or poor. Now the rich, and the poor as well, may travel five hundred miles comfortably in twenty-four hours. Then the mails were weeks in going and coming where days will now suffice. Then telegraphs were unknown, but now any one may send a message to a friend hundreds of miles away for a few cents, and get an answer almost at once, whereas it formerly required several days if not weeks for a message to go and come. These and hundreds of other improvements that have been inaugurated are open to the use and benefit of all, and have greatly lessened the most arduous work of the laboring man, while the necessity for his services is in no wise less now than formerly. In fact it may be truly said that the day laborer can now enjoy many things that the wealthiest men half a century ago could not obtain. In looking at the facts that history presents, no man of a sound and candid mind can honestly deny that, whatever of seeming or *temporary* disadvantages may have fallen upon manual labor, by the introduction of machinery, all have been enabled to reap great advantage. The conclusion must, therefore, be that the introduction of new and improved methods of production should be encouraged, and that there is no real ground of warfare between manual labor and machinery, demagogues to the contrary notwithstanding.—*New York Mercantile Journal.*

Mechanical Progress.

It is an interesting feature of our times to note the rapid progress which has been made in manufacturing ingenuity and scientific skill in the production of substitutes for expensive or scarce raw materials and articles in general demand. It cannot be controverted that art is fast invading the domain of nature. Chemistry is enabling us to replace animal and vegetable dyes, and to form artificial gems or creditable imitations of them, which, as ornaments, answer every purpose. Mineral oils replace animal and vegetable ones for illuminating purposes, and the electric light is slowly superseding the use of noxious and costly gas. The expensive and dangerous whale fishery need no longer be pursued, nor the African deadly jungle penetrated for ivory. The sea tortoise no longer lures the adventurous sailors, nor are the ostriches of the desert hunted at the sacrifice of health and often of life itself. These genuine products have been so long in universal use as to become necessities of our civilization, unless very similar articles can be ingeniously substituted for them.

Chemistry and science have enabled us to manufacture our own tortoise shell, ivory, and feathers, without the risk of visiting wild jungles and arctic or tropical seas for our supplies. In addition to the above, the *American Cultivator* proceeds to enumerate some of the most successful artificial products which are now extensively manufactured, and which take the place, to a large extent, of more expensive genuine substances. A half dozen available substitutes for whalebone are manufactured. Ivory, so extensively in use, is superseded by celluloid. Piano and organ keys, billiard balls, hand mirrors, and handles of knives and forks, are nearly all made of this ingenious chemical substitute for ivory. In the imitation of tortoise shell, it is made into combs, card cases, napkin rings, and the like; while the pink coral, so popular with jewelers and ladies, is imitated by it to perfection.

Ostrich feathers, ever the court plumes of fashion, and held formerly at prices which only admitted of their use by the wealthy few, are now eclipsed in beauty and durability by the ingenious hand of skilled manufacture. A compound of silk or celluloid, spun glass, and other materials is now so cunningly combined as to be equally desirable with the genuine ostrich feathers, and very close examination is required to detect the original from the substitute. Artificial stone and marble are made to any extent, actually rivaling the originals in strength, beauty, and durability. Artificial alizarine is now substituted for the natural product of madder. It is not much more than one-third the cost of madder as originally supplied from the dye-root. We might, adds the editor in closing his article, find plenty of other similar examples to impress the fact of our subject, namely, the rapid mechanical and chemical progess of the times.

The "Ticker" in Wall Street.

Joaquin Miller relates the following scene familiar to most New Yorkers, but not to those who are less acquainted in the ways of this metropolis or the mysteries of Wall street:

"I went to a broker whom I had met at the Union Club," says Mr. Miller, "and told him what I wanted to learn. He kindly took hold of the tape which continually streams out from the 'ticker,' as the little wheel of fortune is called, which constantly records the rise and decline of stocks, and tried to explain all about it.

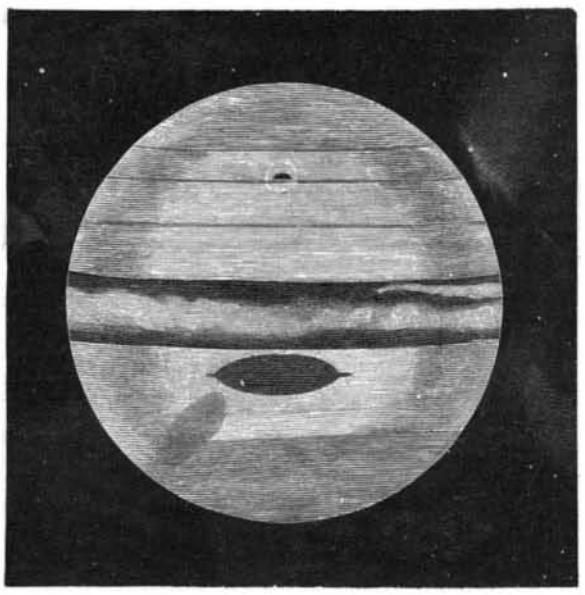
"I found it impossible to get interested. There were about 200 different names of stocks on the list. These were represented by one, two, or three letters, or figures, or some sort of abbreviated word that I could not understand or distinguish, and I was constantly getting confused.

"Around this 'ticker' gathered and grouped a knot of eager, nervous, and anxious men. Ten, fifteen, or twenty at a time would clutch at the tape, as it streamed out with its endless lines of quotations, and mutter to themselves, jabber at each other, swear like pirates, drop the tape, and dash away. Others would dart in, clutch the tape, swear or chuckle, as their fortunes went, wheel about, give orders to their broker to buy or sell, as they prophesied the future of the market; and so it went on all day from 10 till 3, when the battle was ended by the fall of the hammer in the Stock Exchange.

"When I tell you that there are more than 5,000 of these 'tickers,' or indicators, you can form some idea of the magnitude of the business. If we give ten men to each 'ticker,' you have the spectacle of 50,000 stalwart men standiug there holding up a dotted strip of paper, waiting, hollow-eyed and anxious, on the smiles of fickle Fortune. To this 50,000 you may add 2,000 brokers. You must give each broker, at least, 5 clerks, office boys, and messengers, which swell the list 10,000. To this 62,000 you can safely add 200,000 speculators on the outside. So you have a total engaged in this gambling of more than 250,000."

CHANGES ON JUPITER.

Probably never since Jupiter became an object of telescopic study has more attention been bestowed upon him, or a deeper interest felt in the wonderful changes which are



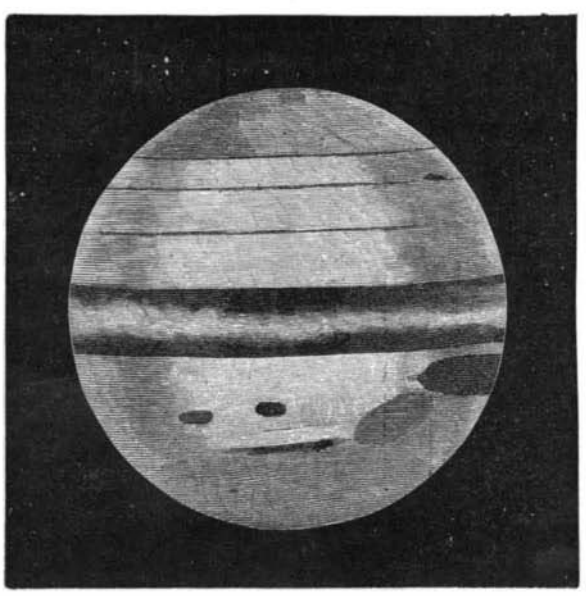
GREAT SPOT ON JUPITER.

constantly being produced on his surface, than has been created by the advent in 1878 of a tremendous "red spot" in the southern hemisphere of the planet. This great marking seems permanent, but how long it will last no one can tell. It would not be astonishing news if some fine night it should be missing.

In October, of last year, the spot was surrounded by a large sea of light extending in all directions, to a distance of some five or six thousand miles. The planet then presented a very beautiful sight, with the great spot like a light red island floating in a sea of liquid light. A large engraving, from a drawing made by me last October, in the *English Mechanic*, vol. xxx., p. 166, shows the striking appearance of the planet during that time.

This year, as soon as Jupiter emerged from the neighborhood of the sun sufficient for good observation, the great red object was sought for. It was found to have suffered no particular change, save that the sea of light surrounding it at one time last year had disappeared.

I have observed the spot on every favorable opportunity this year, and find that its length fluctuates slightly, but its breadth remains pretty constant—about one-eleventh or one-twelfth the polar diameter of the planet. I estimate its mean



SMALL SPOTS ON JUPITER.

length to be about 22,490 miles and its breadth 6,900 miles, covering a total area of about 154,640,000 square miles, which is equal to three-quarters the entire surface of our earth. Its color is a light Indian red.

In observing the great spot one is impressed with the very rapid rotation of the planet. Should we at any time observe the spot just beginning to appear at the east of Jupiter's disk, it will in two hours have passed to the center of the planet, and two hours later will be seen disappearing at the west limb.

The other prominent markings on the planet have been the two equatorial bands and three delicate narrow lines which encircle the northern hemisphere. But my desire is more to call attention to some new and important changes I have detected.

On the morning of July 25, at three o'clock, I discovered a small but distinct oblong spot in mid-transit, on a parallel of latitude somewhat greater than that of the red spot; this fits neatly in a narrow, delicate light-band, which was also new. I should estimate this small object to be about eight thousand miles in length and probably three thousand in breadth. At the same time I detected a heavy shading extending from the southwest end of the great spot. The new spot so far has been permanent, as I have observed it up to August 18. Observing the new spot on August 1, I found another which preceded it by about fifty minutes; this was yet further south, lying on the south border of the light narrow band; I have failed to detect this last mentioned spot on several observations since, and suppose it has disappeared.

On the night of August 16 I discovered a small, dark, almost black spot in the northern hemisphere of the planet; this was in mid-transit with the center of the great spot; it is remarkable for being in the northern hemisphere, as that part of the planet for the past few years has been singularly devoid of any change whatever.

On the morning of August 18, at three o'clock, I again observed the dark spot of the 16th, and also the small one of July 25; and between the latter and the great spot I detected two new ones, similar in appearance. One lay north and the other south of the narrow band of light. The shading from the great spot on this occasion had assumed a definite form, and was in reality a large, faint, but well defined object attached to the red spot, and almost equal to it in area. There is something remarkable about this shading. It is always best seen when near the east limb of the planet. At 4h. 19m. the great spot was in mid-transit—that is, midway across the disk; it appeared of a light Venetian red color, while the north equatorial belt was a warm purple, with which color also the south band was tinged. The small spot in the northern hemisphere was at the same time in mid transit, appearing almost black, and situated on the north border of the middle one of the three delicate lines crossing the disk. The shading from the great spot was very diffused and faint, while a slight continuation was running from the east end of the spot. Between the two equatorial belts, eastward, was a white glistening spot; east of this the space between the two belts seemed filled with light cloudy masses; above them the northern band was cleft asunder. I had for several days suspected the existence of the new markings, but did not have a fair observation until the 18th.

The two drawings, made with a five inch refractor by John Byrne, of New York, show all the new objects, and will be found pretty accurate representations of the planet at the given epochs. I have so far this year made ten observations of the transit of the great spot across the middle of Jupiter's disk, with the intention of determining the planet's rotation. These records will be continued until Jupiter leaves our evening skies, after which the observations will be reduced, corrected for parallax and velocity of light, etc., so that the planet's true rotation may be determined. I have found the rotation to be, approximately, 9h. 55·2m.

Observing the planet again on the 23d, the small dark spot in the northern hemisphere could not be detected; it has, I suppose, disappeared. The space between the equatorial bands was more decided in outline, and the bright spot in the spacing toned down, while the northern band was faintly cleft as far as the great spot. The belts do not now cross the planet as right lines, but are seen curved away from the large red spot, for the planet is slightly tilted, and we see more of the north pole than of the south.

ED. E. BARNARD.

Nashville, Tennessee.

Winter Employment for Amateurs.

Under the above heading Mr. H. Manfield last week pointed out one of many directions in which the amateur photographer may keep himself profitably employed during the winter months—profitably in so far, at least, as he is not wasting his time. With the permission of the editors I would call attention to another branch, and one more strictly photographic, in which the amateur may strike out for himself an almost entirely new path—not only without interfering with the course of his summer work, but actually supplementing it, while at the same time he is "keeping his hand in" during the otherwise idle months.

I allude to the production of enlargements—a department of photography which, so far as the amateur is concerned, is almost *terra incognita*. I see no valid reason why this should necessarily be the case; but it cannot be denied that it is so, for with, I think, one or two exceptions, I never recollect to have seen an enlargement exhibited which has been the production of an amateur. It may be urged that the facilities offered by commercial enterprise in the matter of enlarging are now so great that it is not worth an amateur's trouble to undertake the work. This I grant in one sense; but I am writing for that class of amateur, properly so called, who follows photography for its own sake, and not merely for the sake of the pictures it enables him to secure. These last are the rewards which crown his labors. The man who buys commercial plates and, after exposing them, sends them to be developed, printed, mounted, and finished, and is content to call the results his own, is not an amateur photographer; he is merely what is termed in the sporting world a "pot-hunter."

The real amateur is he who prefers to do every bit of work himself that it is within his power to do. He prepares his own plates, makes his own collodion and emulsion, and would albumenize his own paper or make his own carbon tissue if it were possible on a small scale to equal or even to approach the commercial article. I see no reason why the amateur of this class should not therefore turn his attention to the production of his own enlargements.

A word, first of all, upon the subject of enlargements. What is an enlargement? or rather, what is the limit to which enlarging can be carried without producing an offensive result? In other words, is it necessary to carry the amplification to the extent which has become so fashionable, and of which a few examples are to be seen in the present exhibition, though not so many as last year? I, for one, reply at once that it is neither necessary nor desirable to convert small landscapes (the greater proportion of amateur work will be in that line) into pictures of forty inches by thirty, or even larger. For one thing, the optical conditions under which the negative is taken will rarely permit it, while the productions are like "white elephants," perfectly useless and problematically ornamental.

If, however, the amateur be content with enlarging up to 12 x 10, 15 x 12, or 18 x 16, he will not get beyond the bounds of what he can do and *do well*. He may save himself a great deal of hard work in taking his negatives, as a quarter or 5 x 4 pocket camera will enable him to produce 12 x 10 or 15 x 12 negatives when enlarged only about three diameters—a degree of amplification which will not overtax his optical powers to any very serious extent. Moreover, he will be enabled to produce pictures of this or even larger sizes at a minimum cost for apparatus.

And now as to the methods by which these results are to be secured. If a lantern be available—as is generally the case in amateur photographic establishments—so much the better; though it is not an absolute necessity, it will add much to the convenience of the operator. Failing that, a darkened room with a hole cut in the shutter to receive the negative or transparency, and fitted on the outside with a dead white reflector set at an angle of 45°, will replace the lantern carrier and render unnecessary the condenser. Two upright frames, capable of standing firmly by themselves—one to carry the lens and the other the sensitive surface—and a plain table upon which to set them, will complete that part of the arrangements.

The next point is the production of the transparency. (I am presuming that an enlarged negative is to be made.) I have produced myself, I think, the best results for enlarging purposes by contact printing upon *slow* collodio-bromide plates. If the old process with excess of soluble bromide and a simple tannin or coffee preservative be employed, the most delicate and, at the same time, brilliant results may be obtained; but the finest preservative of any is albumen rendered slightly alkaline. Carbon tissue gives very good results in the transparency when it is even in quality. When using this for transparencies I prefer, after sensitizing, to "squeegee" it on to collodionized glass, and, when dry, to strip it off with the fine surface of the glass. This secures better contact with the negative, which is a matter of great importance, and leaves less granularity and unevenness in the developed image. Gelatine plates—at least the modern rapid ones—are inferior in result. A special plate may, however, be prepared, but it is scarcely worth while when carbon tissue is so cheap.

With regard to the enlarged negative for sizes up to 12 x 10, I think the ordinary gelatine plate should be used; but for sizes beyond that I should prefer paper waxed or not as circumstances may dictate. I question, indeed, whether in a 12 x 10 print from a paper negative a sufficient grain would be visible to be noticeable. Two methods of preparing the paper are open: the first, to coat paper with ordinary gelatine emulsion; the second, to salt and sensitize it as recommended by Captain Abney, the ferrous oxalate developer being used in both cases. The operation of coating the paper with emulsion will be rendered perfectly easy if it be performed in the following manner: Take a sheet of glass (preferably plate) the size of, or a little larger than, the required negative; thoroughly damp the paper to be coated, and squeegee it on to the glass, turning the edges over. Blot off the surface water, and, while still damp, pour on the gelatine emulsion in the ordinary way, placing the glass upon a leveled stand. When set, treat it in every way like an ordinary gelatine plate, taking care not to disturb the edges of the paper until the whole is thoroughly dry, when the gelatino-bromized paper may be stripped from the glass in a perfectly even sheet without wrinkles or cockling.

The gelatinized paper cannot be rendered so translucent by waxing as the plain, as it is more difficult to make the wax penetrate it. The plain paper negative may be soaked in hot water after fixing to remove the soluble portions of the sizing, and, when dry, the wax will be easily absorbed. This treatment is obviously inapplicable to the gelatino-bromide paper.

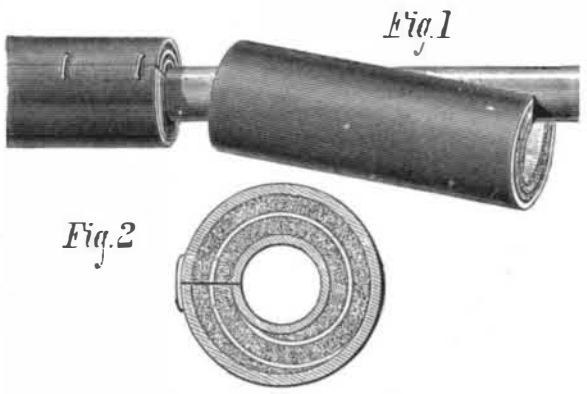
It will, of course, be possible to print direct enlarged positives from the original negative, employing in the same manner the bromized or gelatino-bromized paper and oxalate development. In this case it will be advisable to add a full dose of iodide to the salting bath or the emulsion, as the case may be, in order to improve the tone. The preferable plan, however, according to my idea, is to make an enlarged negative.

In these few lines it is impossible to do more than merely sketch out a plan by which amateurs may make their own enlargements with no greater trouble than is required to produce the direct negatives, if, indeed, as much be necessary. I hope the matter will be taken up by some of our more practical amateurs during the approaching season, and that we shall hear and see more of my suggestion next year. —*H. Y. E. Cotesworth, in British Journal of Photography.*

FELT AND ASBESTOS COVERING FOR STEAM SURFACES.

For some time past Toope's covering for steam surfaces has been in use in England, giving great satisfaction and receiving the indorsement of many prominent English engineers. The business of manufacturing and selling it is conducted there by a limited company located in London. In this country Mr. Charles Toope, manufacturing agent, having an office and works at 353 East 78th street, New York city, is making and introducing the covering.

The covering is readily applied, requires no previous preparation, and when in place is permanent, being incapable of injury by jarring or pounding. It has a smooth and finished appearance, and is said to be much more efficient for the same thickness of material than other forms of covering, and it possesses the further advantage of not being liable to crack or crumble, a common difficulty with some forms of covering applied in a plastic state.



TOOPE'S REMOVABLE COVERING FOR STEAM SURFACES.

This covering is made by wrapping a mandrel with asbestos, and applying a layer of paper, which is afterward wound spirally with an interposed layer of felt, and is finally wrapped upon itself, forming a stiff exterior coating, as shown in Fig. 2 in the engraving. The covering thus formed is cut into convenient lengths, and slit open on one side so that it may be readily placed on the pipe, as shown in Fig. 1. The fastening consists of a series of staples, inserted so as to draw the seam together. For flat surfaces the covering is made in sheets of convenient size.

This covering can be removed and replaced without injury, and may be applied to the pipes whether hot or cold. It is extremely light, and is said to be indestructible at any temperature at which steam is used. It is valuable as a covering for gas and water pipes, pumps, and other similar surfaces, to prevent freezing.

This invention has been patented in the United States, Great Britain, France, and Germany.

MISCELLANEOUS INVENTIONS.

An improved mop-head has been patented by Mr. John K. Collins, of Lebanon, N. H. This invention consists in a novel combination with each other of a mop-holder provided with a notched or serrated shank, and a mop-head provided with pivoted spring pawls engaging with the shank.

Mr. Stephen N. Rowley, of Adrian, Mich., has patented an improved ruffling attachment for sewing machines which will allow the goods to extend at either or both sides, and thereby permit a wider range of work than is possible with ruffling attachments for under-feed machines as heretofore constructed.

Mr. Frederick Diffany, of Newark, N. J., has patented an improved ornament to be used in the manufacture of jewelry, so constructed that it may be made or boughtin strips, cut into pieces of suitable length, and applied to the jewelry to be ornamented.

An improved self-inking hand stamp has been patented by Messrs. Thomas Keith and Andrew Philp, of New York city. The invention consists of a die plate guided by vertical slots in the standards of the frame of the stamp, and pivoted to arms rigidly attached to a transverse bar attached to the handle, which die plate has a fork on the lower side, embracing a stud or pin attached to a rod provided with a symmetrically beveled guide plate, and fitting into a receptacle containing a spring, which forces the guide plate forward against the gudgeon of the die.

Mr. Alfred Beard, of Cincinnati, Ohio, has patented a wrench having a circular eye in its head for the reception of a pipe or nut, the head being traversed by a slot through which an adjustable tapering toothed key is entered to any desired extent to press upon and hold the pipe or nut.

An improved sawmill dog has been patented by Mr. Elwood Bennett, of Kokomo, Ind. The object of this invention is to furnish dogs for sawmills, so constructed as to hold the timber firmly while being sawed, and which may be easily raised from, lowered to, and forced into the timber.

Messrs. Oren Rubarts and John J. Dubruille, of Albany, Oregon, has patented a saddle-horn made of malleable iron, and provided with lugs extending downward on each side and toward the front and rear of the saddletree, whereby both the horn and the tree are braced and strengthened, and provision is made for the ready attachment of the horn and its removal and replacement when necessary.

Mr. Lorenz Lebet, of Pacific, Mo., has patented an improved stock car, arranged in such a manner that stock can be conveniently watered and fed without being removed from the cars.

An improved cultivator has been patented by Mr. Addison Lupton, of Troy Grove, Ill. The object of this invention is to enable plants to be cultivated when small without covering them with clods or soil, and when larger without cutting off or injuring the roots of the plants.

New Water Supply for the City of Oakland.

Near the summit of the Coast Range dividing Alameda and Contra Costa counties, six or seven miles north of the city of Oakland on the Morago Valley road, is situated the property known as the Luch's ranch. On this ranch and near the road above named, a tunnel was started in the side hill, about four years ago, with the purpose of prospecting for coal. After more than two years of persevering and unremunerative labor, for no coal was found, and an expenditure of many thousands of dollars, the company was about to withdraw from the field when a last attempt was decided upon, and a winze ordered to be sunk from the extremity of the tunnel. After a few days' work, instead of striking coal, the astonished miners met with a stream of water so powerful that they had to flee for their very lives; and planks, timbers, wheelbarrows, picks, and shovels were washed out of the tunnel with a frightful velocity. The company being apprised of the fact, went out to see the phenomenon. After having tasted the water, ascertained its quality by analysis, and determined by further investigation that the extent of the underground water basin was of considerable magnitude, the idea of supplying the city of Oakland with pure water originated with the owners of the tunnel.

They at once sent for Mr. John Graham, an expert in waterworks, to have his opinion about the feasibility of supplying the city of Oakland with pure water from the tunnel. Mr. Graham was formerly the superintendent of the Temescal reservoir. This reservoir with its enormous dam was built by Mr. Graham, who also laid the distribution mains clear into Oakland. This Temescal water system, a part of the Chabot water supply, having proved a success in every particular, and no accident whatever having happened during the construction of the works, the tunnel company thought that Mr. Graham would be the proper person to take charge of its works, if it was deemed advisable and profitable to erect them. Mr. Graham, moreover, had built successfully a whole system of waterworks near Edinburgh, in Scotland, at a place named Dunbar, and also has erected waterworks for the village of Worcester, in New York State, this country. Mr. Graham, after considerable investigation of the tunnel water supply, and of the watershed between the summits, which is over 10,000 acres, with many beautiful springs oozing from the hill sides, concluded that water enough could be accumulated there to supply the city of Oakland with its future extensions for 40 years to come. Mr. Graham, after mature reflection, proposed a double system of supply, which is at present under way of being carried out. The magnificent water coming from the underground basin in the tunnel, so delightful in its quality and coolness, would be carried to Oakland in a separate system of mains to be used for drinking and culinary purposes only. The water derived from the springs in the hill sides, and from the rain shed (the lands here are all rock and gravel), although of as pure a quality as those of the San Francisco Spring Valley, would be carried in separate mains to Oakland to serve for laundry purposes, washing carriages, and irrigation, and also for the extinguishing of fires occurring in the city.

These last waters would be kept in a gigantic reservoir, formed by a dam 150 feet high, erected at a place in the cañon 725 feet above the grade of Oakland. As the waters of this reservoir would be conducted directly to the city in a 16-inch main pipe, it is expected that the pressure would be such as to need no fire engines in case of fire to throw the water on to the highest building possible. This, it is expected, would be a great saving to the city, and this alone would be a feature to commend it highly to the favor of the inhabitants of Oakland. Mr. Graham has commenced the construction of the work in earnest, and has been actively at work building a cement and brickwork reservoir to receive the pure waters from the tunnel as they flow out of it. This reservoir, or kind of filtering basin, is intended to catch any gravel or small stones that might be kept in suspension through the velocity of the tunnel waters. These on leaving the basin will be carried through a 12-inch pipe into a reservoir built of masonry and cement, situated near the Deaf and Dumb Asylum, opposite Judge Garber's place. This reservoir is 430 feet above the level of the city of Oakland, is 150 feet in diameter, 60 feet deep, and at a distance of 4 miles from Oakland.

The grading for a line of pipes leading from the filtering basin to the reservoir is being dug along the side hills, and will soon be ready for the laying of the pipes. Soon after this work is performed, and while laying the pipes to conduct the tunnel water to Oakland, the erection of the immense dam across the cañon will be commenced. We expect at some future day to publish in this paper, illustrated with plans and profiles, the whole scheme of the Summit waterworks, to serve as instruction to the interior towns who have not the good fortune of having at hand such a practical man as Mr. John Graham.—*Mining and Scientific Press.*