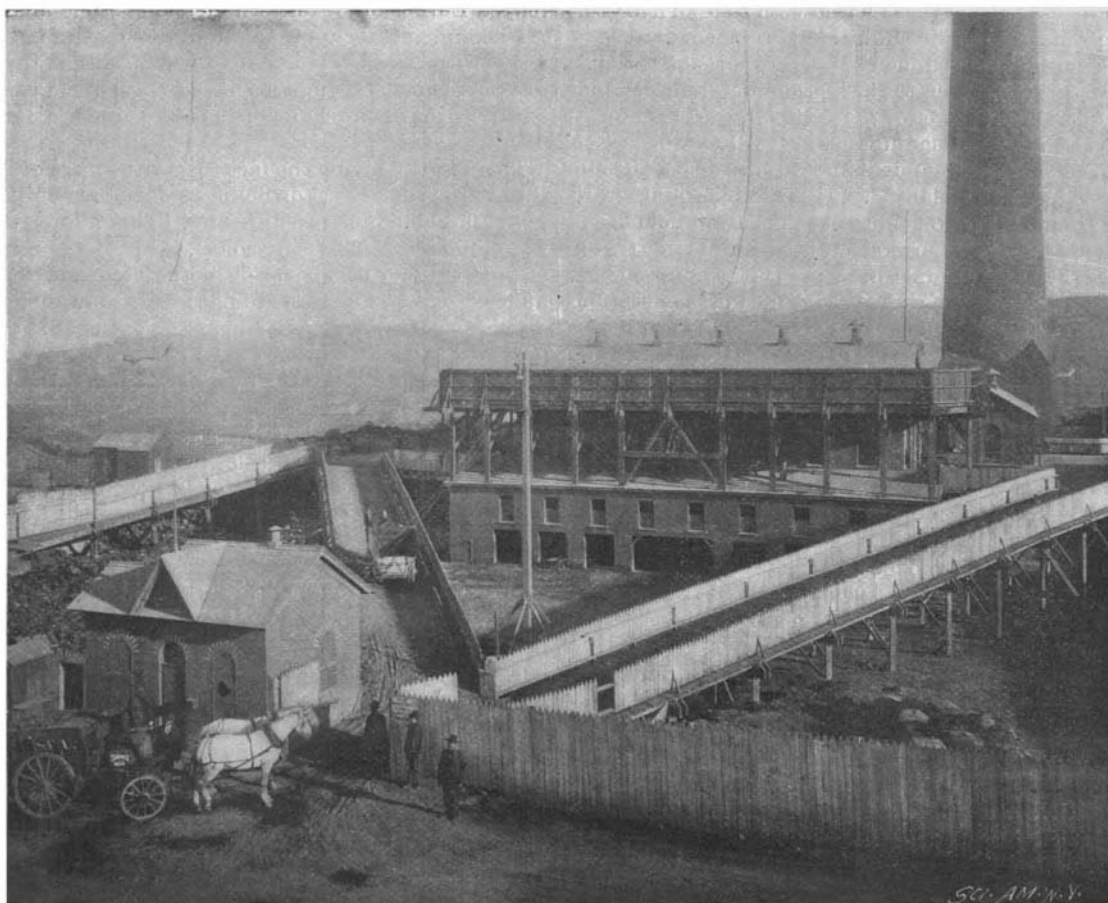


HOW SAN FRANCISCO DISPOSES OF ITS GARBAGE.

The contrast between the methods by which New York and San Francisco, divided by three thousand miles and situated the one on the western shores of the Atlantic, the other on the eastern shores of the Pacific, dispose of their unsanitary waste is marked. In New York the garbage and house refuse are kept in separate vessels; in San Francisco they are mixed together. In the former city the odors arising from pure garbage, kept for several days in warm weather in the basements or back yards of the householders, are apparent at a considerable distance; while in the latter city the garbage, mixed in the same vessel with the ashes from the kitchen and the other house refuse, practically has no odor. In New York the pure garbage is collected and loaded upon scows at the city's expense and delivered to the New York Sanitary Utilization Company, where it undergoes a reduction process at the company's works on Barren Island, and comes out into a residuum consisting of tankage and grease. In addition to the cost of collecting and hauling this garbage, the city pays \$89,900 per annum to the reduction company. The refuse is carried out to sea by barges towed by tugs and there thrown overboard into the sea. The larger portion of this refuse finds its way to the beaches, and renders the Jersey shore anything but a pleasant abiding place.

In San Francisco it had been the custom from time immemorial to dump the garbage and refuse on vacant lots. Some ten years ago this system was changed, and the municipal authorities designated a dumping ground consisting of low and submerged lands in the southern district of the city, but, as that portion of the city grew up, the complaints against this disposition of unsanitary substances became numerous, and the municipal authorities finally decided to sell to the highest bidder a franchise for the term of fifty years for the sanitary destruction of this material. On February 17, 1896, the privilege of disposing of the garbage and refuse of the city in a manner satisfactory to

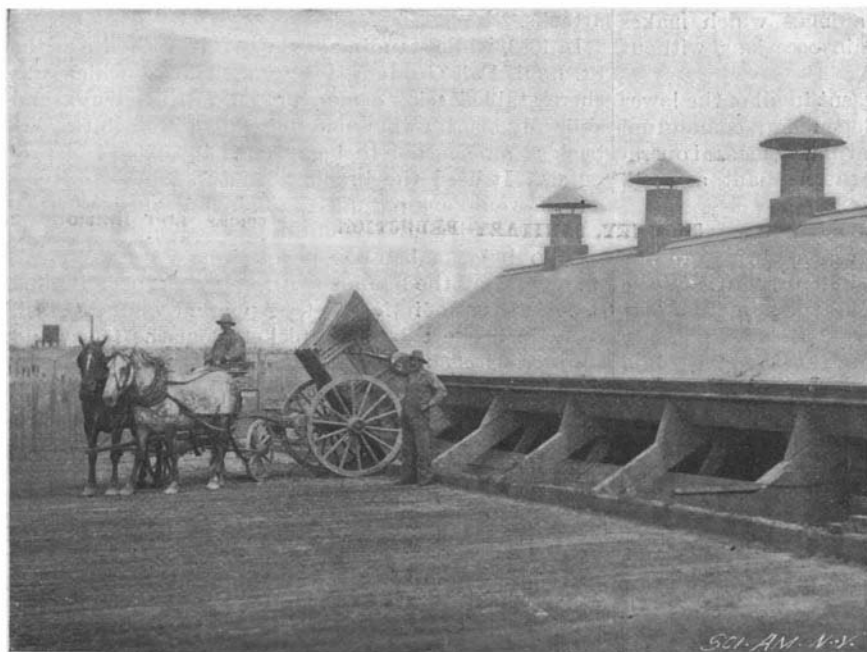


GENERAL VIEW OF SANITARY REDUCTION WORKS, SAN FRANCISCO.

The test run was made for thirty days during September and October, 1897, and on the 8th day of November last San Francisco entered upon its new era of a sanitary disposition of its poisonous wastes.

The main buildings consist of two incinerating houses, with the chimney between. They form together three sides of a square, 265 feet long by 95 feet wide, and two stories in height. There are sixteen large cells in each incinerating house, making thirty-two cells in all, with a grate area of 96 square feet each, aggregating 3,072 square feet of grates. Each cell has a maximum capacity of about twenty tons per twenty-four hours. These cells are the largest in use, the nearest approach to them in size being those of the destructors used in England, the largest one of which has 25 square feet of grate area. There are four crematory furnaces for the cremation of smoke and gases; these can also be used to meet any extraordinary delivery of

has been sunk upon the premises furnishing pure water, and with a capacity of 10,000 gallons per day. A rag cleaning and bottle cleaning plant has also been erected, the former capable of cleaning 300 pounds of rags an hour and the latter can wash several thousand bottles per day. A furnace has been erected for the melting of solder from the tin cans and is now in operation. Tin baling works are also in operation, where the tin is baled and shipped to foundries and made into window weights. The inclined roadways, platforms, offices, and buildings cover an area of 400 by 200 feet. The total investment of the company has been about \$150,000. The maximum capacity of the furnaces and auxiliaries is 700 tons per day, but the entire output of the garbage and refuse of San Francisco has not yet reached that figure. The scavenger wagons commence arriving at daylight and the deliveries are practically over by four o'clock in the afternoon. The works are surrounded by a high board fence. At the entrance is the office of the company, and through this entrance the wagons drive up inclined roadways to the top of the two incinerating houses, where the contents of the wagons are dumped down inclined chutes. On either side of these chutes the pickers take their places and pick out everything of commercial value, such as tin cans, bottles, rags, bones, and even old bread, which is sold to the Chinese chicken gardens. At the foot of these chutes are the mouths of the hoppers where the garbage and refuse enter. The cells themselves are plain rectangular furnaces with arched crowns set at an angle; the hoppers slope upward at the rear of the grates at an angle of about 45 degrees, terminating in their upper ends in a charging door. On each side of these hoppers are flues opening into a main flue. The



UNLOADING REFUSE, TOP OF CHUTES.

the health authorities was sold to the highest bidder for the term of fifty years, in consideration of the payment to the city of \$2,510 in cash and two per cent of the gross receipts for the first fifteen years and five per cent of the gross receipts for the remaining thirty-five years. This contract required the householders to have all their garbage and house refuse, the latter consisting of dirt, ashes, sludge, broken crockery, tins, cinders, bones, and other like material, also all putrid vegetable matter and condemned fish, flesh, and food, carried to the works to be erected by the contractor or his assigns, and to pay to such contractor twenty cents a cubic yard for such destruction, payable upon delivery. Here again the system differs from that in New York and the other Eastern cities, those cities collecting and disposing of their wastes at the city's expense, while in San Francisco the householders bear the entire burden. This system, however, is not altogether equitable, and a strong movement is now on foot to change it and to have the entire expense borne by the municipality. The garbage and refuse of San Francisco varies from two to three cubic yards per ton, a fair estimate would probably be two and a half cubic yards a ton, making the price paid by the householders to the contractor for destruction about fifty cents a ton, which is less than it costs the city of New York for reducing its pure garbage alone. This contract was assigned by the successful bidder to the Sanitary Reduction Works, of San Francisco, which company selected the Thackeray process of incineration, then and now in use on a small scale in one of the three sanitary districts into which the city of Montreal is divided; bought a block of ground in the southern portion of the city, and erected thereon what is now the largest garbage incinerator in the world.

refuse. The chimney is 265 feet high, with a concrete foundation 50 feet square by 3 feet thick. From the top of the concrete to the ground line it is solid brick 47 feet square, and steps back to 32 feet are 12 feet high. The trunk is 30 feet square by 40 feet high, with walls 8 feet thick from the top of the trunk to the top of the house. The walls are built circular, 210 feet high, making the chimney 265 feet from its base. The flue is lined with fire brick 50 feet high and topped with a cast iron cap of special design.

This is the largest and tallest chimney ever built to dispose of garbage and refuse. All the buildings are built in a substantial manner with solid brick walls, galvanized iron roofs, cast iron furnaces, grate bars and hoppers. The works are fireproof. A well



BASE OF CHUTES AND MOUTHS OF HOPPERS WHERE REFUSE IS SEPARATED.

products of combustion from the cells pass by means of the main flue to the crematory furnaces and thence to the chimney. After one charge of the garbage and refuse is burned in a cell, enough of it is left in the shape of embers and live coals to ignite the next charge coming down. In this way the fires never go out and the embers from one cell can always be utilized to assist the burning in another cell. A charge consists of about three tons, and can be thoroughly incinerated, according to the character of the material, in from 2½ to 4 hours. The residuum from this burning consists of ash and clinker, both of commercial value, the former proving an excellent base for a fertilizer, while the latter, ground up and mixed with ten per cent of lime, makes a very excellent mortar; or, mixed with concrete and clay in proper proportions, can be made into an ornamental brick of any color desired. The follow-

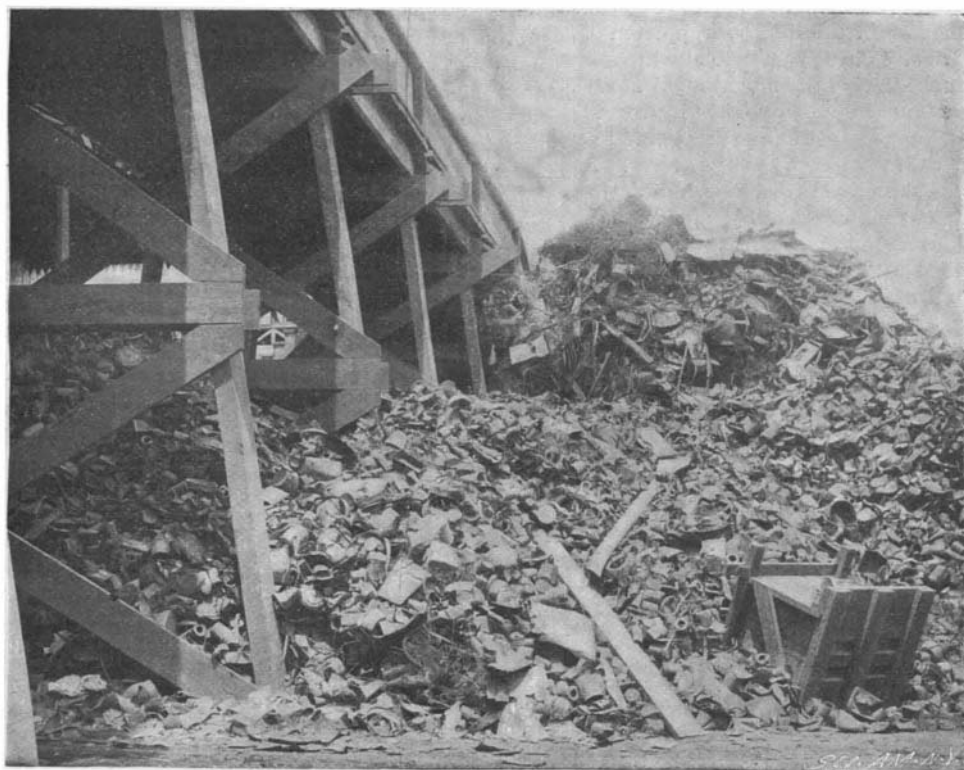
closed down without interfering with the burning of any of the other cells. The cost of burning is limited to the cost of labor. There are 23 men now employed at San Francisco in the incinerating department. This is outside of the number of men employed in the picking department, which more than pays for itself.

After the works had been in operation for a few months it was found that the entire output of the city could be burned in the daytime, the furnaces being charged at night and regulated to burn till morning. This made a big cut in the payroll. The incinerator at San Francisco is the only one in the United States burning garbage and refuse without other fuel than the material itself. No artificial fuel of any kind can be used here; there is no place for it. All the other cities in the United States, incinerating garbage and refuse, have to use either coal, coke, wood, oil, or

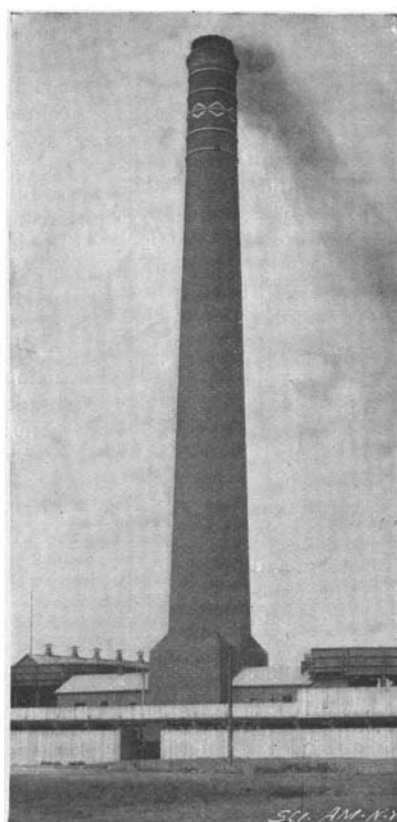
being watched with much interest. The premises are kept in a neat and orderly manner. When the furnaces are charged at night, the material brought during the day has been wholly disposed of. There is an entire absence of smell and gases. Sanitary engineers from all parts of the country have visited this plant during the eight months it has been in operation. It has been indorsed highly by the State Board of Health of California and the San Francisco Board of Health, and the municipal authorities feel as if they had at last reached a solution of a sanitary disposition of the city's wastes.

"Magic" and the New Journalism.

Our esteemed contemporary The Evening Post recently published an article entitled "Running a Yellow Journal," which describes how "a great Sunday paper is made," pointing out how facts of all kinds are manufactured by the fertile brain of that mighty man "the Sunday editor." The article goes on to say that it requires no common order of intellect to lay bare the workings of a great stage illusion or the great magician's master trick. It says "that always makes a good story and is a useful one when other topics are scarce. How does the editor manage, when need be, to always expose and confound such frauds as these? Interview the prestidigitateur? Absurd; he might not tell the truth. Send a spy behind the scenes? Impracticable. Out of the depths of his knowledge and in the light of his foresight the Sunday editor buys a book, a large, thick, green book, long published by the SCIENTIFIC AMERICAN, and containing minute description and detailed diagrams of all the tricks and illusions now known to the stage. When-



METAL PICKINGS TAKEN FROM REFUSE.



CHIMNEY, SANITARY REDUCTION WORKS.



A SECTION OF THE INCINERATING FURNACE.



RAGS, BOTTLES, ETC., TAKEN FROM REFUSE AND PACKED FOR TRANSPORTATION.

ing is an analysis of the ash and clinker made during the test run:

	Clinkers. Per cent.	Ashes. Per cent.
Unconsumed carbonaceous matter.....	1.82	6.74
Silicon dioxide.....	51.91	45.54
Iron sulphide.....	2.73	0.75
Copper sulphide.....	0.86	trace
Lead sulphide.....	0.48	trace
Phosphoric acid.....	0.81	2.52
Aluminum oxide.....	14.30	12.71
Iron oxide.....	1.00	1.92
Calcium oxide.....	15.45	19.59
Magnesium oxide.....	1.89	1.26
Potassium oxide.....	0.82	1.46
Sodium oxide.....	1.78	0.83
Sulphur trioxide.....	1.64	4.10
Carbon dioxide.....	3.94	2.34
Loss and undetermined.....	0.62	0.24
Total.....	100.00	100.00

The furnaces are so simple and have been built in such a substantial manner that they will last for a long time. When repairs are necessary, one cell can be

gas. Several of the English systems claim to burn without fuel, but in all of them it has been found necessary to use more or less fuel for the purpose of forcing a draught by means of a fan, which is not in use in the San Francisco works.

Since the work commenced in November the fires have never been extinguished; no repairs have been needed, but constant improvements are being made by the company in labor saving apparatus and in increasing the commercial value of the residuum. The works were built originally on low-lying ground covered at certain seasons of the year with water to a depth of from 2 to 3½ feet. The company has been using its ashes and clinker up to this time to fill in its own land and contiguous blocks, and it has found that, for the purpose of filling, the residuum has no superior; but the company is now about to erect fertilizing works, using its ashes as a base, and it is also considering the advisability of erecting works for the converting of the clinker into bricks and mortar. These experiments are

ever it is desirable to warn its readers against impositions of this order, the yellow journal has but to turn to the book, pick out a particularly flagrant illusion, and there it is simply waiting to be exposed."

Biltmore Forestry School.

There is an important forestry school at Biltmore, N. C., which is open to graduates of American colleges and of United States military academies, the idea being to educate the men to be expert foresters. The course began September 1, 1898, and lasts for twelve months. It includes practical instruction in forestry, where the actual work of planting, cutting, road making, etc., is going on. Theoretical instruction is also given, treating the entire subject of forestry, such as sylviculture, forest utilization, forest management, forest finance, forest protection, forest history, fish and game keeping, etc. The school is conducted by Mr. C. A. Schenck, Ph. D., Forester to Mr. Vanderbilt's Biltmore estate.

Miscellaneous Notes and Receipts.

Decolorization of Black Cotton Rags.—Aniline black is justly termed an indestructible color, and cotton rags dyed with it could heretofore only be used for the production of the coarsest wrapping paper. A paper manufacturer has caused chemists to seek a medium decolorizing such rags without weakening the fiber to a great extent. The experiment brought the following result: By the action of bisulphites on such rags at a high temperature the color changes from black to pale buff. If the stuff, pre-bleached in this manner, is exposed to the successive action of weak acid, clean water, and lime chloride solution, a material of such whiteness is said to be obtained that it can be utilized for writing paper and book paper.—*Papierzeitung*.

Impregnating Liquid for Incandescent Gas Light Mantles.—According to Invention, M. Salomonov, of Russia, has received a patent on an impregnating liquid for incandescent gas light mantles which effects a coloring of the light. Same consists of magnesium sulphate 12 parts (by weight), zinc sulphate 4 parts, potassium bichromate 1 part, or in its stead ammonium bichromate 1 to 5 parts, dissolved in distilled water 50 to 100 parts. To the solution are added some drops of a silver nitrate solution. The mantles are dipped in this liquid and dried. Such a mantle imparts to the light a pale red color, which can be intensified by the addition of a little stannic nitrate to the impregnating liquid. If an addition of platinum tetrachloride is substituted for the admixture of silver nitrate, the light will have a golden yellow color.—*Metallarbeiter*.

Important Invention in the Domain of Printing.—According to the *Archiv fuer Buchdrucker Kunst*, two Englishmen and a Frenchman have succeeded, after many vain attempts, in solving the problem of printing in different colors simultaneously. The process involved deviates entirely from the ordinary method of printing in colors. It is styled the mosaic-chromatic heat process. Neither wooden blocks nor lithographic stones or rollers are employed. The colors required for the picture are applied in any desired number on a plate about three-fourths of an inch thick and form a coherent, cheesy mass. When the arrangement of the colors is finished, the plate presents the aspect of a mosaic picture. The plate is placed on the bed of the machine, an ordinary lithographic press, but adapted to the process, and the impressions are produced by means of a cylinder heated by gas flames in the interior. This invention is of importance, says the said journal, since it affords a saving of 75 per cent of time and wages compared with the old printing method. It is especially suited for colored show cards, for the coloring of maps and plans, and all sorts of illustrations.

To Brown Iron or Copper.—As it is frequently desired to give iron or copper articles a handsome and yet durable brown coloring, says the *Illustrirte Zeitung fuer Blechindustrie*, for which really good recipes are not at hand, we will give below some directions which have been tried in practice.

The process consists in rubbing the objects with a consistent mass composed of several substances and burning in the applied layer so as to prevent oxidation.

This method finds frequent use on copper ware, not only to avoid oxidation and the tiresome polishing which becomes necessary, but also to impart to the copper, whose natural color is rather glaring, an appearance more pleasing to the eye.

Annealing and careful cleansing with corrosives of the articles have to precede the browning process. A dark brown is obtained by stirring equal parts of verdigris and colcothar (English red) in vinegar to a pasty consistency, applying this on the well cleaned and dried parts, heating to redness, and quickly rinsing off in acetate of copper.

Another mixture which has likewise been found valuable is the following: Make a paste of two parts of finely powdered iron oxide with alcohol. This mass is applied with a brush as uniformly as possible, heat over an open fire, rinse off, and polish with a soft brush.

If the desired effect of the color is not produced thereby, the operation must be repeated.

Lighter brown shades are produced by applying a composition of two parts verdigris, two parts vermilion, five parts sal-ammoniac, and five parts alum with vinegar. After the application the parts are heated and rinsed off.

With the above operations, the greatest cleanliness must be observed, and the touching of portions to be browned with sweaty fingers must be avoided, else spots will result, which can only be removed by taking everything off again.

The process of browning has also found great favor in the manufacture of arms. The barrels of the guns, etc., are, for this purpose, thoroughly polished with emery, cleaned of all adhering grease, and rubbed with the following mixture: Antimony chloride, two parts; crystallized ferric chloride, two parts; gallic acid, one part; water, four parts. This is allowed to dry in a warm place ten to twelve hours; then the

article is warmed slightly, rubbed with a woolen rag, and polished with olive oil and wax. This is repeated according to how the color turns out.

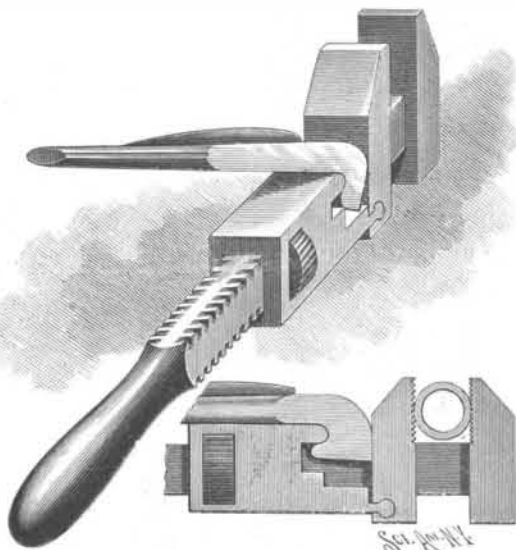
Another good mixture consists of equal parts (by weight) of butter of antimony and olive oil, and one part silver nitrate in 500 parts water, as well as 54 parts blue vitriol, 26 parts alcohol, 14 parts nitric acid, 3 parts iron filings, and 200 parts water.

AN IMPROVED WRENCH.

A wrench has been patented by Charles S. Metcalfe, of Silver City, New Mexico, which provides novel means for obtaining a fine adjustment of the movable jaw in addition to the usual coarse adjustment.

The traveler of this wrench, although operated by the usual nut, nevertheless differs from the travelers of most wrenches in being recessed at its upper end in such a manner that the back portion shall be longer than the front portion. At the end of the long rear portion of the traveler, a cylindrical bearing is provided which is received by a slot in the heel of the movable jaw. By means of this construction, the movable jaw is pivoted on a point remote from the gripping surface, and is carried to and from the fixed jaw by the traveler. A lever is fulcrumed on a semi-cylindrical bearing on the short front portion of the traveler, by means of a hook-shaped head bifurcated to extend at each side of the shank, and provided with a cam-surface at its upper portion and with a connecting straight surface at its upper rear portion. Both cam and straight surface engage the movable jaw.

In using the wrench, the lever is carried out from the shank as shown in the perspective view, the free end of the movable jaw being permitted to drop. When the lever is in this position, the nut is screwed on the shank until the traveler has approached sufficiently near to the fixed jaw to grip the material. By carrying the lever inwardly and parallel with the shank, as



METCALFE'S IMPROVED WRENCH.

shown in the side elevation, the cam-surface of the lever will act upon the free end of the movable jaw, forcing the latter parallel with the fixed jaw, and holding the material in a firm, vise-like grip. When the lever is parallel with shank, the straight upper surface of the lever will hold the sliding jaw in adjusted position.

The Nicaraguan Railway.

United States Consul W. B. Sorsby, at San Juan del Norte, in a consular report to the State Department on the subject of the Nicaraguan railway, now for sale, writes:

I have to report that the railway system of Nicaragua, owned and operated by the government, now offered for sale, was completed in 1885-86 and is in two sections of 58 and 32 miles respectively, with about 3½ miles of side and switch tracks and 4 miles of a branch road recently completed, with further extension of the same under way. It is a narrow-gage railroad. There are three small lake steamers belonging to the system.

According to an inventory taken in 1893, the railway, boats, docks, etc., were worth \$1,798,634 (American gold). I am unable to obtain a copy of the inventory so as to show the property in detail; nor can I give exact data as to the freight tonnage, but I estimate it to be, under present conditions, about 60,000 tons per annum, and capable of such increase as the development and improved conditions of the railway system and of the country will warrant.

It is estimated that to put the railway system in good order an expenditure of about \$100,000 is necessary, to be used in the following manner: Purchase of 100 box cars at \$400, \$40,000; three engines at \$8,000, \$24,000; reconstruction of the Paso Caballos bridge, \$12,000; necessary repairs of the track, \$24,000; total, \$100,000. The gross earnings of the system for nine years, 1886-95, were \$2,017,209, and the expenses for the

same period \$1,438,238, leaving a net earning of \$578,971. The average annual gross earnings for the first three years were \$159,666, and the average annual expenses for the same period were \$94,043. The average annual gross earnings for the following six years were \$256,368, and the average annual expenses for the same time were \$192,686.

It is well, perhaps, to direct especial attention to the fact that the operating expenses have been allowed to entirely absorb the increased earnings.

The net earnings of \$578,971 for the period of nine years indicate a dividend of about 3½ per cent on the valuation of \$1,798,634. If this railway system has been able to earn 3½ per cent under government management, subject as it has been to all the harassing incidents of the military exigencies of the country in the last four years (1894-98), due to constantly recurring revolutionary efforts, and finally to the preparations for war with Costa Rica, it should become a most valuable property in the hands of foreigners and conducted according to the American system of railway management.

The government price for the railway system is understood to be \$2,500,000; and in this connection it may be well to state that the government owes a foreign debt of \$1,400,000, with two years' unpaid interest at 4 per cent; and it is supposed that the desire to pay off this debt is the main object of the government's purpose to sell.

It is believed that the government would award a most valuable concession in order to effect a sale and have the railway system pass under the control of capitalists who would be disposed to improve the present system, and thus aid in the development of the resources of the country. It is thought that, in addition to privileges of the most valuable nature, concessions would be given for the construction of additional railways, either as branches or independent lines, or for an extension of the present system to a point on the Atlantic. For the sum of \$2,500,000 cash and a reasonable guaranty to build a railroad from Lake Nicaragua to some point on the Atlantic ocean ("Monkey Point," for instance, a distance of about 80 miles), in order to afford interoceanic communication and transportation, I believe that a perpetual title to the system, 1,000,000 acres of land, to be selected from any part of the public domain, and practically a monopoly of the railroad construction and traffic of the country, would be given.

From present indications it would seem that Nicaragua is entering upon an epoch of peace and prosperity, and that she is eager for the assistance of foreign capital to aid in the development of the country, lavishly endowed as it is with natural advantages—with a climate agreeable and healthy and free from extremes of heat and cold, with a soil capable of the highest state of cultivation and production, with forests of valuable timber, and with fabulous mineral wealth safely hidden from every effort of exploitation except that of capital.

The greatest need of the country to-day is means of reliable and quick communication between the Atlantic Ocean and Lake Nicaragua, to connect with the present national railway system from the lakes to the Pacific Ocean, in order to insure interoceanic transportation.

The construction of the Nicaragua canal would enhance the value of railway properties, because, while interoceanic travel would be lost, this would be offset by the local traffic resulting from the increased tide of immigration.

The system as it exists to-day, in view of the improvements of the harbor at San Juan del Norte (Greytown) and of the San Juan River, contemplated and even now being vigorously prosecuted by the Caribbean and Pacific Transit Company (the old Atlas Line), will result in an enormous increase in traffic.

The opportunity for investment of American capital is golden, and the influence on commerce between the United States and Nicaragua, with the railway system of the country under the control of Americans, would be well worth careful consideration, not alone as to the gain to the United States, but as to the loss of trade which would inevitably follow if it should be controlled by commercial interests other than our own. These opportunities will not remain open very long; indeed, a strong effort is now being made to secure them by a powerful English corporation.

NEW FRUIT TREE.—A new fruit tree is described by Andrée in the *Revue Horticole*. The name of the plant is *Feijoa sellowiana*; it is indigenous in La Plata, South America, but also thrives in Southern France. The tree which blossomed and bore fruit in Andrée's garden attained a height of 3½ meters and had the form of a shrub. The fruit is an oblong, egg-shaped berry 4 to 6 centimeters long and 3 to 5 centimeters wide, retaining its color even in the ripe condition. The meat of the fruit is firm, of white color and sweet taste, containing much juice and giving off an extremely agreeable and penetrating odor. The flavor is said to remind one of the pineapple.