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The California Gold Rush: A Study of Emerging Property Rights*

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INTRODUCTION

For over 2000 years political philosophers, historians, anthropologists, and sociologists have sought an explanation for the emergence of private property rights (1). More recently, economists have joined in the search (2). This paper was written to present some of my own ideas on the subject, ideas which hopefully the reader will regard as an advance in our understanding of a complex subject.

The concept of property rights is not an easy one to define unambiguously. The key to understanding it is probably to be found in the notion of exclusivity. For an individual or group of individuals to claim a right to some property they must first be able to exclude all other potential claimants. With the competition excluded, the individual can then decide how the property will be used and who shall get the income derived from it. Of less importance, but generally included in the concept of property right, is the notion of transferability. This means that the owner of the exclusive rights can transfer them to someone else in exchange for the exclusive rights to other property. Of course, the right to exclude must precede the right to transfer, because without the former there would be nothing to transfer.

Still, what does it mean to have a right? The right to use a property, to derive income from it, and to exchange it all refer to future events, and future events are uncertain. Therefore, to say that an individual has a right is to say that he has some expectation that his decision regarding the use of some property is in fact how it will actually be used.

In order to render this definition operational it is necessary to identify some observable variable to serve as a proxy for expectations. The one I have chosen is an explicit contract (3). In this contract, two or

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more individuals will agree upon who has the right to do what with specific resources. In other words, the contract will assign to each individual the rights to some of the scarce resources in the economy. Of course these rights will be limited so as to constrain the owner's actions in certain ways. For example, the rights to the use of a gun will not include the right to shoot another person and take over his property (4). Finally, the contract must provide some mechanism for enforcing the agreed-upon rights. Without this, the contract would be of little value.

In particular, the question being addressed here is the following: If a group of individuals is placed in a world of scarce resources, with no government to assign ownership rights and no laws to restrict individual behavior, what will they do? Will they get together and agree on a set of rights to be rationed out among the group or will they choose to forego any agreements and instead resort to the use of personal violence to maintain exclusivity over resources they claim for themselves (5)?

To answer this question, I will develop a theory of property rights through contract. The theory, presented in the next section, will allow the derivation of potentially refutable implications. In the last section, these implications are tested against the backdrop of a most unique historical event, the California gold rush of 1848 and 1849.

Theory

It has long been thought that the income from a scarce resource would tend to dissipate if no exclusive rights to that resource existed (6). These casual suppositions were first formalized into a theory by Cheung in his article "The Structure of a Contract and the Theory of a Nonexclusive Resource." In anticipation of the discussion of the California gold rush, I shall briefly restate Cheung's hypothesis in terms of gold-producing land. Figure 1 will help visualize the argument. In this graph, the horizontal axis measures the quantity of labor being devoted to mining effort, while holding constant the total amount of gold-bearing land. The vertical axis measures the marginal and average products of labor in terms of gold output. *MP* is the marginal product curve and *AP* is the average product curve. Both are assumed to be linear to simplify the exposition. All labor inputs are homogeneous and face an alternative wage equal to *OF*.

If the mining land was privately owned, the proprieter would use *OA* units of labor effort to maximize the rental stream, *FEC*. Labor would be employed in such a way that the *MP* is equal to the foregone alternative wage rate. On the other hand, if no individual has the right to exclude others from the gold land, the positive rent will attract more labor. With *OA* units of labor effort already on the land, the additional worker will perceive his own *MP* to be equal to *MP'*. He will therefore apply extra labor effort until his *MP'* is equal to his wage, or *AK* units. Because

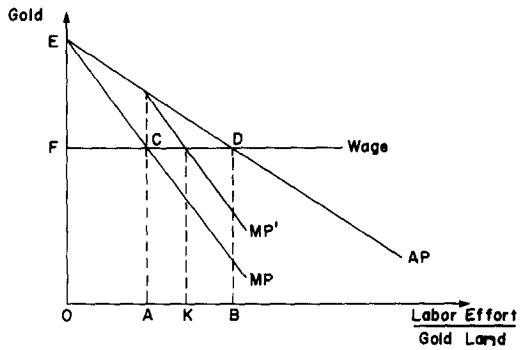

FIGURE 1.

of this extra labor, the first miner will perceive a decline in his *MP*, causing him to reduce his labor effort. This, in turn, will lead to an increase in the perceived *MP'* of the second miner and he adjusts his labor effort accordingly. This process ceases when the two miners are supplying the same quantity of labor. However, if there still remains some rent from the gold land, more miners will be attracted and the process will begin all over. Positive rents will exist as long as the average product of labor is greater than the wage rate. As more and more labor effort is added to the limited land, the average product will decline. Under the assumption that no individual can exclude anyone else, the new equilibrium will be at *OB* labor effort. Here, the *AP* of labor is equal to the wage, rents are zero, and no more labor will be attracted to the gold land (7).

There are three important conclusions which can be derived from this theory. First, in the absence of any exclusive rights, the income attributable to the nonexclusive resource will tend to dissipate. In fact, given the assumptions above, all of the rent from the gold land, *FEC*, will be competed away. The total product of *OB* labor will be equal to *OFDB*, which is equal to the foregone wages of labor. No residual remains from the nonexclusive gold land. Second, because of this dissipation, there are potential gains from excluding some of the labor and establishing property rights to the land. If *AB* labor can be kept off the land, the total social product will increase by *FEC* as the excluded labor takes their next-best alternative at the going wage. Third, the potential gains from establishing property rights will increase with the productivity of the land. If, for example, the land is discovered to contain more gold than previously supposed, the *MP* and *AP* curves will shift upward. More labor would be attracted until the new *AP* equaled the wage. The total income dissipated would now be greater than before and the potential gains from excluding some labor would be larger.

While Cheung's model was the first formal explanation of the dissipation of nonexclusive income and the gains from establishing property rights,

these concepts had not gone unnoticed in the economic literature. For example, Demsetz, in his article "Toward a Theory of Property Rights," suggests that the opening up of the European fur trade raised the value of animal hides among the American Indians of the Labrador Peninsula. As a result, more labor effort was allocated to the nonexclusive hunting lands which, in turn, resulted in dissipation of income (8). Furthermore, Demsetz argues that it was because of this increase in the potential gain from excluding some hunters that the Indians established property rights to land. This conclusion unfortunately does not follow. It ignores the costs of forming exclusive rights.

Because I am examining the emergence of property rights through explicit agreements, it is possible to specify the nature of the associated costs in terms of a contract. In forming a contract, individuals will incur costs in two ways: negotiation and enforcement. For example, suppose a gold miner wanted to get all the other miners to agree that he had the exclusive rights to a particular parcel of land. The first thing he would have to do is get them together and negotiate the precise terms of the agreement. In exchange for their recognition of his rights, this miner would have to agree to respect their exclusive rights over other parcels of land. But, which land will be rationed to each miner? Will the land be distributed evenly or will some get more than others? And, once rationed, what are the miners allowed to do with the land (9)? These questions must be resolved through negotiation and this will entail the use of scarce resources. Assuming that the miners reach some agreement, there will still be the problem of enforcing the agreement. If any miner thought that he could violate the contract and steal the rights assigned to someone else without any costs to him, he would do so. Therefore, any agreement to establish property rights must include some provisions for maintaining exclusivity and scarce resources must be allocated to catching and punishing trespassers, whether they are group members or outsiders.

The postulate of wealth maximization implies that each individual is a potential thief. If the gains from stealing exceed the costs at the margin, everyone will steal. As the value of any given property rises, the gains from theft also rise. This suggests that more resouces will be allocated to stealing the rights to a relatively valuable proeprty than to stealing a less valuable one, other things remaining constant. Therefore, the owners of rights to property whose value is rising will find that they must allocate more resources to the maintenance of exclusivity (10). In other words, as the value of a piece of property rises, the costs of enforcing the rights to that property will also rise.

Of course, similar reasoning leads to the same conclusion about the relationship between the value of the property and the costs of negotiation. As the value rises, each individual will be willing to allocate more resources to convince others that he should be given a larger initial allotment

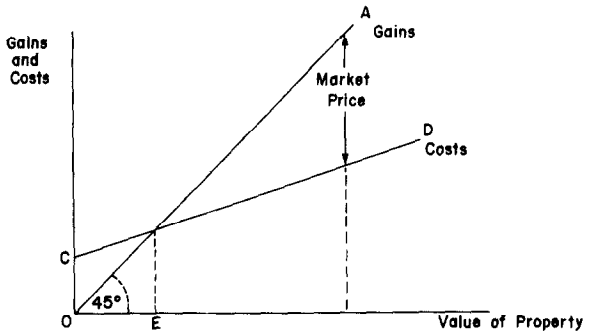

FIGURE 2.

of property. Because this is true for everyone, the costs of negotiating will increase with the value of the nonexclusive resource (11).

Thus far it has been established that there is a positive relationship between the value of a nonexclusive property and the gains from establishing property rights. It has also been deduced that a positive relationship exists between property value and the costs of establishing property rights. Because of this latter relationship, without one additional assumption, it cannot be predicted that the property rights will emerge as the value of the resources increases. The necessary assumption is that, while the costs of forming property rights rise with the value of the resource, they do not rise as rapidly (12).

The theory is now completely specified and, with the aid of Fig. 2, the implications can be derived. The horizontal axis measures the value of the property when put to its most productive use. The vertical axis measures the gains and costs of establishing property rights through contract. Line *OA* is a 45° line which illustrates that the gains from forming property rights are equal to the value of the property when put to its best use. Line *CD* represents the costs. It intersects the vertical axis at point *C* because, even if the property has no value, there would still be positive costs of getting a group of people together to negotiate a contract. As the value of the property increases, the costs of property rights rise, but not as rapidly.

From this simple model it is possible to derive several easily tested propositions. First, as the value of a nonexclusive resource rises, we will be more likely to observe an explicit contract defining, assigning, and providing for the enforcement of exclusive property rights. Notice in Fig. 2 that when the value of property is less than *OE* it is not economical to form rights through contract. At values greater than *OE*, contracts will emerge. Second, if property rights are transferable, the maximum price anyone would pay would be equal to the vertical distance between *OA* and *CD*. In other words, the market price would be equal to the difference between the gains from owning the exclusive rights and the costs of en-

forcing them. Because this difference increases with the value of the resource, we should observe a positive relationship between the market price and the value. Third, as the value of the property increases, we should observe the owners allocating more resources to the maintenance of the exclusive rights. The contracts must make some provision for the enforcement of the agreement.

In order to test these implications against the real world, it is necessary to find a time and place in which there were no governments, laws, or preexistent property rights. Add to this a group of individuals who are unconstrained by any prior agreements. Ideally, each individual would be seeking the rights to one nonexclusive resource, the value of which has increased significantly. As I show in the next section, these test conditions were met in California during the famous gold rush of 1848 and 1849.

The empirical data on the California goldrush are of such quantity and quality that they permit the testing of numerous other subtle implications which can be derived from the preceding model. However, because of the length constraint on this paper, these will not be examined empirically. In fact, except for a few references to implications two and three above, only the first will be investigated in detail (13).

THE EMPIRICAL TEST: A HISTORY OF THE CALIFORNIA GOLD RUSH

The following is a detailed account of the events leading up to and including the establishment of private property rights to a previously nonexclusive resource, the California gold fields. In order to cover a tremendous quantity of information as quickly and coherently as possible, I have chosen to divide this section into four parts. The first part deals with the nature of the legal constraints facing the gold rushers. It is demonstrated here that gold land was truly a nonexclusive resource. The second part is a description of the mining technology of this period. This is included because a basic knowledge of mining principles is important to the understanding of the property rights contracts. In part three, I discuss the initial gold discovery and the early contracts which emerged to regulate miners' rights. Finally, in part four, the full impact of the gold rush is examined. This includes the period in which explicit contracts were formed and the development of property rights to mineral lands was completed.

The Legal Constraints

Prior to 1846, the territory now known as California belonged to Mexico. Any individual wanting the rights to a particular piece of land had only to write out a request and submit it, along with a rough map, to the local representative of the Mexican government. If the request included the rights to rare minerals, the processing was slightly more complex and also required that the owner work the property on a regular basis in order to maintain the exclusive rights granted by the government (14). Except for

some land along the coast and a few private grants in the interior, not many people sought the rights to California property.

On May 13, 1846, the United States declared war on Mexico, and American troops occupied California for 2 years until the war ended. The military government apparently acted only to maintain the status quo with respect to previously granted property rights in land (15). Meanwhile, gold was discovered on January 24, 1848, just 9 days before peace was declared, and in the "Treaty of Peace, Friendship, Limits and Settlement, between the United States of America and the Mexican Republic," California became a territory of the United States. According to the treaty, all Mexican laws not in conflict with the Constitution of the United States were to be continued in force in California (16). Yet, on February 12, 1848, just 10 days after the treaty was signed, the Governor, Colonel Mason, proclaimed that: "From and after this date, the Mexican laws and customs now prevailing in California relative to [acquisition of mining rights on public lands] are hereby abolished" (17). Colonel Mason *offered no alternative legal system by which property rights to mineral lands could be obtained.*

In 1848, the Federal government was considering a detailed bill for organizing a territorial government in Oregon. Similar bills were introduced for New Mexico and California, but Oregon alone was passed. The only other mention of California before 1849 was to include Monterey and San Francisco as mail stops for the naval service. In March 1849, the revenue laws of the United States were extended over California with the rather strange provision that violaters be taken to either the District Court of Louisiana or the Supreme Court of Oregon. *Even in September 1850, when admitted as a state, the general laws of the country were not extended into California.* Not until a district court was established, on September 28, 1850, were the laws of the country officially to take effect in California (18).

In 1850, the United States did not have what could be called a body of mining law relating to private acquisition of mining rights on public land. Like most countries, the rights to mineral lands were reserved for the government and not subject to private appropriation. In 1807, a bill had passed which gave the President the power to evict trespassers on public lands. Another bill, passed on the same day, allowed the government to lease the mineral lands for 5 years, but the lands were reserved from outright sale to private individuals. According to the treaty with Mexico, all land was given to the United States government and as such was "public." No other mining bills of relevance to California were passed at the Federal level until 1866 (19).

It would appear that from 1848 to 1850 California was without any mining law, Mexican or American. From 1850 to 1866 the only Federal law was such as to make all the miners trespassers on California's public mineral

lands: a law which the government chose not to enforce. On July 26, 1866, the legislature of the United States passed "An Act granting the right of way to Ditch and Canal owners over the Public Lands, and for other purposes." This law specifically opened all the public mineral lands to exploration and occupation by any United States' citizen or by anyone declaring their intention to obtain citizenship. Furthermore, it provided that individuals could file a claim for their discovery, as long as they did so according to any local rules or customs. After 90 days, if no one filed a counter claim, the land could be surveyed and sold to the claimant at a rate of $5 per acre plus survey expenses. The Federal government would then issue a patent on the land. Each individual's claim was limited to 200 ft in length along the vein, with the exception that anyone discovering a new vein was allowed an extra 200 ft. Lands previously designated as "mineral land," but where no minerals had been found, were now open to preemption to homestead as agricultural land. Property rights to mineral lands could now be legally obtained from and enforced by the Federal government (20).

After being admitted to the Union in 1850, legal action concerning mining rights at the state level was constrained by Federal laws. All the public land in California belonged to the Federal government, so the state could not legally pass any legislation granting property rights to these lands. In the first meeting of the California legislature, the only bill to pass which related to the mines was an "Act for the better regulation of the mines and the government of foreign miners." This bill required all foreign miners to pay a tax or license fee of $20 a month for the right to mine gold in Califonia. If not paid, the miner could be legally evicted. In 1850 the bill was repealed, but in 1852 was reinstated in an "Act to provide for the protection of foreigners, and to define their liabilities and privileges." The tax was set at $3 per month. This bill underwent some further changes through time but, except for the original $20 fee in 1850, does not appear to have been an important constraint on foreign miners (21).

In 1851, the state passed the Civil Practice Act. Section 621 of this act authorized justices, when deciding a mining case, to admit as evidence "the customs, usages, or regulations established or in force at the [gold miners'embracing such claims, and such customs, usages and regulations, when not in conflict with the Constitution and laws of this state, shall govern the decision of the action." This is the only legislation of any relevance to the issue of property rights over mineral lands. In effect, the state was approving and agreeing to enforce (at least in the courts) the miners' rights to agree among themselves how to work the mineral lands (22).

From 1848 to 1866, California miners were legally trespassers on Federal property. During this period there was no additional legislation at the Federal or the state level which limited or restricted the miner's behavior

in acquiring and enforcing his own rights to mineral land (23). Murder and stealing were against the law, but stealing is only defined when one has property rights already established. Even given these laws, in the early years from 1848 to 1852, they could not be enforced.

In the United States military, the penalty for desertion ranged from several years of hard labor to death. However, in comparing a soldier's salary of $7 per month (24) with the potential gains from rushing to the mines, large-scale desertions might have been predicted. In April 1847, there were approximately 1059 soldiers in California (25). During 1848, the number fell to about 660 (26). This drop was not entirely accounted for by deserters, as Colonel Mason dismissed some at the end of the war. Nevertheless, the following letters indicate the magnitude of the problem.

> Sir,—In my letter No. 24, from La Paz, I recommended the retention on this coast of all cruising ships of the Pacific squadron, and pointed out how they could be kept in repair and manned without returning round Cape Horn to the Atlantic States. When that recommendation was made, I had no conception of the state of things in Upper California. For the present, and I fear for some years to come, it will be impossible for the United States to maintain any naval or military establishment in California; as at present no hope of reward nor fear of punishment is sufficient to make binding any contract between man and man upon the soil of California.
>
> To send troops out here would be needless, for they would immediately desert. . . . Among the deserters from my squadron are some of the best petty officers and seaman, having but few months to serve, and large balances due them, amounting in the aggregate to over ten thousand dollars (27).

In October, the Paymaster General, William Rich, wrote from Monterey that five men-of-war, the "Ohio, Warren, Dale, Lexington, and Southampton are in port; but they cannot land a man, as they desert as soon as they set foot on shore. The only thing the ships could do in case of an outbreak would be to fire upon the town." He reports further that ". . . there are at present but two companies in California—one of 1st dragoons, the other of 3rd artillery; the latter reduced to a mere skeleton by desertion, and the former in a fair way to share the same fate" (28).

Governor Mason tried offering a reward for the deserters. He notified everyone through the newspapers that $40,000 would be given for the capture of deserters from his squadron, in the following sums: "for the first four deserting since July, $500 each, and for any others, $200 each, the reward to be paid in silver dollars immediately on the delivery of the culprit" (29). When this failed, Mason threatened to concentrate his small forces in particular mining areas and arrest the miners for trespassing on government property unless they helped him catch deserters (30). This too failed, as evidenced by the following letter from Colonel Mason.

> what right or authority have I to exercise civil control in time of peace in a territory of the United States? Or, if sedition and rebellion should arise, where is my force to meet it? Two companies of regulars, every day diminishing by desertions, that cannot be prevented, will soon be the only military force in California. . . .

> In the meantime, however, should the people refuse to obey the exisiting authorities . . . my force is inadequate to compel obedience (31).

It was shown earlier that California was literally without any law relating to the acquisition of mineral rights. Now it appears that even had there been laws they would not have been enforceable. This situation led one observer to comment:

> All law, both civil and military, is at an end. Among the mines, and indeed most parts of the country out of the villages, no authority but that of the strongest exists, . . . I know of no section of the United States territories which more imperatively requires strong garrisons for the preservation of order. Without them I think the whole country will sink into anarchy and the worst possible confusion (32).

After the initial rush to the mines, the rate of desertion declined, and by 1852 the number of men in the army in California had risen to over 800 and continued to increase for the next several years (33). Even with this increase, I have been unable to find any evidence that Federal troops interfered with the miners from 1848 to 1866. They served only to protect civilians from hostile Indians (34).

From 1850 to 1854 the state legislature did little to help or hinder the miners' activities. Some boats were purchased and converted into prisons, but these soon proved inadequate for the number of convicted criminals, so a prison was constructed at Point Quinton (35). The only other assistance offered the miners by the state was financial compensation for costs incurred while defending themselves against Indians (36). In 1854, the state legislature passed an act providing for the formation of a state militia. However, it was not until 1855 that any action was taken to put this into effect (37). I can find no indication that the militia was actually used to interfere with the miners from 1855 to 1866. However, the existence of a stronger Federal army and state militia probably served to reduce the costs to the miners of enforcing their contracts in the late 1850s. I doubt that this was a significant reduction in most of the outlying districts. Legally, California gold land was a nonexclusive property from 1848 to 1866.

Technological Constraints

Throughout the time period being investigated most of the gold mining activities were in the placer deposits. These gold deposits were formed primarily by rivers which washed away small pieces of gold from veins higher up in the Sierras and deposited them at lower altitudes. These gold pieces ranged in size from tiny, nearly invisible flakes to nuggets weighing several pounds.

The first gold hunters used only a knife to get the gold. By scraping crevices in rocks located near a stream, they could extract the flakes which had been deposited there by the force of the water (38). In some places, the flakes were big enough that they could be seen mixed in the dirt or

sand, and, with a good deal of effort, could be separated by hand. It was discovered, early in the rush period, that the gold, being much more dense than most elements, would work its way down through the lighter surface soils. Eventually, it came to rest on hard bed rock. The miners, by using a pick and a shovel, would dig down to the bed rock and then, using a knife, scrape the hard surface to retrieve the gold. This gold-bearing stratum was called "pay dirt" (39).

By the early spring of 1848, two other devices were introduced which facilitated the separation of the placer gold from the surrounding elements. These were the pan and the cradle (40). The former was a pan, usually made out of tin, which was about 18 in. in diameter and 3 in deep with gently sloping sides. This was filled with pay dirt and then submerged in water. By applying a circular motion to the pan the lighter dirt was washed away leaving only the heavier gold flakes in the bottom (41).

The cradle was a wooden box about 40 in. long, 20 in. wide, and 4 in. deep. This rested on rockers, like a child's cradle, with the head of the box elevated above the lower end. At the head was placed another box, called a riddle box, which had a bottom made of sheet iron perforated with holes about 0.5 in. in diameter. Dirt was thrown into the riddle box and water was added while the cradle was rocked. The smaller-sized rocks, sand, dirt, and gold fell through the perforations to the floor of the cradle. The water washed the dirt over a set of cleats, which were fastened to the cradle floor, and out the lower end, leaving the heavier gold and sand trapped in the cleats. Two or three times a day the cleats were cleaned with a spoon and the pan was used to separate the gold from the remaining dirt. Two miners together could wash an average of 300 pans a day using the cradle, which was about three times what could be washed with the pan alone (42). One disadvantage of the cradle was that, if the rocking motion ceased, the sand would pack around the cleats and the gold washing over this packing would not be trapped. The cleats had to be cleaned before reusing. So, while one miner could work the cradle by himself, there appears to have been a large cost savings from forming a contract with a second miner who supplied dirt, thus avoiding the interruption of the rocking motion (43).

The only other technique used prior to 1850 was "winnowing." This involved placing the pay dirt in a large bowl or blanket and then tossing it into the air. As the dirt descended the miner blew lightly on it, thus separating the lighter dirt from the gold. Catching the remaining pay dirt as it fell, this process was then repeated until only gold remained. Winnowing was a relatively costly process compared to the use of the pan or cradle and was used only when water was not economically available (44).

After 1850, when the private rights to gold land had been fully developed, there were several significant advances in mining technology. However, these inventions had no major impact on the formation of the initial

contract. Instead they served to alter the spectrum of rights which the miners chose to allow themselves. This, however, is beyond the scope of this paper and is discussed in detail elsewhere (45).

The Early Rush for Gold and the First Contracts

Before 1848, California was a sparsely populated territory. The non-Indian population consisted of missionaries, military personnel, and some farmers, most of whom settled on lands along the coast. Americans had been coming in increasing numbers and locating themselves mostly in the northern part of the country. In 1839, John A. Sutter came to California and built a fort near the present site of Sacramento. Here, he hired Indians and established a large cattle ranch, flour mill, tannery, and rest stop for immigrants coming into California (46). Shortly after Sutter established himself, he bought some property from a group of Russians in Bodega, California. This consisted of some hunting rights, a small boat, several rusty cannons, and some old muskets (47). When the Mexicans heard about Sutter's artillery purchase, they threatened to remove him from California. In response, Sutter gathered around him a large number of Indians and some white settlers in the area and sent a note to the Mexican authorities saying that they should threaten him no more or he would "chastise them" (48). Therefore, in 1842 a new Governor, Manual Micheltorena, was sent from Mexico, along with 600 troops, to subdue Sutter. In Los Angeles, the new Governor was met by a representative of Sutters' who carried a note welcoming Micheltorena and offering submission to his authority. Sutter and the Governor apparently became good friends and a charter was granted Sutter giving him several leagues of land around his farm (49).

At about the same time that Mexico was trying to rid California of Sutter and other Americans, gold was discovered 45 miles northwest of Los Angeles. These placer deposits were not extensive, but from 1840 to 1841 were worked by miners from the province of Sonora, Mexico, and yielded 212 lb of gold (50). Information concerning this gold find never became widespread (51), probably because the Mexicans feared that this would attract more Americans.

During the Mexican–American war, from 1846 to 1848, Sutter continued to work his land. His labor consisted primarily of Indians who were paid in produce from his store, although some white settlers had built homes around Sutter's fort and did some contract work for him (52). Among those retained by Sutter was James Wilson Marshall, a carpenter, who was hired to construct a saw mill to supply lumber for Sutter's buildings (53). It was while building the saw mill on the south fork of the American River (now called Coloma) that Marshall discovered gold. The date

was January 24, 1848 (54), just 9 days before the peace treaty was signed ending the war with Mexico.

When Sutter heard of the discovery, he returned with Marshall to the saw mill and requested that those employed in its construction remain until the job was completed (55). Next, Sutter tried to establish stronger property rights in the land surrounding the saw mill. He negotiated a contract with the Indians in the area agreeing to pay them $200 a year in goods in exchange for their promise to respect his property. They were not to kill his horses, cattle, hogs, or sheep or burn the wheat and other crops which grew on the land specified by the contract (56). To further strengthen his rights, on February 5, Sutter sent Charles Bennett, an associate of Marshall, to see Colonel Mason in Monterey. Mason was the military governor of California at this time and Sutter tried to acquire from him a preemption right to the land surrounding the mill site (57). Mason denied Sutter's request on the grounds that California was still a Mexican territory and he had no right to grant land titles (58). On February 12, Mason abolished all Mexican laws by which private titles could be granted on mineral lands.

Sutter had tried to keep the discovery of gold a secret from his employees at the fort (59), but one of his teamsters, while delivering supplies to the workers at the mill, was told of the gold discovery by a young boy. The boy's mother gave the teamster a small nugget as a present and, upon arriving back at the fort, the nugget was used to purchase a drink of whiskey; the secret was out (60).

As his workers began deserting the fort to find gold, Sutter tried to collect a percentage of the gold they discovered. Even though the mill site was not on land covered in the original grant and Mason had refused to grant a preemption claim, Sutter and Marshall used the treaty with the Indians to claim property rights in the land and the minerals. Each miner was asked to pay up to 50% of his gold find (61). While it is not possible to determine what percentage the miners actually paid, their diaries indicate that they did pay something for the privilege of mining (62). This payment was reduced to one-third of the total and later done away with completely when a mining party from Oregon refused to pay in the summer of 1848 (63).

Rumors of rich mineral wealth had been circulating around California for several years prior to Marshall's discovery, so when the story first appeared in a San Francisco newspaper on March 15, 1848, it had very little impact (64). Short notices continued to appear in both San Francisco newspapers, but few people took it seriously (65). As late as May 6, 1848, the editor of the *California Star* wrote:

> After a very pleasant, but brief sojourn in the Great Valley of the Sacramento, we have returned and resumed our labors, settled down in our chair again,

> physically refreshed and invigorated, and in mind abounding with reminiscences of all that we have seen and done while absent. Great country—fine climate. Visit this Great Valley, we would advise all who have not yet done so. See luxuriant clover, fragrant flowers, gold and silver (66).

But 2 weeks later people were taking notice, as indicated by the following which appeared in the *California Star* on May 20, 1848.

> El Dorado Anew—A terrible visitant we have had of late—a FEVER which has well nigh depopulated a town—a town hard pressing upon a thousand souls (67).

The rush for gold had begun in full force by mid May.

While Marshall is generally accredited with the discovery of gold, the honor of starting the "rush," if it belongs to any one person, must go to Samuel Brannan. It was Brannan who, on about the 12th of May, went down the streets of San Francisco waving a bottle of gold dust and yelling, "Gold! Gold! Gold from the American River" (68). Why would a miner announce publicly the existence of gold on land to which he has no exclusive rights? The answer, in this particular case, appears to be that Brannan, as the leader of the Mormons, had been collecting from his brothers a tithe of 30% on all the gold they discovered. This was done on the pretext of building a shrine for their God (69). The money, instead of going directly to God, went to stock a small store and trading post co-owned by Brannan at Sutter's Fort (70). A large "rush" of people to Sutter's Fort could have benefited his business (71).

In San Francisco, and other towns along the California coast, news was arriving every day of new "strikes" in the gold fields. Reports of tremendous nuggets, many of them verified, were increasing (72). Governor Mason visited the mines and came back with stories about thousands of dollars being made in a matter of days (73). The potential gains from breaking a prior contractual agreement and leaving for the mines were apparently rising, and, with everyone else leaving, the potential cost of punishment fell. Contracts were broken everywhere. Farmers, who had promised to supply wheat to the mills, left their crops to rot in the field. There were no complaints because the miller left too. Builders under contract to construct new houses left the frames half assembled. No one was there to live in them. Newspapers could no longer be published as the workers had all gone to the mines. But there was no one left to read them anyway. Ships would put into San Francisco harbor to unload merchandise and all the sailors would mutiny, leaving the captain tied up if he resisted. Hundreds of empty boats were left to rot at anchor (74). A jailor, by the name of Henry Bee, had 10 Indian prisoners in his charge when the rush began. He tried to turn them over to the alcalde, but he had left his position for the mines. Finally, he decided to take his prisoners to the gold fields, where he had them mine for him. Reportedly, he had made a small fortune by the time the other free miners helped the Indians escape

(75). By May, Bancroft estimated that the mining population within 30 miles either side of Coloma was 800, and by June, 2000 (76). In July, Colonel Mason visited the gold fields and estimated that there were 4000 miners (77). By the close of the year, the number of miners had been estimated at between 5000 and 10,000 (78). While most of these miners were clustered around the south fork of the American River, some prospecting had been done as far north as Reading's Bar and south to the Tuolumne River (79).

The first to the mines were the Mormons employed by Sutter. They had written others of their faith notifying them of the discovery. These early miners worked on the saw mill during the week and hunted gold on their off hours (80). As I mentioned previously, Marshall and Sutter charged them for the right to extract gold from their property so, when the mill was completed, the Mormons began mining on an island about 1 mile down river from Coloma. They named this place Mormon Island. From April to July, their party of about a dozen worked the island using the "panning" method to separate the gold from the dirt. On July 17, 1848, they left for Salt Lake City, reportedly with thousands of dollars in gold (81).

When the Mormons started operations on the island, several employees of Sutter, some settlers around the fort, and Sutter himself began mining on their own. Shortly thereafter they began hiring Indians to mine for them (82). The Indians, apparently not knowing the value of gold, were willing to exchange what they found for beads, cloth, and food, sometimes trading an ounce of gold for an ounce of cloth (83). Later, when the Indians noticed the other miners carefully weighing their gold before an exchange was made, they demanded that their gold also be weighed. The earliest merchants, being few and far between, were reportedly able to discriminate against the Indians by using weights that were much heavier than an ounce. This heavy weight was called a "digger ounce" because the local natives were called "diggers" (84). Of course, even if these natives were so ignorant that they never learned to tell the difference between weights but could tell the differences between a higher and lower gold price, competition among traders would eventually eliminate these discriminatory measures. In fact, by the autumn of 1848, competition had forced miners to pay Indians the equivalent of $20 per day, which was equal to the average estimated daily earnings of the white miners (85). These contracts with the Indians were the first and only wage contracts in the mines during 1848.

Judging from the diaries and early accounts, the first miners entered into no contractual arrangements regulating either the exclusivity of the land or the mining process. They did group together, but this was apparently to take advantage of scale economies in hunting, cooking, providing shelter, and medical care. This is evidenced by the following account:

> We were no sooner our own masters again, than there commenced on all sides a series of the most active preparations for a journey to the mines. The plan adopted was to form bands of three, five or ten, under the leadership of one of the number. . . . A set of written rules was drawn up for the regulation of the general interest, these rules varying in certain points, according to the peculiar views of particular associations. The purport of the majority of them, however, ran as follows:
>
> 1. That we shall each bear an equal share in all expenses incurred for the general advantage, such as the purchase of a yoke of oxen, a cart, horses, packs, etc.
> 2. That we all proceed together to the gold mines, and that no man be allowed to separate from the party without the general consent.
> 3. That in case of unavoidable separation, each person be allowed to take out an amount of goods or money equivalent to the original investment, less what he may have consumed or injured.
> 4. That we work together in the mines, using the tools and property of the party in common.
> 5. That each may be allowed to retain all he can make by digging, but that he shall contribute to the company his equal portion of the funds necessary for the purchase of food and other things for the common use.
> 6. That in case of danger or difficulty, we stand by each other under all circumstances.
> 7. That no sick man shall be abandoned, but every possible means adopted to restore him to health.
> 8. That each man, in his turn, shall do his share of the general work, namely cooking, attending to the horses, chopping wood, fetching water, etc.
> 9. That any member separating himself from the part without the general consent shall forfeit all that he had invested.
> 10. That any man proved guilty of stealing from . . . any member of his company shall be immediately expelled, and forfeit the whole of his property. (86).

This particular contractual arrangement did not last very long, probably because it failed to assign exclusive rights to a scarce resource. As I have already discussed, in the absence of exclusive rights the income generated by the resource tends to dissipate. In this case, no one owned the rights to exclude other group members from a rich gold find and yet no one was required to share his gold with others. This combination led to the following situation. A miner would make an especially rich discovery. The other group members could benefit from this only if they could get the gold out of the ground before anyone else, since the discoverer did not have to share what he found. This resulted in miners spying on each other and rushing to the richest area. It was frequently observed that four or five men would be working within a circle of 6 ft in diameter (87). When discovering a rich piece of land, the miner would try to keep it secret and mine it quickly and quietly. Thus, the income generated by the gold land was dissipated by allocating resources to rushing, crowding, spying, and increasing the rate of mining activities. This dissipation was probably negligible for the first

miners because of the large number of rich deposits. However, as the relative abundance of high-yielding gold land diminished, due to the rapid influx of miners, this contractual form was discarded early in the gold rush.

The only other contractual arrangement from 1848 which I have found appears to have centered around the use of the cradle. As I mentioned earlier, economies of scale could have been realized by combining the labor inputs of at least two men with one cradle. Consequently, contracts were formed, usually between two to four miners (88), in which it was agreed to constrain individual behavior in the following way. Each individual would take his turn working a certain amount of time at a given job. Early observers have broken the cradle mining process into four jobs: shoveling dirt from the ground into a carrying device, carrying the dirt from the excavation to the cradle, pouring water into the riddle box, and providing the rocking motion to the cradle (89). Where there was easy access to water, these jobs were combined such that the one providing water could also do the rocking. All the gold, with the exception of nuggets weighing in excess of 0.5 oz found before going into the cradle, was to be divided evenly among the contracting parties (90). The large nuggets were kept by the individual who found them (91).

Like the contract formed by the soldiers, this contract did not assign to any individual the exclusive rights to work a given piece of land. However, unlike this prior arrangement, the sharing contract had the effect of assigning exclusive rights to all the gold before it was taken from the ground. To the extent that the group could exclude other outsiders, each member had the exclusive right to a given percentage share of the total. As a result, if the provisions of this contract could be costlessly enforced, no dissipation would occur. However, I believe that it was because of positive enforcement costs that the miners made the exception of allowing the discoverer to keep large nuggets. Nuggets weighing in excess of 0.5 oz were worth $8 or more and could still be easily concealed from other miners. By granting the discoverer the rights to these nuggets, potential conflicts could be reduced and resources that would have been devoted to watching each other, or to concealing gold, could be saved. Notice also that the particular characteristics of cradle mining technology would have had the effect of reducing the costs of enforcing the sharing agreement. The likelihood of finding a nugget smaller than 0.5 oz without the aid of a cradle or a pan was quite small. It was these gold particles which accumulated in the cleats of the cradle after the lighter dirt had been washed away. When the cleats became full, all cradle operations ceased. The group would clean the residual from the cradle and then, each miner taking a pan, would go to the nearest water source for the final separation process. The fact that each cradle full of gold was cleaned by all the miners in the group in close prox-

imity to each other probably reduced the costs of watching for cheaters and enforcing the sharing provision. By the beginning of 1849, this had become the most widely used contractual arrangement.

During 1848, several remarkable things occured. Nearly 10,000 people rushed to mine gold on property to which no one had exclusive rights. Furthermore, although nearly every miner carried a gun (92), little violence was reported. In July, when Governor Mason visited the mines, he reported that the miners were respecting Sutter's property rights and that "crime of any kind was very infrequent, and that no thefts or robberies had been committed in the gold district . . . and it was a matter of surprise, that so peaceful and quiet a state of things should continue to exist" (93).

In the first 6 months after the initial discovery by Marshall, the size of the known gold fields increased from a small area around Sutter's mill to an area covering over 10,000 squares miles. For the early miners, it was apparently less costly to move to a new discovery than to use violence to acquire someone else's mining rights (94). As long as gold land remained relatively abundant, small groups of miners found the sharing arrangement to be the most economical. *I can find no contracts, in 1848, in which it was agreed to assign and enforce an individual's exclusive rights to a given parcel of gold land (95).*

By the end of 1848, most of the miners had returned to the coastal cities as the change in weather raised the costs of mining. Meanwhile, on the east coast of the United States and in nearly every other country, thousands of people were preparing for the trip to California. Every boat that could possibly float, and some that might not, were booked up months in advance. Companies were being formed to provide financing and protection for those who chose the overland route (96). When these people reached California in the spring of 1849, they had significant and predictable effects on the types of emerging property rights contracts.

The Emergence of Private Property Rights in Mining Lands: 1849–1850

In the early months of 1849, the rush was on. Between December 7, 1848, and April 17, 1849, over 8000 people sailed out of New York for California. More than 2000 left Boston and another 1200 left New Orleans. It has been estimated that a total of 20,000 people left for California by boat from the east coast of the United States (97). The Harbor Master's Office at San Francisco reported that nearly 40,000 people from all over the world arrived by boat in 1849 (98), including those who came overland from the States, the Oregon territory, Mexico, and South America. The population in California by the end of 1849 was about 107,000, and by the end of 1852 it has been estimated at 264,000 (99).

In 1848 the ratio of land to miners was large enough that mining rights had relatively little value. If one area got too crowded, the miners just

moved upstream to a new gold field. However, as the new wave of miners entered California in 1849, gold land became scarcer and scarcer. It is not unusual to read accounts of thousands of potential miners converging on a piece of land previously being worked by only four or five men. As the land became relatively scarce, its value at the margin increased. If the theoretical implications are not to be refuted, we should observe explicit agreements emerging which assign the exclusive rights to mine a piece of land. The formation of these explicit contracts is so important in understanding the actual constraints on the development of property rights that I have chosen to give several first hand accounts.

> When the mines in and around Nevada City were first opened they were solely in the ravines . . . and there was no law regulating the size of a miner's claim, and generally a party that first went into a ravine had the exclusive right there too, . . . As population increased that rule did not long maintain. The miners saw that something must be done, and therefore a meeting was called and a rule was established that each miner could hold thirty feet square as a mining claim (100).
>
> All these bars on the Middle Fork of the American River, from Oregon Bar upwards, after the lowest estimate, employed in the summer of 1850 not less than 1,500 men; originally working on shares, and the assessment on the share paid out daily, so that those who had been drunk or absent did not get any part of it; but this after a while caused dissatisfaction and was the reason of breaking up the co-operative work and commencing work on claims. A claim was a spot of ground fifteen feet wide on the river front (101).
>
> In a comparatively short time we had a large community on that creek, which led to rows and altercations about boundaries, that eventuated in an agreement, entered into by unanimous agreement, that each person should have ten square feet (102).
>
> Wood's Creek was filled up with miners, and I here for the first time after the discovery of gold, learned what a miner's claim was. In 1848, the miners had no division of the ground into claims—they worked where it was richest, and many times four or five could be seen at work in a circle of six feet in diameter; but . . . here they were now measuring the ground off with tape measures so as to prevent disputes arising from the division (103).

I could give more examples (104) but these few clearly reveal the nature of this transition period in which private property rights in land were being established through contracting.

The process by which the miners actually reached an agreement, or contract, was termed the "miner's meeting." An excellent description of this process was found in the following interview with one of the original forty-niners.

> A few hours labor convinced the discoverers that the royal metal was there in paying quantities. . . . Soon the news spread; and within a week there were fifteen or twenty men at work in the . . . bed or creek. At first the camp had no organization or government, and every man's conduct conformed to his own ideas of right and justice. Each miner had chosen a "spot to work in," and no question of encroachment could possibly arise until in the widening circle their operations began to approach each other. About the close of the first week after the establish-

> ment of the camp, the near approach of two miners' operations caused a dispute about the size of claims. One of the miners considered his rights infringed upon; and a few days later, after a good deal of talk, his friends circulated an informal oral request through the camp, whose population had by that time increased to fifty or more, asking for a miners' meeting in the evening. When the miners of the new camp assembled, one of their members called the meeting to order and nominated a permanent chairman, who was at once elected (105).

The result of this meeting was to specify the geographic limits over which their decisions would govern. In this case, the mining district was about 3 miles long by 2 miles wide. Within these boundaries, each individual was allowed a claim to a piece of land of some specified size (106).

Very few of these original contracts from 1849 are available today. Many of them were never written down (107) and most of those that were in writing burned in the fires that plagued every mining town during this early period (108). However, from the few existing documents and the statements of observers it is possible to piece together the following: (i) At every district meeting an explicit contract was formed in which each participant received exclusive rights to a designated piece of land called a claim. (ii) Each miner was to mark the boundaries of his claim with wooden stakes. To these stakes was frequently attached a notice informing others of the identity of the claimant or the likely consequences of trespassing.

> All and everybody, this is my claim, fifty feet on the gulch, cordin to Clear Creek District Law, backed up by shotgun amendments (109).
>
> any person found trespassing on this claim will be persucuted to the full extent of the law. This is no monkey tale butt I will assert by rites at the pint of the sicks shirter if legally necessary so taik head and good warnin. (110).

(iii) These early contracts usually contained a provision which required each miner to work his claim a certain number of days out of the week. (iv) As long as the individual complied with this rule the other miners would help him keep off potential "jumpers" or those who would violate his exclusive rights. If the miner failed to comply with the terms of the contract, his claim was considered by the others to be nonexclusive and open to any jumpers (111).

It appears that a contract was formed when the population had risen to the point where there were enough miners to enforce their exclusive rights against outsiders. I can find only one instance where an entire district was outnumbered by outsiders. The actual account of this event given by one of the miners present, reveals clearly the constraints in establishing exclusive rights.

> The first workers on the bar had taken up claims of a generous size, and soon the whole bar was occupied. The region was full of miners and they came pouring down upon the river, attracted by the reports of a rich strike, until their tents and campfires presented the appearance of a vast army. Those without claims far exceeded in number the fortunate ones. A miners' meeting was called to make

> laws. Majority rules in a mining camp in those days, and it was voted to cut down the size of claims to forty feet. The claim owners were powerless to resist, but had to submit to the fiat of the majority. The miners were then registered in the order of the date of their arrival upon the bar, and in that order were allowed to select claims until all were taken. Even then there was a great crowd of disappointed ones (112).

Notice that the majority always prevailed at the miner's meetings. I have copies of nearly 200 original contracts formed by miners to assign exclusive land rights (113). In every case the provisions of the contracts were determined through majority-rule vote. Of course, in the absence of any agreement, violence would be the allocator, and, if we assume that the miners were about equal in their abilities to shoot each other, the majority would always decide an outcome. Notice, also that preference in claim selection was given to those who were first to arrive in the district.

By the end of 1849, more of the miners were putting their agreements on property rights in writing. The miners at Jackass Gulch had a typical contract which provided:

> First. That each person can hold "one claim by virtue of occupation," but it "must not exceed one hundred feet square."
>
> Second. That a claim or claims if held by purchase "must be under a bill of sale, and certified by two disinterested persons as to genuineness of signature and of the consideration."
>
> Third. That a "jury of five persons shall decide any questions arising under the previous articles."
>
> Fourth. That notices of claims must be posted upon the ground chosen, and must be renewed every ten days "until water to work the said claims can be had."
>
> Fifth. That, as soon as there is a sufficiency of water for working a claim, "five days absence from said claim, except in case of sickness, accident or reasonable excuse," shall forfeit the property.
>
> Sixth. "That these rules shall extend over Jackass and Soldier gulches and their tributaries" (114).

The format of the miner's contract changed very little after 1849. In 1856, the miners of the Kelsey District formed this contract, more detailed, yet very similar to that formed in 1849.

> 1. The mining district of Kelsey shall include one mile from said town.
>
> 2. A claim of old ground, and worked, shall be 150 feet in length and 60 feet wide.
>
> 3. A claim on new discovered ravines, bank or surface diggins, shall be 100 feet in length and 50 feet wide, the discoverer to be entitled to one extra claim.
>
> 4. A claim on new ground generally denominated "hill diggings" shall be 100 feet square, and an extra claim to the discoverer.
>
> 5. There shall be a recorder appointed for the district, whose duty it shall be to record all mining claims in said district, in a book kept for that purpose.
>
> 6. Any person or persons locating a claim after the passage of these laws, and failing to have the same recorded within five days after such location, shall forfeit the same; or purchasing a claim and failing to have the same transferred on the recorder's book, shall forfeit the same.

7. All mining claims recorded as aforesaid, shall be held by the person or persons recording the same during all the time there is not sufficient water to work the same.

8. Any person or persons holding claims over or during the dry season, must commence working the same within ten days after there is sufficient water to work the same, unless the said person or persons are unable to do so on account of sickness; and failing to do the aforesaid, shall forfeit said claim.

9. Any peson or persons failing to work a claim for a longer time than five days after there is sufficient water to work the same, shall forfeit said claim, unless the owner or owners be sick, except from the 1st of July to the 1st of November, when miners may hold their claims without working them.

10. Miners only shall be arbitrators or jurors in settling any disputes or difficulties about mining claims or mining interests.

11. Each person may hold one claim by purchase and one by preemption by working and causing the same to be worked as required by law.

12. The recorder shall keep a copy of the mining laws of Kelsey district posted all the time in some public place in the town of Kelsey.

13. The recorder shall be entitled to a fee of $1.00 for each recording of a claim, and the sum of 50 cents for each transfer of purchase (115).

By 1850 property rights to mineral lands were completely developed. The contracts by which miners assigned property rights to mineral land had a definite structure. From the sample that I have available, almost every contract provided for the following:

1. It defined the geographic boundaries within which its provisions would be binding on all individuals.

2. It assigned to each individual the exclusive rights to work a claim.

3. It stipulated the maximum size of each claim.

4. It enumerated the conditions which must be met if exclusive rights to the claim were to be maintained. These might include staking the claim boundaries, recording the claim with some appointed official, and working the claim a certain amount of time.

5. It indicated the maximum number of claims which any individual could hold at one time, either by preemption or purchase.

6. It established some means of enforcement.

CONCLUSIONS

The theory presented in the first section implies that an explicit contract in which individuals agreed to constrain their behavior in the use of a resource would emerge as the value of the rights to use that resource increased. When gold was discovered in California we found explicit contracts being formed almost immediately. It was further predicted that the contracts would have to provide for the allocation of resources to the enforcement of the exclusive rights. This was the case without exception.

Throughout this paper, I have chosen the explicit contract as the empirical counterpart to the theoretical concept of property rights. By itself, the existence of documents and lists of rules is not sufficient evidence that any human behavior was constrained. To complete the argument

that the miner's contract did in fact constrain behavior in a manner similar to the theoretical property rights' constraint, I offer the following evidence:

First, from 1849 to 1866, scarce resources were used by the miners to agree upon and to enforce the contractual provisions. Any individual found guilty of a violation was punished immediately (116).

Second, by 1849 and throughout the 1850's and 1860's, it was observed that miners were devoting hundreds of thousands of dollars to developing their claims. Expenditures on such things as digging water ditches and building sluices would frequently not yield a positive income stream for several months or even years. In other words, the miners behaved *as if* they had some expectation of continued-use rights.

Third, by 1850, most districts allowed miners to buy and sell claims and, shortly thereafter, this transfer of mining rights became a common occurrence. Some of the richer claims were exchanged for thousands of dollars (117). Had exclusive rights to the claims not existed, no one would have paid for them.

Fourth, in 1866, the Federal government passed an act allowing miners to acquire fee simple absolute in mineral lands. By 1867 only four claims had been patented, and in 1869 and 1870 a total of six claims had been patented (118). This, of course, does not prove that miners already had property rights, but it does indicate that the additional benefits of federally recognized rights were not worth the patenting costs for most miners.

Fifth, the mining act of 1866 legally recognized the rights of miners to the exclusive use of what was previously public land. Yet, with this Federal recognition and enforcement of property rights, there was no noticeable change in total gold yield, as shown below (119).

Year	Total gold yield
1865	$17,930,858
1866	17,123,867
1867	18,265,452
1868	17,555,867
1869	18,229,044
1870	17,458,133
1871	17,477,885

Sixth, in his report of 1868, government agent J. Ross Browne gives a detailed report on the history and current operations of hundreds of mines in California. I can detect no systematic change in resource allocation after 1866 (120).

In concluding, the evidence offered failed to falsify my hypothesis which predicted that, as land values rose along with the mining population, an explicit contract would evolve in which an individual's exclusive rights to mining lands are defined, assigned, and enforced. This contract marks the emergence of private property rights.

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2. Bush, W. (1974), "Individual Welfare in Anarchy." *Explorations in the theory of anarchy* (G. Tullock, Ed.), Virginia: Center for Study of Public Choice. Pp. 5–18; Alchian, A. (1961), *Some economics of property*. Rand Corporation; Demsetz, H. (1967), "Toward a Theory of Property Rights." *American Economic Review* **57**, 347–359; Cheung, S. (1970), "The Structure of a Contract and the Theory of a Non-Exclusive Resource." *Journal of Law and Economics* **13**, 49–70; Pejovich, S. (1971), "Towards a General Theory of Property Rights." *Z. für Nationalökon*, 141–55.
3. The concept of property rights emerging through a contract is not a new one. It was first formalized in the literature on the Social Contract and gained its popularity in the writings of Rousseau, *The social contract*, and Hobbes, *Leviathan*.
4. To give someone the "right" to do anything he wanted with some resource would be to deprive everyone else of all of their rights. For example, if the rights to use a gun are unconstrained, the wealth-maximizing owner of these rights can extract all of the wealth owned by everyone else through threats on their lives.
5. Logically, these are the only two alternatives facing the group. If they are unable to reach any agreements on the division of rights, violence is the only way to resolve the competition. For more on this, see Umbeck, J. (1975), *A theoretical and empirical investigation into the development of property rights*, thesis. University of Washington.
6. Knight, F. H. (1924), "Some Fallacies in the Interpretation of Social Cost." *The Quarterly Journal of Economics* **38**, 582–606; Gordon, H. S. (1954), "The Economic Theory of a Common Property Resource: The Fishery." *Journal of Political Economy* 124–142; Bottomly, A. (1963), "The Effects of Common Ownership of Land Upon Resource Allocation in Tripolitania." *Land Economics* **39**, 91–95; Cheung, S. (April 1973), "The Structure of a Contract and the Theory of a Non-Exclusive Resource." *Journal of Law and Economics*.
7. Cheung has explicitly assumed that adjustments at all other margins are prohibitively costly. This allows dissipation only through over entry of labor. If this assumption is relaxed, dissipation can occur in an infinite variety of ways.
8. Demsetz, H. (May 1967), "Towards a Theory of Property Rights." *American Economic Review*. Demsetz does not explicitly employ the concept of dissipation, but instead uses the notion of externality. I believe that in this context they are identical.
9. These questions are beyond the scope of this paper. For a further discussion and some interesting empirical tests see Umbeck, J., Ref. 5.
10. This, of course, assumes that the costs of enforcing exclusive rights are positively related to the quantity of resources that thieves allocate to the stealing of those rights. I suspect that this is a reasonable assumption to make.
11. It turns out that the negotiation process is severely constrained by the potential for violence. This reduces significantly the increase in the costs of determining the initial allocation of resources. See Umbeck, J., Ref. 5, Chap. III.
12. While I have merely asserted this positive relationship between value and enforcement

costs, it can be derived from a set of simpler assumptions. See Umbeck, J., Ref. 5, Chap. III.

13. For the theoretical derivation and the empirical tests of implications relating the costs of enforcing property rights to the initial allocation of gold land, see Umbeck, J., "Might Makes Right: Or a Theory of Initial Endowment," submitted to the *Journal of Political Economy*, March 1977. To see how the costs of negotiating and enforcing private property affected the choice of contracts, see Umbeck, J., "A Theory of Contract Choice, with Special Application to the California Gold Rush," forthcoming, *Journal of Law and Economics*. Further implications showing how contract costs have affected the types of provisions agreed upon have been derived and tested in Umbeck, J., Ref. 5, especially Chap IX. For implications derived from this same framework, but applied to more contemporary property enforcement, see Umbeck, J., "An Economic Theory of Private Property and Crime," paper to be presented at the WEA meetings, June 1977.
14. For a more detailed discussion of Mexican laws regulating the private acquisition of mineral rights, see Rodman, W. (1909), *History of the bench and bar of Southern California*. Los Angeles: William J. Porter. Pp. 85–92; deFooz, J. H. (1860), *Fundamental principles of the law of mines*. H. W. Halleck translation. San Francisco: J. B. Painter. Pp. i–CXIiii; Bancroft, H. H. (1888), *History of the pacific states*. San Francisco: The History Co. Vol 18, pp. 548–560, notes. Contained here are many court cases involving Mexican land grants. Almost all were found illegal, as they failed to comply with the Mexican law.
15. Bancroft, H. H. See Ref. 14, p. 563.
16. Rodman, W. See Ref. 14, p. 87.
17. Yale, G. (1967), *Legal titles to mining claims and water rights, in California, under the mining law of congress, of July 1866*. San Francisco: A. Roman & Co. P. 17. While Colonel Mason's proclamation applies specifically to "denouncements," which is a term reserved for the reclaiming of an old mine, he probably meant to abolish Mexican laws pertaining to the establishment of rights in new and old mines. There is also some evidence that Mason did not know of the treaty with Mexico until 8 months after its signing.
18. Yale, G. See Ref. 17, pp. 15–16.
19. Yale, G. See Ref. 17, pp. 325–354. See also the Rocky Mountain Mineral Law Foundation (Eds.) (1973), *American law of mining*, Vol. 1, Cumulative supplement. New York: Matthew Bender. Pp. 17–39. A complete review of all the bills relating to mining rights can be found in Lindley, C. (1903), *A treatise on the American law relating to mines and mineral lands*. San Francisco: Bancroft–Whitney. Vol. 1.
20. Yale, G. See Ref. 17, pp. 355–382.
21. Yale, G. See Ref. 17, pp. 34–42.
22. Yale, G. See Ref. 17, pp. 58–69. For a review of all the major court cases at the state level involving mineral rights see Parker, C. (1868), *Digest of California reports and statutes*. San Francisco: Bancroft. Pp. 632–643. Also David, J. (1902), *Historical sketch of the mining law in California*. Los Angeles: Commercial Printing House. Pp. 1–83.
23. A good general review of the legal and political problems in setting up a system of mining laws in California will be found in Ellison, J. (July 1926), "Mineral Land Question in California, 1848–1866." *The Southwestern Historical Quarterly* **30**, No. 1; Gordon, G. (1859), *Mining titles: Are there any—What are they?* San Francisco: J. G. Gilchrist; Mowry, S. (1864), *The mines of the West. Shall the government seize them?* New York: G. E. Currie; Ricketts, A. H. (1893), *A dissertation upon American mining law, its origin, development and establishment*. Sacramento: State Printing.
24. Colton, W. (1859), *Three years in California*. New York: A. S. Barnes. P. 247.
25. Thomas, D. (1904), *A history of military government in newly acquired territory of the United States*. New York: Columbia University Press. P. 239.

26. Ellison, J. (1927), *California and the nation, 1850–1869*. Berkeley: University of California Press. P. 80.
27. Letter from Thomas Jones, Commander-in-Chief of the Pacific Squadron, to the Secretary of Navy, October 25, 1848. Reprinted in *The American Quarterly Register and Magazine* (1849), **11**, 293–294.
28. A letter to the Paymaster General from William Rich, October 23, 1848. Reprinted in Ibid., pp. 294–295. For other reports of deserters see Royce, J. (1886), *California, from the conquest in 1846 to the second committee in San Francisco*. New York: Houghton, Mifflin. P. 223; Bancroft (14, pp. 64–66).
29. Bancroft, H. H. See Ref. 15, p. 65, note 26.
30. Congressional Documents, Serial No. 573, Doc. 17, p. 580. Reprinted in Williams, M. F. (1921) *History of the San Francisco Committee of Vigilance of 1851*. California: University of California Press. Pp. 59–60.
31. Letter from Mason to the adjutant general on August 19, 1848. In Williams, M. F., Ref. 30, p. 61.
32. Letter from Captain J. L. Folsom. Reprinted in Bryant, E. (1876), *What I saw in California*. California: Lewis Osborn. Pp. 476, 480.
33. *Journal of the fourth session of the legislature of the state of California; Journal of the proceedings of the senate*. San Francisco: George Kerr State Printing. P. 4.
34. For several accounts of Indian conflicts see Bean, E. (1867), *Bean's history and directory of Nevada County, California*. California: Daily Gazette Book and Job-Office. Pp. 185–187; Bancroft, H. H. (1888), *California, Inter pocula, a review of some classical abnormalities*. California: The History Company. Pp. 436–560.
35. Bancroft, H. H. See Ref. 34, pp. 413–417.
36. Angel, M. (1936), *History of Placer County, California*. Pp. 345–347; Martinez, T., and Drummond, F. (1936), *Early mining laws of Tuolumne and Calaveras Counties*. P. 6; Bancroft, H. H., Ref. 14, p. 319.
37. Angel, M. See Ref. 36, p. 346.
38. Bigler, H. W. *Diary of a Morman*. Reprinted in Paul, R. W. (1966), *The California gold discovery, sources, documents, accounts, and memoirs relating to the discovery of gold at Sutter's mill*. California: The Talisman Press. P. 62.
39. Hittell, J. S. (1863), *The resources of California* California: A. Roman & Co. P. 264. This is probably the best nontechnical description of the various mining techniques. Also described in Hutchings and Rosenfields (1858), *The miner's own book*. San Francisco.
40. Hittell, J. S. (1861), *Mining in the Pacific states of North America*. San Francisco. P. 15.
41. Hittell, J. S. See Ref. 39, pp. 262–263; Hutchings and Rosenfield. See Ref. 39, p. 2.
42. Hittell, J. S. See Ref. 39, pp. 258–262; Hutchings and Rosenfield. See Ref. 39, pp. 3–4.
43. Hittell, J. S. See Ref. 39, p. 262.
44. Hittell, J. S. See Ref. 39, pp. 264–265; Angel, M. See Ref. 36, p. 77; Hittell, T. (1898), *History of California*. (California: Stone & Co. Vol. 4, p. 124); Colton, W. See Ref. 24, p. 306. This method was apparently used only by Mexicans who, because of discrimination against them, had a lower opportunity cost of their labor.
45. The inventions being referred to are the sluice and hydraulics. Both served to reduce significantly the costs of processing a cubic yard of pay dirt. For an investigation into the impact of these inventions on the structure of the property rights contract see Umbeck, J., Ref. 5, Chap. IX.
46. Sutter, J. (1939), *New Helvetia diary*. San Francisco: Grabhorn Press. A good biography of Sutter is given in Zollinger, J. P. (1939), *Sutter, the man and his empire* New York.
47. Bidwell, J. (1962), *Echoes of the past*, New York: Citadel Press. P. 17.
48. Bidwell, J. See Ref. 47, p. 78.
49. Bidwell, J. See Ref. 47, p. 79. See also Bancroft, H. H., Ref. 14, p. 559 note.

50. Jenkins, W. W. (1907), "History of the Development of Placer Mining in California." *Annual publication of the Pioneers of L.A. County.* Los Angeles: Moke Printing. Vol. VII, p. 71. This refers to "avoirdupois weight" as opposed to "troy." At $16 per ounce and 16 oz to the pound, this gold had a value of about $54,000.
51. Bidwell, J. See Ref. 47, pp. 96–97. Bidwell claims that Sutter knew of gold around his land as early as 1843. In 1844, a Mexican, Pablo Gutierrez, went to Bidwell and asked for money to go to Mexico in order to buy a *batea* (mining pan) with which to mine gold out of the mountains around Bear River. Bidwell did not trust him and delayed in granting the financing. Gutierrez was later hung by troops of ex-Governor Alvarado while carrying a message to Micheltorena from Sutter.
52. In 1847, Sutter reported a white population of 289 in the vicinity of his fort, 16 half-breeds, Hawaiians, and Negroes, 479 tame Indians, and 21,873 wild Indians. There were 60 houses, 6 mills and 1 tannery. Sutter had 12,000 cattle, 2000 horses and mules, from 10,000 to 15,000 sheep and 1000 hogs. He eventually died in poverty. Miners took almost everything Sutter had. See Bancroft, H. H., Ref. 14, p. 14. For a different set of figures see Reed, G. W. (1923), *History of Sacramento County, California.* Los Angeles: Historic Record Co. P. 31.
53. The contract between Sutter and Marshall was unique. Written in August 1847, by Bidwell, before the end of the war, it contained the following terms: If the U.S. wins the war, the mill belongs to Marshall. If the Mexicans win, it belongs to Sutter. Parsons, G. F. (1870), *The life and adventures of James W. Marshall* Sacramento. Pp. 79–80.
54. The accounts of the actual discovery are numerous, but there is some disagreement here as to the actual date the gold was found. A good case can be made for January 19. Rodman W. Paul has compiled many of the original sources and many secondary references on the actual discovery and the surrounding events in (38).
55. Sutter's account of this was written in a letter to *Hutchings California Magazine* (November 1857) and reprinted in Thompson and West (1881), *History of Amador County, California.* Pp. 56–58.
56. This contract is recorded by Marshall himself in a letter dated January 28, 1858. Reprinted in Jackson (1880), *History of Nevada County, California.* California: Howell North Books. Pp. 40–41. See also Sioli (1883), *History of El Dorado County.* Pp. 62: Paul, R. W., Ref. 38, pp. 61–62; Bancroft, H. H., Ref. 14, p. 41.
57. Nadeau, R. (1965), *Ghost towns and mining camps of California.* California: The Ward Ritchie Press. P. 12. Also Ricketts, N. B. (1966), *Mormons and the discovery of gold.* California: Pioneer Press. P. 19; Bancroft, H. H., Ref. 14, pp. 43–44, note 4.
58. Bancroft, H. H. See Ref. 14, pp. 44, note 4. Mason had not yet heard the peace treaty.
59. Bancroft, H. H. See Ref. 14, pp. 44–45.
60. Bancroft, H. H. See Ref. 14, p. 45. Also in Sutter, J., Ref. 46, entry of February 14.
61. Bancroft, H. H. See Ref. 14, p. 51, note 9. Also in "Azariah Smith's Journal" entry of April 7 and "Peter L. Wimmer Gives His Version" a first-hand account of the discovery, both in Paul, R. W. See Ref. 38. Marshall later claimed these payments were for prospecting services [Paul, R. W., Ref. 38, p. 115].
62. Paul, R. W. See Ref. 38; Ricketts, N. B. See Ref. 57, p. 19.
63. Paul, R. W. See Ref. 38, p. 135.
64. Gold Mine Found.—In the newly made raceway of the Saw Mill recently created by Captain Sutter, on the American Fork, gold has been found in considerable quantities. One person brought thirty dollars worth to New Helvetia, gathered there in a short time. California, no doubt, is rich in mineral wealth; great chances here for scientific capitalists. Gold has been found in almost every part of the country. Note found in the *San Francisco Californian*, March 15, 1848.
65. For reprints of these newspaper articles see Paul, R. W., Ref. 38, pp. 68–80.
66. Paul, R. W. See Ref. 38, p. 78.
67. Paul, R. W. See Ref. 38, p. 79.
68. Bancroft, H. H. See Ref.14, p. 56, note 5.

69. (1965) *History of Kern County, California* California: Wallace and Company. Pp. 58–59. Also, in an article by Sutter which appeared in *Hutchings' Illustrated California Magazine*, November 1857, and reprinted in Paul, R. W., Ref. 38, p. 130; Bancroft, H. H., Ref. 14, p. 51, note 9.
70. Paul, R. W. See Ref. 38, p. 130.
71. Assuming, of course, that the miners "respect" Brannan's rights to the goods in his store. This they apparently did. To my knowledge, no one has noticed the incentives for Brannan's "strange" behavior in the streets of San Francisco. Later, prospectors would occasionally try to keep their find a secret, but many of them reported their discoveries to others. Their behavior is more difficult to explain than that of Brannan.
72. The most complete account of these rich discoveries is in Bancroft, H. H. Ref. 14, pp. 89–91, notes.
73. Letter addressed to the War Department by Governor Mason. Reprinted in Bryant, E., Ref. 32, pp. 456–464.
74. Colton, W. See Ref. 24, pp. 246–255. Colton served as *alcalde* (a Mexican title for a judge, jury, and sheriff all in one) in Monterey during the initial stages of the gold rush. Also Bancroft, H. H. See Ref. 14, pp. 61–62, notes.
75. Bancroft, H. H. See Ref. 14, p. 62, note 20.
76. Bancroft, H. H. See Ref. 14, p. 70.
77. Letter from Governor Mason to the War Department in Bryant, E., Ref. 32, p. 458.
78. Hittell, J. S. See Ref. 40, p. 20. Hittell estimates there were but 5000 miners actually at work. Bancroft, H. H. (Ref. 14, p. 71, note 7) estimates just over 9000. This figure is probably most accurate, judging from the number of Oregonians, Hawaiians, and Mexicans that arrived that year. If Indians are included, this figure could exceed 20,000. For other estimates, see Williams, M. F., Ref. 30, p. 54. According to Sutter, there were only five men left in San Francisco; everyone else was in the mines [Thompson and West, Ref. 55, p. 57].
79. Indian problems prevented further exploration to the south. The best single reference of the early propsects will be found in Coy, O. C. (1948), *In the Diggings in 'Forty-Nine*. Los Angeles: The California State Historical Association. For more detailed accounts of early mining see Sioli, Ref. 56; Jackson, Ref. 56; Thompson and West, Ref. 55; Reed, G. W. Ref., 52 and (1882), *History of Fresno County, California*. California: Wallace & Elliot; Angel, M., Ref. 36.
80. Bigler, H. W. *Diary of a Mormon*, in Paul, R. W., Ref. 38, p. 158.
81. Bancroft, H. H. See Ref. 14, p. 50, note 8.
82. Hittell, T. See Ref. 44, p. 129; Coy, O. C. See Ref. 79, p. 42; *History of Humboldt County, California*, p. 82; Mansfield, *History of Butte County*, pp. 43, 46; Letter from Folsom, in Bryant, E., Ref. 32, p. 454; Mason's letter in Bryant, E., Ref. 32, p. 461; *The American Quarterly Register*, p. 289; Angel, M., Ref. 36, p. 355.
83. Mansfield, see Ref. 82, p. 46; Bancroft, H. H., see Ref. 14, p. 92, note 14; Buffum, E. G. (1859), *Six months in the gold mines*. The Ward Ritchie Press. Pp. 93–94, 128, 129.
84. Bancroft, H. H. See Ref. 14, p. 92.
85. Bancroft, H. H. See Ref. 34, pp. 438–439.
86. W. Ryan (1850), *Ryan's California, Personal adventures in upper and lower California in 1848–1849*. London: William Shoberl. Pp. 211–214.
87. J. H. Carson, Eq. (1852). *Early recollections of the mines*. Stockton. P. 18.
88. Mason's letter in Bryant, E., Ref. 32, p. 457. These are observations around the mill sight. Farther from the mill, the observed group size increased as reported in Borthwick, J. D. (1917), *The gold hunters*. New York: MacMillan Co. P. 152; Farriss and Smith (1971), *History of Plummas, Lassen and Sierra Counties, California*. Berkeley: Howell & North Books. Pp. 289, 457, 473; Sioli, Ref. 56, pp. 182, 193; Angel, M., Ref. 36, pp. 68–69, 71, 79, 88; Bancroft, H. H., Ref. 14, p. 97; Thompson and West, Ref. 55, pp. 74, 203, 215, 222; Shinn, C. (1885), *Mining camps: A study in American*

frontier government. Charles Schribner's Sons. P. 109; Royce, J., Ref. 28, p. 289. This increase in group size is probably explained by the higher incidence in Indian hostilities and the need for more protection as the miners moved farther from the mill. For reports on Indian attacks, see Hittell, T., Ref. 44, pp. 77, 86, 158–159; Nadeau, R., Ref. 57, p. 168; Paul, R. W., Ref. 38, pp. 94–95; Bancroft, H. H., Ref. 34, pp. 449–450; Jackson, Ref. 50, p. 53; *History of Humboldt County, California*, p. 121; Bancroft, H. H., Ref. 14, pp. 72, 78; Angel, M., Ref. 36, p. 345.

89. Bryant, E. See Ref. 32, p. 457. The proportion of water to soil in the cradle was such that it was cheaper to carry the dirt to the water. Later, the water was brought to the dirt by ditches. Hittell, J. S., Ref. 39, p. 262.
90. Brooks, J. T. (1849), *Four months among the gold-finders in California*. London: David Bogou. 2nd Ed., p. 82.
91. Brooks, J. T. See Ref. 90, p. 77; Royce, J. See Ref. 28, p. 290.
92. This fact is testified to by nearly every observer during this period. See Hittell, T., Ref. 44, p. 461; Mansfield, Ref. 82, p. 103; Shinn, C., Ref. 88, p. 139; Marryat, F. (1855), *Mountains and molehills; or recollections of a burnt journal*. New York: J. B. Lippencott. P. 123.
93. Mason's letter in Bryant, E., Ref. 32, pp. 458–462. Nearly every writer during this period agreed with Mason. However, the crime rate reported rose sharply after 1849, and, as mentioned before, Sutter eventually lost nearly all his property.
94. Sutter, in Paul, R. W., Ref. 38, p. 131; Brooks, J. T., Ref. 90, pp. 66–67, 83; Hittell, J. Ref. 44, pp. 50–51;Coy, O. C., Ref. 79, pp. 52–53; Colton, W., Ref. 24, p. 291; Shinn, C., Ref. 88, p. 158.
95. With the exception of the contract between Sutter and the Indians mentioned earlier.
96. For information on the various routes to California and the problems encountered, see Moerenhout, J. R. (1885), *The inside story of the gold rush*. Translated by Abraham P. Nasetir. San Francisco: California Historical Society; Bancroft, H. H., Ref. 14, pp. 126–164; Howe, O. T. (1923), *Argonauts of '49, history and adventures of the emigrant companies from Massachusetts, 1849–1850*. Cambridge: Harvard University Press. Pp. 16–114.
97. *New York Tribune*, June 7, 1849.
98. Daily Alta California, November 29, 1849, and January 31, 1850.
99. Browne, J. R. (1850), *Report of the debates in the convention of California on the formation of the state constitution, in September and October, 1849*. Washington: John R. Towers. XXIII. For a collection of estimates on the population of miners in the various mining regions, see Merriam, C. (1951), *Bars on the Yuba River*. Marysville. Pp. 1–16; Bancroft, H. H., Ref. 14, pp. 352–376; Coy, O. C., Ref. 79; Nadeau, R., Ref. 57. Keep in mind that these populations were subject to drastic change over a very short period of time due to the "rushing" of the miners to new locations. A complete discussion of population estimates through immigration reports, election returns, and census reports will be found in Langley and Matthews (1859), *The state register and yearbook of facts of 1857*. San Francisco. Pp. 119–122, 184–189.
100. Ferguson, C. (1924), *The experiences of a forty-niner during a third of a century in the gold fields*. Chicago: M. Carson. P. 98.
101. Sioli. See Ref. 56, p. 84.
102. Kelly, W. (1000), *Excursion to California*. London: Chapman and Hall. Pp. 24–25.
103. Carson, J. H. See Ref. 87, p. 18.
104. Gerstaecker, F. (1946), *California gold mines*. Oakland: Biobooks, Pp. 58–86; Unbound documents, Bancroft Library, No. 50, "Letter from Willow Bar"; Mansfield, G. (1929), *The Feather River in 1849 and 1850's*. p. 10; Canfield, C. L. (1920), *The diary of a forty-niner*. New York: Houghton Mifflin. Pp. 42, 43–44; Hittell, T., Ref. 44, pp. 96–97; Colton, W., Ref. 24, p. 287; Hanson, G. (1924), *The early history of the Yuba River Valley*. Thesis. Berkeley. Pp. 73, 84; Adams, D. (1924), *Life in the mining camps of the Yuba River Valley*. Thesis. Berkeley. P. 56;

Joy, E. *Chili Gulch*. M. S. Bancroft Library. P. 6; Martinez, T., and Drummond, F., Ref. 36, pp. 4–5; Bancroft, H. H., Ref. 34, pp. 237–239.

105. Shinn, C. See Ref. 88, pp. 160–162.
106. Shinn, C. See Ref. 88, pp. 161–162.
107. Howe, O. T. See Ref. 96, p. 139; Shinn, C. (1884), *Land laws of mining districts*. Johns Hopkins University. P. 557; Martinez, T., and Drummond, F., Ref. 36, p. 13.
108. For some spectacular accounts of these fires which destroyed nearly every mining camp, see Mansfield, Ref. 82, p. 66; Reed, G. W., Ref. 52, p. 133; Thompson and West, Ref. 55, pp. 210, 230, 233; Shinn, C., Ref. 88, p. 160; Jackson, Ref. 56, pp. 66–67, 71, 75–76, 83–84, 92; Bean, E., Ref. 34, pp. 81, 87, 89, 93, 401; Paul, R. W., Ref. 38, pp. 75–78. In fact, Dutch Flat has the distinction of being the only mining town which did not burn down at least once. Browne, J. R. (1868), *Report on the mineral resources of the states and territories west of the Rocky Mountains*. Washington, D.C.: Government Printing. p. 105.
109. Shinn, C. See Ref. 107, p. 558.
110. Shinn, C. See Ref. 107, p. 559.
111. Howe, O. T. See Ref. 96, p. 139. These results were at the "dry diggings" in 1849.
112. Farriss and Smith. See Ref. 88, p. 287.
113. For the location of these contracts see Umbeck, J., Ref. 5, appendix. There were estimated to be about 500 districts formed during the rush. My sample of contracts represents about 40%.
114. Shinn, C. See Ref. 107, p. 557.
115. Sioli. See Ref. 56, pp. 99–100.
116. Drummond, F., and Martinez, T. (1936), *The popular and legal tribunals of Tuolumne County, 1849–1867*. Berkeley. This work contains a large selection of court cases gathered from the county archives. Also Bancroft, H. H., Ref. 34, pp. 582–657; Borthwick, J. D., Ref. 88, p. 153; Royce, J., Ref. 28, pp. 313–344; Sioli, Ref. 56, p. 186; Bancroft, H. H., Ref. 14, pp. 433–434; Hittell, T., Ref. 44, pp. 272–309; Marryatt, F., Ref. 92, p. 124.
117. For examples of the transfers of rights to work a claim, see Bean, E., Ref. 34, p. 359; Jackson. Ref. 56, pp. 183–184; Bloom, H. S. *Tales of the pioneers of the Kankakee*. M. S. Bancroft Library. Pp. 77, 84, 88, 90; Thompson and West. Ref. 55, p. 205; Angel, M., Ref. 36, p. 229; Coy, O. C., Ref. 79, p. 74; Hittell, T., Ref. 44, pp. 198, 257–260; Bancroft, H. H. Ref. 14, pp. 258, 297, 398. With the possibility of selling a claim came the opportunities for fraud. Reports are given where a miner, finding a claim to be lacking gold, would "salt" his mine. This amounted to placing gold (nuggets and dust) in his claim and then offering it for sale at a high price. Potential buyers would pan out some dirt and find the hidden gold, thus leading them to believe that the claim was very rich. Sometimes, the seller, in order to achieve a more "natural" distribution of "salted" gold, would put gold dust in a shotgun shell and fire it into the dirt. Some accounts of salting and its consequences are given in Kelley, W., Ref. 102, pp. 35–36; Hittell, T., Ref. 44, p. 198.
118. Paul, R. W. See Ref. 38, p. 234. This is not a perfectly clean test, however. There was a catch to the patent. By state law, private property was taxable while public lands were not. In acquiring a patent, the miner was converting his mine, previously on public property, into private taxable property. These figures only indicate that the additional guarantee of exclusive rights granted by the government was not worth the extra tax bill. This tax ranged from 3–4½% of assessed valuation. See Browne, J. R., Ref. 108, pp. 13–14.
119. Clark, William B. (1970), *Gold Districts of California*. Bulletin 193, San Francisco: California Division of Mines and Geology. For a further discussion of the problems in estimating these gold yields, see Paul, R. W., Ref. 38, pp. 345–348.
120. Browne, J. R. See Ref. 108, pp. 15–179.