrigation use. The estimated cost is \$52,000.00.

Application was filed on March 16, 1936, for construction of the Long Lake Dam, a small rockfill at the outlet of Long Lake, at an estimated cost of \$1,000. The structure will have a storage capacity of approximately 1500 acre-feet.

Application was filed on March 19, 1936, for construction of the Long Valley dam by the city of Los Angeles. This is to be a rockfill structure 117 feet in height and storing 163,000 acre-feet, located on the Owens River in Mono County and is estimated to cost \$1,379,050.00.

Construction of the Cajalco Reservoir of the Metropolitan Water District is proceeding satisfactorily as is the work at San Gabriel Number 1 dam of the Los Angeles County Flood Control District.

Excavation for the enlargement of the O'Shaughnessy Dam has progressed throughout the winter and it is expected that pouring of concrete will be commenced shortly.

All of the dams of the Santa Clara Valley Water Conservation District, with the exception of Coyote Dam, have been completed. At the Coyote Dam some additional rockfill is yet to be placed as well as some of the spillway lining. The heavy rains during the past month filled some of these structures completely and an opportunity was had to observe them under load.

Construction has been resumed on the Arcata Dam in Humboldt County. Further exploratory work is under way at the Mad River Dam site of the city of Eureka.

The city of St. Helena has completed the rehabilitation of the St. Helena Lower Dam and the structure is again in operation.

In addition to the inspections of construction work under way, it has been possible to make many inspections of the structures already approved under conditions of maximum storage as a result of the recent heavy rains.

(Continued on page 28)

Two Mojave Projects Totaled \$1,603,000

(Continued from page 27)

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

Office work during the past month has consisted of computing and compiling data with which to report the diversions, return flow, stream flow and acreage irrigated in the Sacramento-San Joaquin territory and the encroachment and recession of the salinity in the Delta during 1935.

The high water of February caused the recession of salinity in the Delta to a point where the water in Suisun Bay was practically fresh. This condition is being maintained and there is virtually no salinity above Bullshead Point.

CALIFORNIA COOPERATIVE SNOW SURVEYS

During the first part of the month activities were confined entirely to assembling, correlating and tabulating the result of the snow surveys made at the end of February by the State and all cooperative agencies. These data were incorporated in the second monthly snow survey bulletin to be published this year, which was mailed to all interested parties on March 12th.

The balance of the month was occupied with compiling natural stream flow records for the past two years and preparing for the forecasts of runoff from the various basins of the State. The results of all snow surveys made at the end of March and early in April, together with the forecast of April-July runoff will be published in the next snow survey bulletin about April 12th.

WATER RIGHTS

Supervision of Appropriation of Water

Twenty applications to appropriate water were received during February; 11 were denied; 10 were allowed; 9 permits were revoked; 9 licenses were issued and 3 licenses were revoked.

Among the applications received were two to appropriate from Mojave River for projects of considerable size in San Bernardino County. One of these applications was by the Committee for the Mojave River County Water District, which was recently organized. This application proposes an appropriation of 400 cubic feet per second at a cost of \$57,000 for an area of 20,000 acres. The other application was filed by Everett H. Swing to appropriate 300 second feet at a cost of \$1,546,000 for an area of 15,000 acres.

Water Distribution.

Water master service for the 1936 season was commenced on the following named streams on March 19th: Owl, Soldier, Emerson, Cedar, Deep and Mill Creek Water Master Districts (In Surprise Valley, Modoc County).

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Progress was made during the month on field work in connection with the Kreyenhagen Hills Quadrangle in Fresno County; the San Bernardino No. 1 and No. 2 Quadrangles in San Bernardino County and cultural revision of the Hesperia, San Antonio, San Bernardino and Cucamonga Quadrangles in San Bernardino County. Office work was completed on the Cucamonga No. 4 Quadrangle in San Bernardino County and the Sebastopol Quadrangle in Sonoma County. Progress was made on the Paynes Creek Quadrangle in Tehama County and the Burney Creek Quadrangle in Shasta County.

The final sheets of the Chatom Raach Quadrangle in Kings County and Lone Tree Well Quadrangle in Kern and Kings Counties are now available. These sheets were published on a scale of 1:31,680 with a contour interval of 5 feet.

The advance sheet of the Macdoel Quadrangle in Siskiyou County is now available. This is published on a scale of 1:96,000 with a contour interval of 50 feet and 100 feet.

WATER RESOURCES

South Coastal Basin Investigation.

Summary of the year's hydrological data was made but has not yet been published. Work continued along routine lines on the various phases of the South Coastal basin investigation.

Central Valley Project.

Progress is being made by the United States Bureau of Reclamation on the preparation of plans preparatory to starting construction on the initial units of the project.

Surveys are progressing at Kennett and Friant dam sites and along the proposed route of the Contra Costa Conduit, and appraisers have been placed in the field to evaluate the lands and right of way required on the construction of the project.

Exploration operations are under way at Friant and Kennett dam sites and The Division of Highways is making excellent progress in drilling the proposed site of the combination Highway-Railroad bridge on the Pit River.

On mules we find two legs behind,

And two we find before.

We stand behind before we find

What those behind be for.

First Imbiber: "I found (hic) a half dollar."

Second Stew: "T'sh mine, it'sh got my name on it."

First Sot: "Whats'h your name?"

Second Stiff: "E Pluribus Unum."

First: "Yeah, it'sh yours."

Old Timer, Do You Hold a Card to Beat This?

CONTENT to let others vie for the honor of being head man in the Old Timers' Club of the State Division of Highways, H. Fay Allen of Los Angeles is more interested in having an employee of District VII represented in the organization.

Wherefore, he sends in his application for membership in the club with the identification card given him by the old Highway Commission attesting to his appointment as draftsman in Division (now District) VII.

While he modestly refrains from mentioning the fact, Mr. Allen is a very close runner-up with C. M. Butts, District Construction Engineer of District X, Stockton, and George Mattis of Emeryville, one of the resident engineers of the San Francisco Bay Bridge,

CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
CHAS. D. BLANEY
H. D. DARLINGTON
BURTON A. TOWNE, CHAIRMAN

Forum Bldg.
SACRAMENTO, CALIFORNIA.

HIGHWAY ENGINEER
AUSTIN B. FLETCHER
SECRETARY
WILSON R. ELLIS

THIS IS TO CERTIFY that
H. Fay Allen of Glendale, Cal.,
was duly appointed, February 15, 1912, to be
Draftsman attached to Division VII

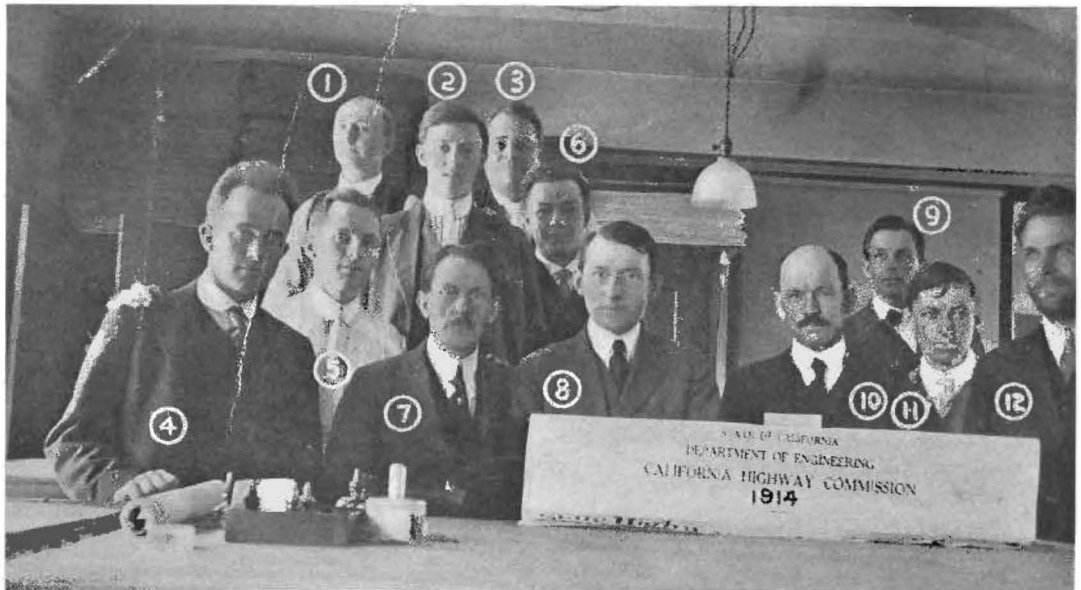
of the CALIFORNIA HIGHWAY COMMISSION, his term
of office to be at the pleasure of the Commission.

A. Fletcher *W. R. Ellis*
HIGHWAY ENGINEER SECRETARY

H. F. Allen's card shows he has been at the job 24 years.

who are sharing the distinction of leadership in the club, both having been appointed to positions by the original Highway Commission on February 1, 1912. Mr. Allen's identification card is dated February 15, 1912.

(Continued on page 30)



HEADQUARTERS ENGINEERING PERSONNEL in 1914—No. 1—Franklin P. Borgnis, Chief Draftsman. 2—Clifford J. Temby, Engineering Draftsman. 3—Charles U. Fonteneau, Engineering Draftsman. 4—Lloyd A. Batham, Engineering Draftsman. 5—Clarence E. Bovey, Engineering Draftsman. 6—C. M. Saul, Engineering Draftsman. 7—A. B. Cleveland, Assistant Office Engineer. 8—Allen J. Wagner, Structural Draftsman. 9—John N. Bidwell, Engineering Draftsman. 10—George R. Winslow, Assistant State Highway Engineer. 11—Ralph E. Dodge, Office Engineer. 12—Benjamin Bean, Engineering Draftsman.

Personnel Roster of Headquarters in 1914 is Recalled

(Continued from page 29)

Mr. Allen also has an honor all his own. He has been continuously employed in District VII for more than 24 years.

In a letter accompanying his application for membership, Mr. Allen says:

"Referring to back numbers of the CALIFORNIA HIGHWAYS AND PUBLIC WORKS, I have been unable to find that any employee of District VII has applied for membership in the Old Timers' Club although I know several men who are eligible. Am enclosing my identification card given to me when I entered the State service in Division VII on February 15, 1912.

TWENTY-FOUR YEARS SERVICE

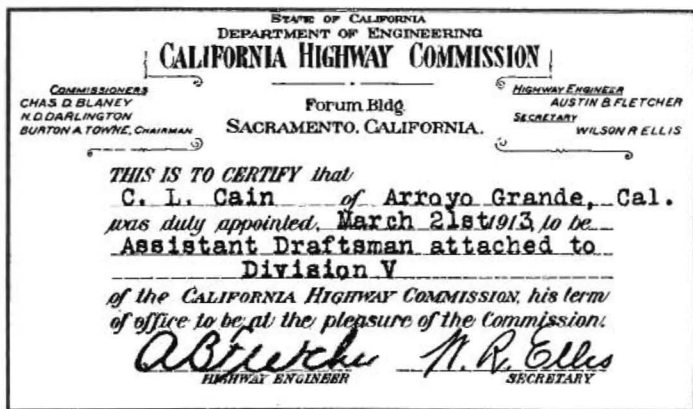
"I have been in continuous service in this district for over 24 years. Unlike Mr. George Mattis of Emeryville, who says he 'feels just as old as if his service had been continuous' I do not feel anything like as old as my years, and nobody calls me the 'old man' yet—at least, not more than once."

C. J. Temby, District Office Engineer, District X, Stockton, applies for membership. He failed to send in an identification card, but forwarded an interesting photograph of the engineering personnel of headquarters of the Division of Highways taken in the drafting room of the California Highway Commission in Sacramento in 1914. Mr. Temby was appointed draftsman in the central office in August, 1914, after the Commission had ceased issuing cards. Mr. Temby writes:

ENGINEERING PERSONNEL GROUP

"Your articles in the CALIFORNIA HIGHWAYS AND PUBLIC WORKS relative to 'old timers' are very interesting and I would like to submit a little contribution toward 'old timers' history.

"The attached photograph was taken in 1914 in the drafting room of what then was headquarters of the California Highway Commission on the fifth floor of the Forum Building in Sacramento. The picture is of the entire engineering personnel of headquarters as of that date, with the exceptions of Structural Draftsman Johnson and George D.



C. L. CAINE (Caine correct) entered the service on February 15, 1912, although his card shows him appointed March 21, 1913.

Whittle, who took the photograph. Incidentally, this personnel also handled all bridge work then performed by the Division of Highways at headquarters.

"The titles of the men at the time the photograph was taken were: George R. Winslow, Assistant State Highway Engineer; Ralph E. Dodge, Office Engineer; A. B. Cleveland, Assistant Office Engineer; Franklin P. Borgnis, Chief Draftsman; Allen J. Wagner, Structural Draftsman, and Benjamin Bean, Lloyd A. Batham, Clarence E. Bovey, Charles Fonteneau, C. M. Saul, John N. Bidwell and Clifford J. Temby, all Engineering Draftsmen.

"As far as I know at this time, the whereabouts of these men are as follows: Winslow, Assistant Construction Engineer, Central Office; Dodge, deceased; Cleveland, Automobile Club of Southern California; Borgnis, in private practice; Wagner, with U. S. Government, San Francisco; Bovey, District Maintenance Engineer, District X, Stockton; Temby, District Office Engineer, District X; Fonteneau, Engineering Draftsman, District X; Batham, Chief Draftsman, District IV, San Francisco; Bidwell, Resident Engineer, District IX, Bishop; Whittle, Bridge Engineer, U. S. Bureau of Public Roads, San Francisco; Saul and Bean, whereabouts unknown to me."

A new member of the Old Timers' Club is C. L. Caine of Barstow. Mr. Caine entered the service of the Division of Highways on February 15, 1912, as axman and on March 21, 1913, was appointed assistant draftsman of Division V. The identification card he sends in with his application for membership bears this date. Mr. Caine now is maintenance superintendent with headquarters at Yermo, San Bernardino County.

Highway Bids and Awards

for March, 1936

ALAMEDA COUNTY—Between Laguna Creek and Dublin, about 3.8 miles in length, crusher run base to be constructed and armor coat to be applied thereto, District IV, route 107, Section B. Pacific Truck Service, Inc., San Jose, \$22,419; J. A. Casson, Hayward, \$22,467; Geo. French, Jr., Stockton, \$19,841; Palo Alto Road Materials Co., Ltd., Palo Alto, \$22,097; N. M. Ball Sons, Berkeley, \$24,542; A. J. Ralsch Co., San Jose, \$24,712; A. Teichert & Son, Inc., Sacramento, \$23,424; E. A. Forde, San Anselmo, \$24,297; Chas. L. Harney, San Francisco, \$23,672; Heafey-Moore Co., Oakland, \$23,800; Independent Const. Co., Ltd., Oakland, \$22,898. Contract awarded to Claude C. Wood, Stockton, \$19,302.25.

CONTRA COSTA COUNTY—Between Antioch and Border Highway, 16.6 miles cr. run base shldr. with seal coat, District IV, Route 75, Section C.D. Palo Alto Roads Material Co., Ltd., Palo Alto, \$38,741; A. Teichert & Son, Inc., Sacramento, \$37,653; L. C. Seidel, Sacramento, \$37,865; W. H. Larson, Oakland, \$38,941; Geo. French, Jr., Stockton, \$39,905; Hanrahan Company, San Francisco, \$34,784. Contract awarded to Frederickson & Westbrook, Lower Lake, \$33,426.

HUMBOLDT COUNTY—In Eureka, between Sly city limits and Wabash Avenue, about 1.5 miles to be graded and surfaced with bit. tr. cr. grav. or stone, District I, Route 1, Section G, Eur. Hemstreet & Bell, Marysville, \$71,499. Contract awarded to Mercer, Fraser Company, Eureka, \$69,338.95.

IMPERIAL COUNTY—On Calipatria Imperial Road, between New River and 2 miles west of Calipatria, about 20.6 miles to be graded and b'rs. to be constructed, District XI, Route Calipatria-Imperial Feeder, R. E. Hazard & Son, San Diego, \$212,810; C. W. Caletti & Co., San Rafael, \$244,132; Oswald Bros., Los Angeles, \$218,907; J. E. Haddock, Ltd., Pasadena, \$242,666. Contract awarded to V. R. Dennis Const. Co., San Diego, \$209,844.

INYO COUNTY—Between 8 miles south of Keeler and Centennial wash, 1.8 miles to be graded, District IX, Route 127, Section D. Basich Bros., Torrance, \$22,193; A. S. Vinnell Co., Los Angeles, \$19,395. Contract awarded to Young & Son Co., Ltd., Berkeley.

KERN COUNTY—Between Eric and La Rose, 4.9 miles to be graded road-mix surf. trt. applied, and a timber bridge constructed, District VI, Route 53, Section G. J. E. Haddock, Ltd., Pasadena, \$106,634; R. R. Carlson, Stockton, \$102,688; Oswald Bros., Los Angeles, \$105,491; David H. Ryan, San Diego, \$96,009; Guy F. Atkinson Co., San Francisco, \$98,317; Young & Son Co., Ltd., Berkeley, \$87,699; A. S. Vinnell Co., Los Angeles, \$90,670; Gibbons & Reed Co., Burbank, \$109,358; Griffith Co., Los Angeles, \$136,748; Granfield, Farrar & Carlin, San Francisco, \$88,142; M. J. B. Const. Co., Stockton, \$94,312; C. W. Caletti & Co., San Rafael, \$94,597. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$86,146.80.

MADERA COUNTY—Between Keshaw Corners and Coarse Gold, 8.0 miles, grade and oil, District VI, Route 125, Section C. Dale Hinman, Denver, Colo., \$244,166; Gibbons & Reed Co., Burbank, \$279,644; Mitty Brothers Construction Co., Los Angeles, \$307,135; A. Teichert & Son, Sacramento, \$325,941; Isbell Construction Company, Reno, Nevada, \$279,175. Contract awarded to C. W. Caletti & Co., San Rafael, \$226,015.20.

MARIN COUNTY—Between Route 1 and Point San Quentin, 2.4 miles cr. run surf. and armor coat, District IV, Route 69, Sections A, S.R.F. Pacific States Construction Co., San Francisco, \$24,321; A. G. Ralsch, San Francisco, \$24,828. Contract awarded to E. A. Ford, San Anselmo, \$21,994.

MONTEREY COUNTY—Between Lewis Creek and Priest Valley, about 1.1 miles in length, to be graded, surfaced with selected material, and treated with liquid asphalt, District V, Route 10, Section C. R. R. Carlson, Stockton, \$27,812; J. L. Conner, Monterey, \$23,095; Leo F. Piazzo, San Jose, \$33,377; M. J. B. Construction Co., Stockton, \$25,201; L. A. Brisco, Arroyo Grande, \$26,329; William C. Horn Company, Pomona, \$29,973; Granfield Farrar & Carlin, San Francisco, \$25,301; A. Teichert & Son, Inc., Sacramento, \$27,174; Poulos & McEwen, Sacramento, \$25,-

088; C. W. Caletti & Co., San Rafael, \$28,853. Contract awarded to Young & Son, Ltd., Berkeley, \$20,915.60.

MONTEREY COUNTY—Between Soledad and Gonzales, 8.3 miles grade and plant-mixed surface, District V, Route 2, Section D. C. Heafey-Moore Co., Oakland, \$146,745; Peninsula Paving Company, San Francisco, \$147,542; A. Teichert & Son, Inc., Sacramento, \$154,376; Union Paving Co., San Francisco, \$139,481. Contract awarded to A. J. Ralsch Co., San Jose, California, \$134,348.35.

NAPA COUNTY—Between Napa city limits and Napa Wye, 2.6 miles, surf. with cr. run base and plant-mixed surf. District IV, Route 8, Section B. Hanrahan Co., San Francisco, \$42,166; E. A. Forde, San Anselmo, \$41,444; L. C. Seidel, Sacramento, \$44,737; Pacific States Const. Co., San Francisco, \$42,840. Contract awarded to A. G. Ralsch, San Francisco, \$38,374.50.

SAN BERNARDINO COUNTY—Between Ontario and Riverside, about 14.4 miles in length, shoulders to be graded and treated with liquid asphalt, District VIII, Route 19, Sec. B & A. P. J. Akmadzich, Los Angeles, \$25,195; Dimmitt & Taylor, Los Angeles, \$28,174; A. S. Vinnell Co., Los Angeles, \$23,042; Geo. Herz & Co., San Bernardino \$22,955; Oil Fields Trucking Co., Bakersfield, \$27,519; Match Bros., Elsinore, \$21,412; Basich Bros., Torrance, \$28,580; Oswald Bros., Los Angeles, \$26,659. Contract awarded to C. W. Wood, Stockton, \$20,308.

SAN DIEGO COUNTY—Diesel oil to be applied to roadside vegetation for a distance of about 85 roadside miles. At various locations in District XI. Consumers Oil Co., Los Angeles, \$1,367; Gilmore Oil Co., Los Angeles, \$1,666; Paulsen & March, Inc., Los Angeles, \$1,808; R. E. Hazard & Sons, San Diego, \$1,536. Contract awarded to Square Oil Co., Los Angeles, \$1,045.25.

VENTURA COUNTY—Between Oxnard and Hueneme Road, about 4.9 miles wide ex. rd. bd. and place P. C. C. wide strip, District VII, Route 60, Section A. Basich Bros., Torrance, \$75,234; Sander, Pearson & Mundo Eng. Co., Los Angeles, \$75,558; Geo. R. Curtis Paving Co., Los Angeles, \$77,820; Match Bros., Elsinore, \$69,984; Oswald Bros., Los Angeles, \$69,086. Contract awarded to J. E. Haddock, Ltd., Pasadena, \$67,523.05.

VENTURA COUNTY—Between E. Casitas Pass and Coyote Creek, about 2.8 miles to be graded and a road mix surface treatment applied, District VII, Route 151, Section B. C. Mitty Bros. Const. Co., Los Angeles, \$89,518; M. J. B. Const. Co., Stockton, \$80,793; David H. Ryan, San Diego, \$89,774; Granfield Farrar & Carlin, San Francisco, \$79,083; C. G. Willis & Sons & Chas. G. Willis, Los Angeles, \$78,260; A. S. Vinnell Co., Los Angeles, \$91,265; Daley Corp., San Diego, \$69,378; Sharp & Fellows Cont. Co., Los Angeles, \$80,396; Sander Pearson & Mundo Engineering Co., Los Angeles, \$88,696; Oswald Bros., Los Angeles, \$84,054; Match Bros., Elsinore, \$82,842. Contract awarded to C. F. Robbins, Los Angeles, \$65,321.50.

YOLO-SACRAMENTO COUNTIES—Between M Street Subway and Sacramento River Bridge (Yolo-C), and between Ben All Subway and Ben All Station (Sac-3-B), about 1.2 miles highway roadides to be landscaped, District III, Route 6-3, Section C-B. Leonard Coates Nurs., Inc., San Jose, \$6,022; California Nursery Co., Niles, \$8,927.56. Contract awarded to Rexroth & Rexroth, Bakersfield, \$7,948.05.

Teacher: "Percy, why are you crying?"

Percy: "Jimmy kicked me in the stomach."

Teacher: "Jimmy, did you mean to kick Percy in the stomach?"

Jimmy: "Naw, he turned around just when I kicked."

Kit: "Gee, but that date last night was fresh."

Kat: "Why didn't you slap his face?"

Kate: "I did; and take my advice, never slap a guy when he's chewing tobacco."—*Exchange.*

Ground Broken for Bridge on Proposed Lodi-Rio Vista Road

(Continued from page 20)

Rio Vista with a drawbridge over the North Fork of the Mokelumne River and a slough crossing on Brannan Island.

From Terminous to the state highway, Route 4 (Cherokee Lane) near Lodi, an existing narrow county road with 18-foot pavement will be widened and utilized, according to tentative plans.

PROVIDES EXPORT OUTLET

Completion of the new road will offer many advantages to the delta agricultural area as it will provide an outlet for the transportation of agricultural products by truck direct from ranches to the port of Stockton for transshipment by water to eastern and foreign points.

The distance between Rio Vista and Stockton, via the present state and county roads, is 43.6 miles. The proposed cut-off will diminish this distance to about 30.9 miles, or a saving of approximately 12.7 miles. A possible revision of the county road alignment south of the Terminous road may effect an additional saving of 2 miles, making the total distance saving between Rio Vista and Stockton by the projected short cut about 14.7 miles.

The new road also will serve as an important link between the Redwood Empire, the San Francisco-Oakland bay region and San Joaquin Valley, and also the scenic areas of the Sierra.

HIGH TRAFFIC COUNT

Plans for the new highway call for a graded roadbed 36 feet wide and surfaced 20 feet wide. Construction of the bridge across Potato Slough and its approaches was provided for in the Federal Works Program at an estimated cost of \$175,000.

Approximately 1700 vehicles use the existing road daily and this volume of traffic is expected to materially increase following completion of the new project.

In 1921 the legislature adopted the present road between Rio Vista and a connection with State Highway Route 4 near Lodi as a state highway, which, from Fairfield in Solano County to Lodi via Rio Vista, Isleton, Walnut Grove and Thornton, is designated Route 53.

State Highway Trees Saved From Attack of Pine Beetle Pest

(Continued from page 26)

For inoculation, holes should be bored on 12-inch centers on the circumference near the ground. Then another series four feet higher on the tree. This will, theoretically, take care of eight feet of the trunk which is sufficient for an uninfested tree. Injections should start in March and April and continue until June. Once a week should be sufficient, a 5-foot diameter tree taking approximately two to three pints a treatment. Two gallons should inoculate a tree, the 10 per cent solution costing about \$1 per gallon made up.

ONE TREATMENT IMMUNIZES

It is believed that one season will place enough nicotine in the inner bark to immunize a tree at a cost of \$3. Should the tree show signs of beetle activity in succeeding years treatments could be given at one-half the initial cost.

In conclusion the following points are brought out:

1. A 10 per cent solution of "Black Leaf 40" (equivalent of 4 per cent solution pure nicotine sulphate) is not injurious to adult yellow pine.
2. Western pine beetle have been identified as working in the trees under treatment.
3. Groups of dead adults have been found in the trees under treatment and identified as Western pine beetle.
4. Trees under treatment showed yellow and brown foliage at the start and no additional dead foliage since.
5. Of the 20 trees under treatment none have died.

For inoculation of uninfested trees the borings and cork method would be necessary, but for infested trees I have in mind a pressure gun that will inject fluid directly into the pitch tubes and force the solution through the egg galleries. Sheep dip or fly spray would be used which would not only kill the adult beetles but larvae and eggs at the same time.

This method will be tried the season of 1936 provided a pressure gun can be devised and I am confident will give quicker and more effective results at far less cost.

The 1933 legislature authorized the Department of Public Works to make any changes deemed necessary in the existing route between Rio Vista and Lodi or to vacate the whole or any portion of it for a new route.

STATE OF CALIFORNIA
Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM Governor
EARL LEE KELLY Director
JUSTUS F. CRAEMER Assistant Director
EDWARD J. NERON Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

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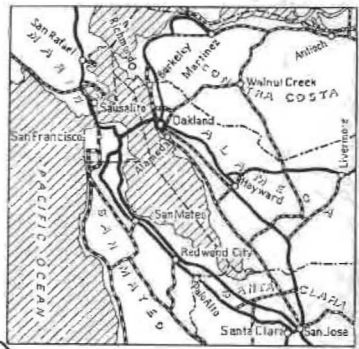
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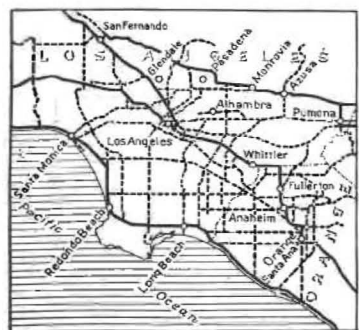
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LOS ANGELES AND VICINITY

See Detail Map

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