REBUILDING OF SAN FRANCISCO

TOLD IN FIGURES

BY BARTON W. CURRIE

HAVE you ever during your leisure moments considered what vast amount of money, energy and material will be demanded in the reconstruction of the fire devastated section of San Francisco?

Few have probably, and those few perhaps have not come anywhere near the great figures which evolve themselves out of this herculean undertaking. The bricks alone that will go into the rebuilding of the burned district, if set end to end or strung together like an interminable necklace, would wrap around the world thirty times and leave a lap-over greater in length than any transatlantic cable. If put into a wall of a single brick's thickness and five feet high the latter would girdle the earth.

This is not a mere random speculation, nor a bit of idle assumption based upon figures obtained in a dreamy speculation. It is based upon estimates as certain as the confidence of San Franciscans in the future greatness of the city, no matter what angle of view they have of the mammoth undertaking of rebuilding.

Considering the situation casually, it does not seem so great a task to cover four square miles of ruins with splendid metropolitan buildings when we view in our minds the great territories built upon by other cities of the world. In the days of modern engineering marvels we have come to look upon huge construction projects as merely a matter of the wherewithal to build.

But to go over the matter in great detail with building experts, engineers of great building organizations, architects and other professional men soon leads the way into staggering mathematics, especially the figuring necessary to estimate the material that will go into the construction of 17,000 buildings of the permanent type that in a few years will cover the burned area of San Francisco.

I went over the subject of the material that the new city will absorb with the engineers of the different departments in these organizations and was soon enabled to reach some startling conclusions, or, rather, sum totals in brick, timber, stone, cement, steel, cast iron, window glass and other building material that will be used during the reconstruction period.

Eight hundred thousand miles of brick! More than one million and a half miles of lumber!

In order to reach such stupendous approximations a four-story brick building 44 feet wide and 110 deep was taken as a standard. Of course there will be hundreds of greater brick buildings, but there will also be a great number of smaller ones. In the greater city, then, using the above standard as a basis of calculation, there should be at least 12,000 brick buildings.

To return to the standard four-story brick building, there would be used in its construction 548,000 bricks. Then in 12,000 such buildings the walls would consume 6,576,000,000 bricks. By actual measurement I found that the brick manufactured in this city is seven and one-half inches long. By a simple multiplication we find that we must use 49,320,000,000 inches of brick, or about 778,400 miles—more than thirty times the distance around the globe.

A brick weighs about five or six pounds and in a usual haul there are in the vicinity of 500 bricks to a load. It is difficult to realize that we are going to cover the debris scarred city with 6,576,000,000 bricks and that we will need 13,154,000 teams to do the hauling, figuratively speaking, of course, for the hauling will extend through a period of years. With two horses to every brick cart 26,308,000 equines will be brought into requisition, or it might be better to say that if the hauling was to be done all at once that vast number of animals would be required.

Each wagon and team covers or extends along fifteen feet of ground, and if more than thirteen million teams were strung out in line, the noses of the horses touching the tailboards of the wagons, the brick train would be 12,456 miles long. Such a train of wagons would reach from Vladivostok to Paris, along the trail of the Trans-Siberian Railroad to Moscow, thence by devious routes to the French capital; and with 1000 miles of horses and wagons overflowing into other corners of Europe. Such a procession of wagons would extend four times across the North American continent, or from Greenland to Cape Horn, yet they would only be carrying the bricks that will go into the rebuilding operations of San Francisco.

At the present time the only brick works in operation in this city have a capacity of 100,000 bricks a day, so that if the rebuilders had to depend on this single plant it would take 65,760 days to bake all the bricks needed, or 180 years. Fortunately other sources of supply will arise to meet the demand. Then it will be possible to use a billion or so of bricks that are now in the ruins.

To revert to interesting speculations (and they should afford good illustrations of the heroic feat the rebuilders will accomplish) a husky hod carrier can tote about twenty bricks up to the bricklayer "who has to do all the work." Twenty bricks is rather the maximum than the minimum, for it is not the custom of the craft to romp under such a burden. But taking the limit of 20, something like 328,000,000 hod carriers would be in demand if the carrying was to be done all at one time. This is about twice as many as the adult male population of China.

Were these 328,000,000 hod carriers to march in single file, allowing a comfortable five feet to a man, the procession would extend more than fourteen times around the globe, or once around if the army marched 15 abreast.

But in building with brick nowadays patent scaffolds are used, which relieve the toil of both hod carriers and bricklayers. With these scaffolds it is possible to erect a great brick building in a minimum of time. By using such a scaffold a brick building can be raised at the rate of a story a day, making it possible to lay about 100,000 bricks a day in one building operation.

When the permanent building is well under way in San Francisco more than a million bricks will be laid a day, insuring the employment of a great army of bricklayers, though of course this cannot be accepted as an average, for rain and other delays must be taken into consideration.

The bricks that will go into the building operations that this city will project and complete in the next five years would make a wall five feet high and six inches thick for a huge inclosure extending from San Francisco to Chicago, and it would build a chimney that would pierce the sky a thousand miles. Leaving bricks and coming to concrete, it is estimated that if concrete foundations were laid for all the buildings to be erected in the Greater San Francisco that more than 4,000,000 cubic yards of the material would be needed. A building 44x110 feet requires a footing of about 300 yards of concrete, and a yard of the material weighs at least a ton and a third. A team of horses could draw about two yards of the crushed stone with which concrete is made, so that 2,000,000 teams would be needed to draw 4,000,000 yards. The cost of 4,000,000 yards of concrete is about $30,000,000. But this is only considering foundation work. If—and the indications point all that way—there is going to be a great deal of reinforced concrete construction a vast amount of manufactured stone will be used; so great an amount that no engineer I could find in the city would even attempt to approximate it, though experts in reinforced concrete can compute with amazing expedition how much material will go into the construction of a huge building.

Then there are about 500 miles of sidewalks to be rebuilt. If laid with concrete one foot deep and nine feet wide the sidewalks would use 2,540,000 yards of co[illegible]te, as there are 2,540,000 feet i[illegible] miles, and a cubic yard of concre[illegible]d go into a pavement one fe[illegible]e foot deep and nine feet in

Altogethe[illegible] estimates on pr[illegible]forced concrete buildings, about 7,000,000 yards of concrete will be swallowed up in the reconstruction work. This is enough artificial stone to make a nine foot by one foot path 1325 miles long. Laid at a depth of only four inches the path would extend from the Pacific Coast to New Work, and thence to Boston and Montreal. What a glorious automobile speedway!

The deeper we delve into such a profundity of figures the better idea we obtain of the magnitude of the damage done by the fire, and of the hugeness of the task which is being undertaken with such splendid courage.

There are only two stone quarries, equipped with crushing plants, in operation in San Francisco County at the present time. One is at Thirtieth street and the other at Telegraph Hill. The present capacity of these quarries is less than 1000 yards a day. At least 3,000,000 yards of stone will be used in the rebuilding, a quantity that the city quarries, running at twice their present capacity, could not turn out in five years. But this stone will also be needed for macadam roads, for the beds of railroads and for many other purposes. There is no wonder then that every available quarry within a radius of 100 miles of San Francisco that can establish a connection with a spur of railroad track or with tidewater is being put in commission for unceasing activity for years to come.

The lumbermen in the north are looking down upon the widespread ruin of San Francisco with a degree of glee. Within the past ten weeks 20,000,000 feet of lumber have been shipped to the city merely for temporary building. Now, when you consider that in one building such as the eight-story reinforced concrete office structure being built for the Boyd estate at Drumm and California streets 500,000 feet of lumber will be consumed, some conception of the vastness of the future's demand may be had. In concrete buildings much of the lumber required is used for the construction of forms for the concrete. The remainder goes into the interior finishing of the building.

Before work is begun on any structure, whether a huge class A building or a one-story shack, the architect or structural engineer estimates just how many feet of lumber will be needed for scaffolding, foundation work, shoring, finishing or any other purpose.

I asked one of a staff of constructing engineers to estimate for me how much lumber would be absorbed in the reconstruction of San Francisco. He flung up his hands and said that he might as well try to figure what would be the income of John D. Rockefeller III if he lived to be 100 years old and became absolute heir to all the oil king's wealth.

Conditions vary in the construction of every building. More than 1000 piles must be driven to support the foundations of some structures, whereas in others, even with water to encounter, the footing can be designed after the manner of a concrete raft or cradle. Think of 10,000 or even 5000 buildings requiring 1000 piles each to support them! This would mean 5,000,000 tree trunks with all their enormous area of shade swept from the face of the land and hammered into the depths of the earth, you might say, in one fell swoop of the ax. What a waste such a timber felling as that would leave!

But a new factor has recently come into the structural world that it is hoped will supplant the wooden pile. This is the concrete pile. With lumber boosted 50 per cent higher than it was a year ago (and prices are still rising) the concrete pile may solve a serious problem of a possible lumber shortage. Wharves and quays can be built with these piles that the teredo would attack in vain. Liverpool has splendid granite piers and other European cities have their handsome stone quays. Then why shall not the Golden Gate to the Pacific have her concrete docks defying the insidious little auger-mouthed worm and lasting for ages?

Going back to the prospective lumber consumption in the new city, I figured the thing out at length with several engineers and reached the staggering total of 10,000,000,000 feet. Ten billion feet is 1,893,939 miles. You could almost build a tower to the stars with such a stupendous pile of lumber. It would circle the globe 78 times and build a tidy footpath 25 times around the earth. It would also make a tall stockade to girdle the earth with. Fifty times as much lumber would reach to the moon, if, as some textbooks say, her lunarship is only 90,000,000 miles away.

Figuring with the engineers on the four-story brick building, I assumed for a standard the estimate for cement is one barrel for each thousand bricks laid in the walls, or 548 barrels of cement for 548,000 bricks. In the construction of ten thousand such buildings the consumption of cement would be 5,480,000 barrels. A barrel of cement is used for every yard of concrete in the foundation footings, and with 300 yards of concrete in the foundations there would be required for the entire building 848 barrels of cement. Of course, there is no way of estimating now what number of buildings will require new foundation footings, or any sort of cement support, but it is pretty safe to say that at least 1,000,000 barrels will be used for this purpose, making a total of 6,500,000 barrels. Then we must take into consideration the great number of reinforced concrete buildings that will go up in San Francisco. An average of 4000 or 5000 barrels of cement to a concrete building is a fair estimate, say the engineers.

No doubt Greater San Francisco will be able to show the world at least 2000 or 3000 reinforced concrete buildings, for the city is not merely going to regain her former size, but expand enormously. Then this would mean 12,000,000 barrels of cement for superstructural concrete work. In the aggregate then the rebuilding city will devour 18,500,000 barrels of cement. This is more than the entire production of cement in the United States a few years ago, though in 1904 the country produced 26,505,881 barrels.

But think of San Francisco rising from the most awful calamity in history, about to use in the span of a few years as much cement as 90,000,000 building people consumed in a year!

A good quarry of lime rock with which to manufacture a high grade of cement would be a mine of wealth in California for the next ten years. Dozens of prospectors are out hunting for good California lime rock, and this means the development of a great industry for the State. The disaster to this city will undoubtedly have done much toward the development of the resources of California in the manufacture of building materials before the city has been rebuilt. The demand for cement in this country under normal conditions so far exceeds the supply that vast quantities of it are imported. A fleet of a score of vessels (steam and windjammers) is on its way to San Francisco now, carrying many thousand barrels of cement. It is estimated that between $35,000,000 and $40,000,000 worth of cement will go into the rebuilding of the city, and that which goes into reinforced concrete, say the members of the Structural Association, cannot be shaken or burned down.

Should 18,500,000 barrels of cement be stretched out in a straight line, allowing 4 feet for each barrel, they would extent more than 14,000 miles. Stood one upon the other (each barrel is more than 3 feet high) they would rise into the circumambient more than 12,000 miles. There are about fifteen staves to a cement barrel, and were these laid out in a strip the width of a stave they would stretch seven times around the world—180,000 miles—and this is practically waste lumber. Think of the glorious bonfires it would make!

"A long session at the mathematics required to estimate all of the building material that will go into the new and Greater San Francisco," said James L. McLaughlin, head of one of the big construction organizations, "would soon tax the stamina of the very best mental fiber. It is simple enough to make estimates for the construction of great manufacturing plants, or even manufacturing towns, when a staff of trained and experienced engineers get down to figuring; but an estimate of the supplies needed for the rebuilding of a metropolis is a far different matter. In the erection of every building you are compelled to face different conditions. There is an ever varying ratio of supply and demand. There is the problem of prices, availability of material, the labor situation and a host of other things to consider when giving estimates on big building operations.

"Take a skyscraper, for instance; there are forty different trades represented in the construction of such a building. Take the item of steel—about 3,000,000 pounds; then there are the millions of brick to be used in such a building, millions of feet of lumber, carloads of nails to nammer the lumber together, carloads of glass to fill the tens of thousands of square feet of windows. Why, if I should sit down to casually figure out estimates on a cityful of sky-piercing buildings I believe I would soon be on the verge of distraction. It requires a staff of experts to figure out even an individual building project on a large scale, as building organizations do these things nowadays with scientific accuracy."

Returning once more to the mass of estimating I have launched into, it ought to be interesting to figure in even the number of doors that will be swung on the hinges of the new San Francisco. The four-story building I have taken for an example is fitted with about twenty-four doors. Therefore 15,000 buildings will carry 360,000 doors. Each door has two knobs, and we get 720,000 doorknobs, more than 1,000,000 pounds of doorknobs, or forty carloads; 360,000 sets of keys. Each door is about seven feet high, so we have 2,520,000 feet of doors or 477 miles. With twenty-one feet of lumber in each door there will be used in San Francisco's new doors 7,560,000 feet of milled lumber, or 1421 miles.

The same sort of building that swings twenty-four doors will absorb about fifty kegs of nails, so the rebuilding city will use in a few years 750,000 kegs of nails. I started out to count the number of nails in a keg, but after getting up to a thousand decided that the effort was superfluous. I began to ponder on the number of blows that would drive so many nails and immediately perceived a sensation of paralysis and pain in my right arm. Then I recalled the sufferings of early married life, when, as an amateur, I hammered down carpets.

Every building has to be plastered, and the average amount of plaster slapped on the walls is about 5000 yards to a structure. Fifteen thousand structures would require the services of the army of plasterers necessary to slap on 75,000,000 yards. Ponder on the boom there is going to be in the lime industry and the millions of yards of sand that will be mixed with it. A good sand bank in San Francisco is going to be a mine.

The window glass manufacturers will reap a rich harvest with about 2600 square feet of windows to a building. Multiplying by the conservative 15,000, it will be seen that San Francisco will provide a market for 39,000,000 square feet of glass. As there are 1,742,336 square feet in a square mile, about twenty square miles of glass will go into the windows of the greater city. This is almost enough glass to cover a township, which is thirty-six square miles. It would blanket an area five times as great as the burned district and provide a vitreous carpet for all of New York's Manhattan Island.

Fully 1,500,000 tons of steel and cast-iron will help to stiffen and gird up the new structures of the city, as vastly more of these metals is used in modern than was in former construction. Eleven hundred millions, or 1,100,000,000 pounds.

"That," said a steel man who had been racing a pen over a pad for an hour, figuring up, "will be going some. It will be going some for us and for hundreds of other manufacturers who make cast-iron beams, rods or structural steel. Just think of the army of blacksmiths that would have been put on the job in the olden days, and how the forges would have rung with the clangor of ten thousand anvils. Of course, now we have mammoth labor-saving and Carnegie making machines to do the greater part of the work for us."

If all this steel and iron the new city is going to use were welded into armor of the sort worn by medieval warriors there would be coats of mail, visored helmets, clanking greaves; in fact, the complete cap-a-pie equipment for an army of 50,000,000 men—more armored warriors than fought in all Europe's wars in dark or brighter ages, more warriors than fell in battle in all the famous wars of the world.

The Ever Elusive Key of a Trunk

She is a very unusual woman who knows where her trunk key is when she's about to start on a journey. Men have many advantages over their sisters, but none greater than that of owning a key-ring.

If a woman had a key-ring, and a chain to carry it on, and a pocket to keep it in she would not be so unpopular with her masculine relatives in the summer time. But she has none of these things.

When she comes home from a trip she puts the key to her trunk carefully in a small box. The small box she places in a large box in the left hand corner of her top bureau drawer.

There comes a time when she needs the small box, and so she takes the key out of it and keeps it in the big box for a while.

Later she needs the large box—to send some caramels away—and she takes her trunk key and places it carefully in some hiding place selected by herself for its obscurity.

Then she prepares to go traveling and at the last minute—the very last minute, when the expressman is at the door—her trunk-key cannot be found.

It is at this moment that her masculine kinfolk revile her whole sex. They ask why woman was made if not to torment the souls of men. They ask why women go traveling, why they don't have pockets, and why they don't remember where they put things, all in one breath.

In the end, these remarks not serving to bring forth the key, the trunk is carried forth, an unlovely thing, tied up with a bit of clothes line to keep its contents from falling out and enraging the expressman.

The owner of the trunk swears to herself that never, never again shall such a contretemps occur; that she will hang on to her key thenceforth and forever as if she had been wedded to it—but, alas for the ways of femininity, she doesn't. The next time she allows herself a trip the key is gone again.

The number of embarrassing situations which have resulted from the mislaying of trunk-keys is legion. Thus there was an American girl who was traveling abroad. She arrived in London when the noon-day sun was shining, and had her lightly strapped trunks placed on top of a cab and taken to the hotel. In front of the hotel a large crowd of new arrivals had gathered, and the igrl, after alighting, turned to watch the cabman take her baggage from the top. He pulled the largest of the boxes toward him and tilted it to take it down, when, presto! open it came and deposited a shower of very long and very heavy black stockings on his head.

It was a terrible moment for that American girl, and after she and the cabman together had picked up her possessions and stuffed them back, the girl decided that she just couldn't stay at that hotel—and she didn't.

The uses of the trunk-key should be sung in song and told in story, but even then, no doubt, women would not learn its value—until she lost hers.

What the Front of Your House Indicates

The front of a house, and, of course, this does not apply to the temporary structures that are now being erected in San Francisco, is found to be indicative of its owner's character. And a revelation of the kind is more particularly evident in dwellings of the severely modest order. From the aspects of a mansion lying in what the house agents would term "a park-like expanse of ground," there is comparatively little to be gleaned. The architecture may be ancient, modern or a medley of anachronistic excrescences; the edge of the drive may be more or less well kept; the shrubberies and hedges may be sternly clipped or allowed to stretch themselves a little at their ease. But so extensive a shelter must necessarily obscure the personality of the owner.

For genuine evidence of individuality, or of the lack of it, those streets which are lined with a succession of the smallest order of villa dwellings should be searched. At first sight the aspect of the rows is utterly monotonous. The color of the bricks, of the roof and of the front doors is uniform throughout. The setting of the windows, the unlovely slant of the roof, and the poise of the squat chimneys is identical in every case. The whole represents an abject badge of servitude to drab-hued convention. The mean quarter of the poorest Italian or Spanish city is heroic by comparison.

In revolt against the decharacterization of poverty, it will illuminate its squalor by flaming blue, red and yellow walls. One almost trembles to think of the effect that one of these would produce in a street that wears the sad livery of struggling respectability. This type of building, moreover, once planted, would seem ineradicable. Fire and premature crumbling may lay it low for a while, but it is wont to spring up again in an even more consistent fashion than that of the phenix. For the latter's reincarnations may well have produced an occasional variety in feathers, but in the case of one of these buildings the prospect of an altered feature is infinitesimal.

But human ingenuity has contrived to insert a touch of individuality into even such unpromising matter as this. It is visible within the lower window that is set by the side of the door. This space, indeed, is all that is available for the display of the inhabitant's taste and whims. The first tenet in the creed of these window decorators demands a table in the center of the exposed area. Indeed, the table is as indispensable to the decorate scheme as a wedding ring to a matron, for it is upon this that the ob'ect which characterizes the houses is placed. It must be admitted that the scope which these latter embrace is reasonably large.

Extending from the worsted mat to the more ambitious globe of gold-fish, it claims a widespread assortment of exhibits. One of the most justly popular of these consists of a plant in its pot. Diversity here is evident in the latter rather than in the former, for the predominance of the geranium among these plants is accentuated to a degree that must lead many to suppose the flower indigenous to windows. It is in these spots, too, that the artificial blossoms of the early Victorian period cluster together in a final struggle against total extinction. Reposing in glass or recklessly exposed to the outer air, the waxen petals cling with wonderful pertinacity to the remnants of a patriarchal existence. It must be admitted that after the passing of a certain number of windows thus decorated the sight of even a moribund fern in its glaring pot that hangs within a bamboo triangle comes with a sense of relief.

The effect of the numerous china ornaments that prevail is sometimes the reverse of that which was intended. The aspect of even a dancing nymph is apt to become sardonic as one regards the prospect upon which the fixed porcelain smile is directed. The large spotted dogs and cats of the same material that gaze outward with a sphinx-like stare fit in far better with the spot. But there is more than this to be seen in the windows of these modest streets. There are ornaments of the marine order—shells culled from some tropical beach, and very occasionally small models of sailing vessels. Curiously enough, perhaps that which demonstrates the least intelligence on behalf of the inmates, is the exhibition of a more or less bulky book. Any literary value that the book might ever have possessed has long ago atrophied into a condition of mere furniture. It is a thing to be dusted, replaced, and dusted again. The opening of its pages has become a crime for which a child would suffer the same penalty as for breaking a waxen flower.

In many houses of the kind it is noticeable that the ornament within, whatever it may be, is supplied with a more or less appropriate foreground, by means of the decoration of the window sill. But this venture, though occasionally altogether successful, is apt to be attended by failure proportionately great. The verve and daring of the attempt, discouraged by smuts, has frequently departed, leaving behind it a tragic aftermath. A miniature fence will show its small bars, wrecked and in disorder. The cork veneer of an oblong flower-box will gape at intervals to reveal the uncompromising tin beneath, while the earth within, gray and depressed, has long become oblivious of the power to feed even the most ascetic of weeds. There are numerous other methods, of course, by which the window-sill may be adorned or marred, as the case may be, although the scope is not so large as that which the space behind the panes permits. So far as the house-front is concerned, all possibilities would seem to begin and end in this region. The sight of a trellis-work porch alone would be sufficient to stigmatize the dwelling that owned it as bizarre. One can figure the attitude of the surrounding establishments as similar to that of a collection of workaday factory hands to a Pierrot in their midst. As to the inmates themselves, it is a moot point whether, cowed by the architectural laws of such districts, they reluctantly sacrifice all sense of variety, or whether such efforts as they make are faint symptoms of rebellion against monotony, and of a groping toward an unattainable end.