THE DEBRIS QUESTION.

SUMMARY OF COL. MENDELL'S REPORT TO THE GOVERNMENT.

What is Threatened—What Should be Done—What it Will Cost to Do It—Statistics.

The following is a summary of the report of Colonel G. H. Mendell, of the United States Engineer Corps, made to the Secretary of War, and transmitted recently to Congress.

The report is dated January 26, 1882, and was made in accordance with the following clause in the river and harbor Act of 1880, viz: "The Secretary of War is hereby directed to cause to be made such examination and survey as may be necessary to devise a system of works to prevent the further injury to the navigable waters of California from the debris from the mines, and the estimates of the cost of such works, and report the result of such examination, survey and estimates of cost of proposed works, made in pursuance hereof, to Congress at its next session."

SURVEYS.

The surveys and examinations on which the report is based extended from the Tuolumne river on the south to the Feather river on the north. As neither the Trinity nor Klamath rivers are navigable streams they were not considered within the scope of the inquiry, although a large amount of mining debris is dumped into their beds.

Careful studies and detailed surveys were made of the Yuba, Bear and American rivers, on which streams it is proposed to build restraining bars or dams.

DESCRIPTION OF MINING FIELD.

The auriferous drift deposits extend from the Merced river to Chico creek along the western slope of the Sierra, a distance of 150 miles, and also found across the coast range on the Klamath and Trinity rivers. They extend in elevation from the plains to 4,000 or 5,000 feet above sea level. They are in many places covered by a volcanic overflow—either basalt or tufaceous ashes—and have been, in very many places, cut through by the mountain streams. These modern streams are some times from 1,000 to 2,500 feet below the ancient channels, and to this fact is due the possibility of working the mines to advantage by hydraulic process.

The material found in these ancient river beds is generally heavy at the bottom—consisting of bowlders, large gravel and sand, firmly cemented together and requiring the disintegrating action of powder—getting finer and finer with increasing hight, and with frequent beds of clay-pipe and sand in the upper deposits. The depth of material is often from 150 to 200 feet. The accepted theory now is that these rivers were filled with detritus brought down by their own currents.

Where the gold is concentrated near the bed-rock the mine is worked by the drift process, but generally, however, the pay is not concentrated, but diffused throughout the gravel in increasing proportions, from top to bottom, and the only way, in this general case, to get the gold is by the so-called hydraulic mining. For this it is necessary that there should be dumping facilities, a supply of water, and that the gravel should not be covered too deeply with volcanic drift.

HYDRAULIC MINING INDUSTRY.

In a certain sense all mining is hydraulic, as water is indispensable for the separation of the gold in all the processes of mining. What is now known technically as hydraulic mining is the use of water in large quantities under pressure against the gravel banks, which, with the aid of powder and labor, does the excavating and also transports the material washed to the dumps. The comparatively moderate amount of human labor required is the secret of the cheapness of this kind of mining.

The excavating power of the large streams of water now often in use is generally largely in excess of the transporting capacity of the sluice, and hence the grade of the sluice is the most important factor, so far as the amount of material removed is concerned.

The duty of a miner's inch (one miner's inch for twenty-four hours equals about 2,250 cubic feet of water) varies according to differences in sluice-grades and character of material, being much greater in light surface gravel than in the bottom heavy material.

According to the State Engineer, the amount of material moved each year on the waters of the Sacramento river is shown by the following table:

Stream.	Miner's inches for 24 hrs.	Duty of each inch.	Am't moved in cub. yds.
Dry creek, etc...	901,479	3½	3,133,662
Feather river....	1,259,363	3½	4,407,770
Yuba river.....	5,458,171	3½	19,103,598
Bear river.....	1,117,682	3	3,351,246
American river..	1,914,509	4½	8,615,250
Total.....	10,650,595	....	38,610,926

From the Cosumnes to the Tuolumne, in the San Joaquin drainage, it is estimated that 3,384,370 miner's inches are annually used, resulting in the washing away of 7,414,465 cubic yards of material.

The successful development of these mines requires deep bed-rock tunnels and long canals with large storage reservoirs. The extent and boldness of these engineering works are calculated to excite surprise and admiration. One of these tunnels alone cost $500,000. The mining canals in the State aggregate over 6,000 miles in length. The storage reservoirs on the waters of the Sacramento have a united capacity of 7,600 million cubic feet of water (57,000 million gallons).

The total amount of capital invested in the California mines is estimated at $160,000,000, of which $100,000,000 is invested in the hydraulic mining industry. These estimates are, of course, generalizations, and may, as to the hydraulic mines, be excessive. A detailed list, however, of the expenditures of nine hydraulic companies shows a capital investment by them of $16,283,434 77, and which gives an idea of the magnitude of the industry.

In seventeen counties of the State mining is the principal industry, and in some of them, such as Nevada and Trinity, it is the basis for all industries, in the sense that if it did not exist the population would mainly disappear.

The gold and silver product of California from 1848 to December 31, 1881, has been about $1,178,000,000, of which much the greater portion has been derived either from the direct washings by man of the ancient river channels, or from the deposits in the modern streams, which received their gold from the natural erosions of these ancient channels. It is reasonable to be supposed that hundreds of millions of dollars yet remain untouched in these pliocene channels.

The annual product of the precious metals for the past two years in the State has varied from eighteen to twenty million dollars. Of this, earth washings probably produce about ten millions per annum, although Professor Whitney, in his last work, places the larger estimate of $12,000,000 to $14,000,000 per annum. For 1881, the product from the gravel mines on the San Juan Ridge, Nevada county, was $1,705,019, although three of the leading mines were closed, by injunction from Judge Keyser, for the best months of the year. Had these mines worked continuously, the product for the year for this ridge would have probably been $2,000,000.

The yield of gold per cubic yard in the mines varies greatly, it being practicable to work light surface gravel only paying four and three-fourths cents per cubic yard; the lower heavy gravel must give a much larger yield to be profitable. The yield per cubic yard in a large number of mines ranges from a few cents up to $1 50.

QUARTZ, DRIFT AND RIVER MINING.

Quartz, drift and river mining contribute a considerable quantity of detritus, none of which can be expected to remain where discharged from the mines. The product of the quartz mill is impalpable sand; the drift miner leaves the bowlders in the mine and brings out only the gravel; the Chinese river miners quite extensively disturb the beds of the rivers in low stages, which, though it makes no addition to the amount of gravel in the river bed, disturbs the equilibrium and facilitates the movement down stream. These causes contribute, in a sensible degree, to the evils due to mining.

Professor Price estimates that the quartz mills contribute one million cubic yards per annum of powdered sand. It is also stated that one drift mine contributes 100,000 yards per annum.

LITIGATION BETWEEN FARMERS AND MINERS.

The miners on Bear river were enjoined by Judge Keyser in the case of Keyes vs. Little York et al., from fouling or corrupting the waters of the stream. Among the defendants in this suit were several drift miners. This decision was overruled by the Supreme Court on a technical point.

The distinctions between different kinds of mining, so far as they relate to the beds of water-courses as places of deposit, are distinctions of degree, and not of principle. As practiced at present, they all foul the waters of the streams. The impalpable sand products of quartz mines are borne by currents with the greatest facility, and are deposited in places where currents are reduced to little or nothing. The detritus from the drift mines is smaller in size than that from the hydraulic mines.

To what extent mining can be prosecuted under the conditions expressed in this decree, remains to be seen. Quartz tailings may to some extent be impounded in reservoirs; with drift tailings it would be more difficult. Hydraulic mining could not be carried on under such a decree.

NATURAL WASHINGS.

The valleys of the Po and Sacramento resemble each other greatly, being about the same size and having similar chains of mountains on either side. According to Guikis the times required by various rivers, acting through natural agencies, to remove an average thickness of one foot of rock from their drainage areas, is as follows:

Rivers.	Years.
Danube	6,846
Mississippi	6,000
Ganges	2,358
Po	729

Applying the Mississippi rate of erosion to the Sacramento, there would result 5,592,110 cubic yards of material of 1.9 specific gravity each year. Applying the Po rate, there would be 43,000,000 yards per year, and with the Ganges rate, 13,200,000 yards, as the washings from the natural degradation of the Sacramento valley. The rate of denudation may be roughly stated on the Sacramento as being more than that on the Mississippi and less than that on the Po.

Applying the Po rate of denudation to the basin of the Yuba, Bear and American rivers (3,520 square miles of area), there results 6,000,000 cubic yards wash per annum, while the mining denudation of these basins is about 31,000,000 cubic yards.

This shows that continued accumulations in the river beds occur because mining operations contribute more material than the floods can transport, and that if mining were to cease now, the floods being able to transport considerably more material than that due to natural erosion, would then be in a condition to attack deposits in the beds, which are comparatively safe so long as the floods are overloaded as they now are.

CHANGES IN NAVIGABLE WATERS.

The low-water mark at Sacramento in 1880 was 7½ and in 1881 6½ feet above that of 1849. Making allowances for differences in rainfall and reservoir supply of water from the mines, it is probable that the low-water plane has been raised some six feet since 1849. The bed of the Feather river has been raised 15 feet at Marysville and 5 feet at its mouth. This increase in the low-water grades of these streams adds to their transporting power.

The steady increase in the low-water plane at Sacramento indicates that the relation now existing between slope and sediments is not that of a stable equilibrium, and for the present we must look for an increase of slope.

This elevation of the river bed is not accompanied by an equal increase in the hight of the banks, and hence the abandonment of existing channels is a consequence to be apprehended. On the Yuba and Bear rivers, the beds are now higher than the adjoining country.

A careful comparison of official charts shows that from 1855 to 1873 San Francisco bar had suffered no injury; that the ship channel in San Pablo Bay from 1855 to 1878 had narrowed about one-fifth, the ruling depth of water remaining unchanged in 1878; that a deposit of 2,000,000 yards had been made in the lower three and one-half miles of the Sacramento, and 500,000 yards in the San Joaquin from 1867 to 1878; that the shoals in Suisun Bay have increased since 1867, and that deposits have in recent years been made in Carquinez Strait.

DEPOSITS OF DETRITUS IN YUBA, ETC.

Near the mines, main Bear river has been filled some 150 feet in depth, Steep Hollow 250 feet, and Greenhorn creek 200 feet. In 1878 it was estimated that there were deposited in Bear river and its tributaries 122,000,000 cubic yards.

In 1879 Mr. Manson estimated 72,000,000 cubic yards in the Yuba (not including the much larger amounts in the various tributaries of the Yuba).

On the lower Yuba, with a grade of ten feet per mile, sands greatly predominate; with grades of twenty to thirty feet per mile, the great deposits of gravel are found; on grades of over forty feet to the mile, the canyons are generally clear of material, except that of considerable size.

As to the American river Mr. Manson reports to me that the North Fork now contains from twenty to twenty-five million cubic yards from above its junction with the Middle Fork, with a maximum depth of say 100 feet; the grade in which this material finds lodgment is forty-six feet per mile at the upper end, and twenty-three feet per mile at the lower part; after the two Forks join, the volume of flood water is so great as to prevent large deposits. The debris washed from the mines on the South Fork forms an excellent soil, as is shown by intentional deposits of it for agricultural purposes; from the mouth of the canyon to the Sacramento river some 6,000 acres of land have been covered, and the river bed raised from five to thirty feet.

The State Engineer estimated in 1880 that 15,220 acres of land on the Yuba had been seriously injured by these deposits.

The question of damage to lands, however, does not come under the scope of this investigation.

Generally, when the detritus consists in part of heavy cobbles or larger stones, it is supposed to be moved slowly; it thus forms a barrier which serves to impound above it a mass of gravel which otherwise would have traveled further down the stream.

GRAVEL WORKABLE BY THE HYDRAULIC PROCESS.

The quantity of auriferous gravel on the slopes of the Sierra is practically unlimited, but only a comparatively small portion of the whole deposit can be worked by hydraulic method, by reason either of lack of fall, capping by volcanic drift, or poverty of the gravel. An inspection of the mines tributary to the North Fork of the American (including Forest Hill) shows that they contain a workable gravel about 75,000,000 cubic yards, of which about 20,000,000 yards are at Gold Run.

On Bear River there remains about 50,000,000 yards. On the Yuba they may be assumed at 700,000,000. On the upper Feather the miners find natural storage for their detritus; on the lower Feather, near Oroville, there seems to be no practical method of storing the debris.

On the Cosumnes and other southern rivers there are considerable amounts of gravel, but information at hand is not sufficient to warrant positive estimates. The aggregate amount of gravel not subject to the hydraulic processes, but which can be worked by drifting, must be considerable, and, as wages become cheaper, promises to take great proportions and to continue for several generations.

REMEDIAL MEASURES.

It might be possible to deposit the debris in the low tule basins of the Sacramento. This, however, would require the diversion of the rivers. The cost would be great, and it must also be remembered that the mining streams are generally not able to carry all the debris placed in them, and hence their beds, where inclosed by high banks, are rising year by year, and where there are no banks their beds are being obliterated. For the present this plan of relief, on account of these considerations, must be deferred.

Restraint in the mining streams themselves is the first and essential step for relief, not only for debris coming in the future from the mines, but also to hold back the many millions of cubic yards already deposited in the Yuba, Bear and American, and which is gradually making its way toward the Feather and Sacramento.

Stone dams or barriers can be placed in these mountain streams, which can be illustrated by a description of the one proposed for the Yuba. The location is at the mouth of Deer creek, near Smartsville, with high rocky banks, river bed 270 feet wide; the dam will be formed of heavy rubble-stone, blown from the adjoining cliffs, with a slope of 4 to 1 on the lower side, and 1 to 1 on the upper side; the stone on the lower side will be of large size, and placed in steps to diminish danger from the floods; the dam will first be built 75 feet in hight, and is calculated to hold back about 30,000,000 cubic yards.

These dams are not intended to be water tight, and being unable to store water, it is impossible to conceive them, in the event of breach, as capable of inflicting disaster upon riparian inhabitants below. Nor could a breach cause an unusual flow to any great distance of detritus in a given flood, for the reason already established, that floods are now fully loaded with all the material they are able to carry. The result of a breach, however serious, could therefore be only to restore conditions now existing. Moreover, it is impossible to conceive sudden and wholesale disaster overtaking one of these structures. They may settle, and their usefulness may be impaired, but being simply a mass of large rubble stone without bond, disaster cannot take great proportion, or be an element of sudden danger to persons or property.

As the beds in these mountain streams are widened by the deposits of debris held back by the dams, the depth of water, and hence the current in the river, will be considerably diminished, thus allowing lighter and finer sediment to be deposited.

It cannot be claimed for this method, however, that it will fully retain the finer particles of sand and clay carried in suspension, and which would require settling basins to insure their deposit.

It is also proposed the first year to fully restore the brush dams built by the State on the Bear and Yuba rivers, and the next year to protect these structures by stone, it being thought necessary to do this for the protection of Marysville and the neighboring lands from the large amount of sand and gravel already in place, and which now threatens Marysville and the navigable streams.

THE COST OF RELIEF.

The plans of relief for the Yuba will involve the expenditure of $325,000 the first year, and $810,000 for the next nine years, providing a total storage of 194,000,000 cubic yards; on the Bear the expenditure of $89,100 for the first year, and $124,400 for the next seven years, providing storage for 42,000,000 yards; on the American the expenditure of $106,500 the first year, $70,700 for the next six years, providing storage for 42,000,000 yards.

The total cost for the first year will be $511,600, and for ten years, in all, $1,516,700.

The total storage provided will be 278,000,000 cubic yards, and the cost, therefor, of storing each cubic yard, about one-half a cent.

MEN OF THE HOUR.

"Some are born great, some achieve greatness, and some have greatness thrust upon them."—[SHAKESPEARE.

GEN. WM. S. ROSECRANS,

OF CALIFORNIA.

General Rosecrans is an "Ohio man" by birth, having been born at Kingston, in that State, September 6, 1819. He was educated at the West Point Military Academy, where he graduated in 1842 and after service as lieutenant in the Engineer Corps, he returned in 1844 as assistant Professor for three years. For the next five years he had charge of the fortifications at Newport, and in 1853 he resigned from the army. When the war broke out he joined the Union army, being commissioned Colonel in June, 1861, and promoted to Brigadier-General in the regular army before the close of the year for his gallant services in West Virginia as second in command to McClellan. He was soon made commander of the Department of Ohio. In 1862 he succeeded Pope as commander of the Army of the Mississippi, was commissioned as Major-General of volunteers, and won the battle of Iuka. In October he was made commander of the Department of the Cumberland, won the battle of Stone River, and met the crisis of his military career at Chickamauga in September, 1863 after which he was relieved of his command, and held no very responsible position during the remainder of the war. In 1867, General Rosecrans resigned his Brigadier-General's commission and removed to California. In 1880, he sought a nomination for Congress, succeeded, and was elected.

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Delinquent Notice.—Great Crevice Mining Company. Principal place of business, Sacramento city. There is delinquent upon the following described stock, on account of assessment levied on the 6th day of MARCH, 1882, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shs.	Amt.
Booth & Tibbals	35	5	$2 50
I. L. Merrell	118	20	10 00
C. G. Hidden	132	8	4 00
C. G. Hidden	141	55	27 50
Joseph Beebe	155	13	6 50
Tubbs & Co	04	6	3 00
John Hogan	182	20	10 00
L. T. Smith	154	5	2 50
L. T. Smith	185	5	2 50

And in accordance with law and an order of the Board of Directors, made on the 8th day of APRIL, 1882, so many shares of each parcel of such stock as may be necessary will be sold at the store of SHERBURN & SMITH, No. 323 K street, on the 25th day of APRIL, 1882, at 2 P. M. of such day, to pay delinquent assessment thereon, together with cost of advertising and expense of the sale. NELSON WILCOX, Secretary.
Office, No. 629 M street. a11-1d

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LEGAL NOTICES.

REREGISTRATION.

WHEREAS, BY AN ORDER OF THE BOARD of Supervisors of Sacramento county, made in conformity with Section 1094 of the Political Code, and entered of record on the 9th day of December, 1881, canceling all names then on the Great Register of said county, and requiring a reregistration of the voters therein, all persons entitled to be registered as voters in said county are hereby notified to present themselves at the office of the County Clerk, in the Court-house at the city of Sacramento, for such registration.
Sacramento, December 10, 1881.
THOMAS H. BERKEY,
d10 tf County Clerk.

ADMINISTRATRIX' SALE.

NOTICE IS HEREBY GIVEN THAT IN PURsuance of an order of the Superior Court of the county of Lake and State of California, made on the third day of April, A. D. 1882, in the matter of the estate of AUGUST HEISCH, deceased, the undersigned, the administratrix of said estate, will sell at private sale to the highest bidder, for cash, in gold coin of the United States, and subject to confirmation by said Superior Court, on or after MONDAY, the 15th day of MAY, 1882, all the right, title, interest and estate of the said August Heisch, deceased, at the time of his death, and all the right, title and interest that the said estate has, by operation of law or otherwise, acquired, other than or in addition to that of said intestate at the time of his death, in and to all that certain lot, piece or parcel of land lying and being in the city of Sacramento, county of Sacramento and State of California, bounded and described as follows, to wit: The east (100) one hundred feet of lot number (8) eight in block or square bounded by M and N and First and Second streets, as shown and described by the map or plat of said city now on file in the County Recorder's office of said county of Sacramento. Terms and conditions of sale: Cash in gold coin of the United States; deed at the expense of purchaser. Bids or offers may be made at any time after the first publication of this notice, and before the making of the sale. All bids or offers must be in writing, and left at the office of Woods, Crawford, attorney at law, Lakeport, Lake county, California, or be delivered to the undersigned personally, at her residence at Heisch's Springs, in said county of Lake.
Dated this 5th day of April, 1882.
CAROLINE HEISCH,
Administratrix of the estate of August Heisch, dec'd.
a8-td

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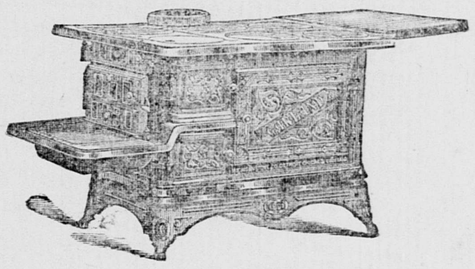

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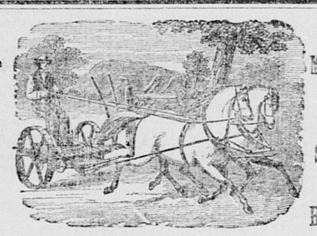

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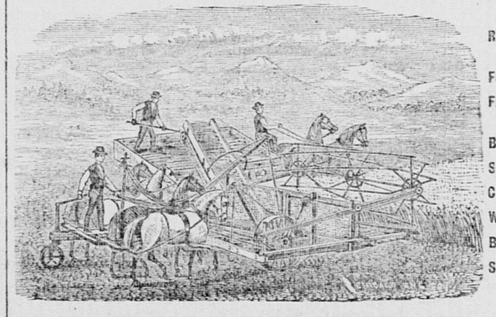

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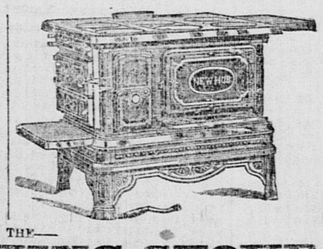

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