

broad. They overlie the immense coal beds found in that region, and consist of sandstone impregnated with oil. They are supposed to have originated by the absorption of oil by sand, the oil having been expelled from the ancient vegetable growths by heat and pressure, during the original process of coal formation.

These rich oil shales may be loaded directly into the cars from their native ledges on each side of the track of the existing railway, and their possession must ultimately yield an immense revenue to the company.

ENFORCEMENT OF UNAUTHORIZED CAVEAT RULES.

It has heretofore been the practice of the Patent Office to permit the widest liberty to inventors in the matter of their caveat papers. A photograph, a pen and ink sketch, a drawing of almost any kind, has sufficed, and this freedom has always been a matter of much satisfaction to persons engaged in studying and working out inventions.

In the other departments of the Patent Office, the inventor has been subjected to trouble and expense by the introduction of new rules, or the addition of new forms and ceremonies in the obtaining of patents. The one oasis in the Patent Office desert has been the caveat bureau. Here the inventor has always felt that restrictions were to a great extent removed. He was at liberty to block out his papers in the crudest style if he pleased, and, by payment of ten dollars, have them stuffed away into the official pigeon holes, taking an official receipt therefor. He has always known that his chances of receiving official notice of competing applications for patents were improved by having his caveat papers prepared in a clear and careful manner. Nevertheless, in very many cases, he prefers to describe his invention in his own style in the caveat, even if the officials make his lack of time an excuse for their neglect to send him the notice. Even without the notice, he has found the free caveat facilities, heretofore afforded by the Patent Office, to be a real convenience and comfort.

But the Commissioner of Patents has concluded to deprive the inventor of these satisfactions by requiring that, hereafter, all drawings for caveats shall be done according to the red tape rule. Photographs and ambrotypes (which, by the way, are the cheapest, most convenient and best modes of clearly reproducing a new thing) are now excluded from caveats; so are the ordinary pen and ink and pencil drawings, done on common foolscap paper, uniform with the specification. Inventors who wish to file caveats must now furnish drawings or tracings done on the official sizes and separate from the specifications. Few inventors can do this. They must in future employ agents to make special drawings for them, and pay special charges therefor, thus considerably increasing the expenses of the caveat.

We think this enforcement of rules is entirely unnecessary. It is doubtless a convenience to the clerk who files the caveats, and probably the papers look a little better to the official eye, when filed, if all are uniformly executed. But it is doubtful whether the rule will serve any other purpose. It will certainly subject the caveator to increased expense and inconvenience.

In respect to the filing of applications for patents, the law is very specific. It recites that the applicant shall file a full, clear and concise description of the invention, framed in such exact terms as to enable any person skilled in the art to make, construct and use the same. When the nature of the case admits, drawings must be furnished, and also a model.

In respect to caveats, the law contains no such requirements. It reads as follows:

"Any citizen of the United States, who shall have made any new invention or discovery, and shall desire further time to mature the same, may, on payment of the duty required by law, file in the Patent Office a caveat setting forth the design thereof, and of its distinguishing characteristics, and praying protection of his right until he shall have matured his invention; and such caveat shall be filed in the confidential archives of the Office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof; and if application shall be made within the year by any other person for a patent with which such caveat would in any manner interfere, the Commissioner shall deposit the description, specifications, drawings, and model of such application in like manner in the confidential archives of the Office, and give notice thereof, by mail, to the person filing the caveat, who, if he would avail himself of his caveat, shall file his description, specifications, drawings, and model within three months from the time of placing said notice in the post office in Washington, with the usual time required for transmitting it to the caveator added thereto, which time shall be indorsed on the notice. And an alien shall have the privilege herein granted, if he shall have resided in the United States one year next preceding the filing of his caveat, and made oath of his intention to become a citizen."

It will be noticed that the law does not prescribe the supply of drawings or models, but leaves the creator free to make up the contents of his caveat to suit himself. We believe that the Commissioner's stringent rule in regard to caveats is not warranted by law. Rule 97 reads as follows:

"When practicable, the caveat must be accompanied by full and accurate drawings, separate from the specifications, well executed on tracing muslin or paper that may be folded, and of the same size as demanded in drawings for patents."

Under the general powers of the Commissioner, he may doubtless give minor directions as to the size of sheets, etc.; but in ordering that the caveat must be accompanied by full and accurate drawings, separate from the specifications, he probably exceeds his authority. We hope the order will be modified so as to bring it within the terms of the law, while

granting the utmost possible latitude to the caveator in preparing his papers.

MOUNT SINAI.

The exact location of this memorable spot, sacred in the minds of all Christian people as the place where Jehovah appeared to man in fire; where the Ten Commandments were written by the finger of the Lord upon two tables of stone and delivered to Moses—has always been unsettled. But a Calle telegram announces that all doubt is now removed. Dr. Beke, the celebrated scholar and traveller, gives as the result of his recent expedition the discovery of Sinai and the finding of verifying inscriptions, of which he has made copies. The cable despatch says that the expedition places the holy mountain at "a day's journey northeast of the village of Akaba, Arabia, at an altitude of five thousand feet above the level of the sea."

Dr. Beke has long maintained that Sinai was an extinct volcano, and the correctness of that opinion is now said to be fully confirmed by his personal explorations. Indeed, the Biblical account of the manifestations, which took place at Sinai in the presence of the tribes of Israel, corresponds in several respects to the descriptions given in these modern times of the volcanic eruptions of Vesuvius. In the nineteenth chapter of Exodus the following graphic narrative is presented:

"And it came to pass on the third day in the morning that there were thunders and lightnings, and a thick cloud upon the mount, and the voice of the trumpet exceeding loud; so that all the people that was in the camp trembled.

And Moses brought forth the people out of the camp to meet with God; and they stood on the nether part of the mount.

And Mount Sinai was altogether on a smoke, because the Lord descended upon it in fire; and the smoke thereof ascended as the smoke of a furnace, and the whole mount quaked greatly."

Moses then went up the mount, and the Ten Commandments were proclaimed; the inspired narrator adds:

"And all the people saw the thunderings, and the noise of the trumpet, and the mountain smoking; and when the people saw it, they removed and stood afar off."

Subsequently, it will be remembered, the Israelites forgot their vows and went back to heathenish practices of idol making, and set up a metallic calf. Moses, on coming down from the mount, had the tables of stone in his two hands; and when he saw the molten calf, he threw down the tables and broke them in pieces. Then he broke up the idol, pounded it into fine dust, which he scattered in a brook that came down from the mount. The inspired narrative then tells us how, by prayer, the Lord was appeased, and He commanded Moses to hew out another pair of tables, and take them up the mount, which he did. Whereupon the Lord again wrote out the same ten commandments as at first, and gave the two new tables to Moses, who brought them down from Sinai and put them in an ark which he had made of shittim wood, "and there they be." Deut. X, 5.

It would be interesting to know what kind of stones are conveniently found at Sinai, out of which Moses might have hewn the tables. From their light weight, indicated by his carrying one in each hand, going up and down the mountain, it would seem as though they might have been composed of slate or other laminated formation. We presume that Dr. Beke's report will give full particulars of the geology of the neighborhood, and perhaps tell us something new about the Mosaic stones.

PLEASANT WORDS.

We are receiving so many kind letters of encouragement and approval of our efforts that, while we should delight in returning our sincere thanks individually to each writer for his good wishes, we would but trespass on the good nature of our readers in monopolizing too large a space in columns which might be filled with more generally interesting matter. We trust, however, that we may not lay ourselves open to the imputation of undue egotism by quoting a few of the pleasant words we receive, since we do so more to mark our appreciation of the spirit which prompts them than for the benefit they may secure to us in the commendation which they express:

"I have completed my quarter of a century as a reader of your paper, and a good portion of that time have been a direct subscriber. I thought to do without the SCIENTIFIC AMERICAN this coming year, but it won't work, so I try it another year. I have been trying to find fault with it all my life, and for all I know will continue trying, and so far unsuccessfully," says one correspondent, and a score or so more writers echo about the same opinion. The *Science Record* for 1874 is also coming in for its share of approval. A letter before us says: "It is a perfect storehouse of valuable and instructive information," and another reader tells us that the lady members of his family join with him in thinking it "one of the most useful and interesting books in the library." For all of which very flattering comments we metaphorically disapparel our heads, make our very best bow, and, with conscious unworthiness, return acknowledgments as grateful as they are sincere.

SCIENTIFIC AND PRACTICAL INFORMATION.

TRIAL OF THE WATER WORKS AT ROCHESTER, N. Y.

The water works of the city of Rochester, N. Y., constructed on the Holly system, have recently been completed, and on the occasion of a public test developed a power and capability which may be fairly considered as unprecedented. The machinery consists in two sets of pumping engines, each of four double acting cylinders 9 x 24, each set being arranged to take suction and discharge at eight suc-

cessive and equal points during the revolution, to give a uniform and steady flow. These supply the mains and pipes for ordinary use and are run by two turbine wheels driven under a 90 foot head. There are also two pairs of double cylinder steam engines, actuating four double acting pumping engines 10½ x 27, a 150 horse rotary Holly engine, and two rotary Holly pumps. The capacity of all is not less than 4,000,000 gallons per hour in the street mains per 24 hours, and 3,000,000 gallons in the same time can be delivered extra, by the steam machinery. The water is taken to the city by an aqueduct from Hemlock Lake. On the occasion of the trial, says the *Rochester Union*, the works succeeded in throwing thirty large streams at one time, to a sufficient height to be efficacious in cases of fire, reaching an average altitude of 135 feet; one two inch stream was thrown up 220 feet; one four inch horizontal stream was thrown 465 feet; one three inch stream reached an altitude of 285 feet; a four inch vertical stream was thrown 287½ feet; and a vertical stream five inches in diameter was thrown 250½ feet! These are, indeed, astounding facts. It was, however, in the thirty stream test that the practical usefulness of the system was most clearly demonstrated. The four and five inch streams could rarely if ever be rendered useful for fire purposes, and it is doubtful whether under any circumstances it would be safe to have recourse to them. So great is the force of the torrent thrown from the standing pipes that few buildings in any city would be able to stand up long under it.

A NEEDED IMPROVEMENT IN SUGAR MAKING.

Mr. José Guardiola, of Hacienda, Chocó, Guatemala, the inventor of several improved machines for sugar making, coffee drying, etc., descriptions of which were some time since published in these columns, forwards us a letter inquiring whether there is any means by which sugar drained in centrifugal machines can, after the operation, be compressed into loaves or square cakes, so as to remain as hard and compact as ordinary sugar loaves drained in the mold. To drain sugar in a centrifugal machine is an operation which takes but a few minutes, and has the advantage of economy of time and cleanliness; while on the other hand purging sugar in molds requires from six to ten days, increased expenses, more buildings, and greater waste. Our correspondent thinks that pressure will not effect the desired result, but we hardly agree in this view. As long ago as thirty years, sugar was pressed in copper molds. In regard to his inquiry above, however, we learn upon investigation that, if the crystals are compressed when damp and the sugar put into a drying room heated to a temperature of 130°, adhesion will be likely to take place.

THE CHILI EXPOSITION.

In relation to the projected international exposition, to be held in the fall of 1875, in Santiago, Chili, our manufacturers would do well to bear in mind that at the present time fully ninety-five per cent of the trade with Chili is monopolized by England, as against five per cent with the United States. The South American Republics undoubtedly offer a great market for our productions, and it would seem, from our geographical position, that the advantages of the same should be to us instead of to Great Britain. The reason is, however, the lack of an extended means of communication between the United States and Chili as exist between Chili and England; but it would appear that, were the limits of trade between the two first mentioned countries enlarged, the facilities for its greater pursuit would necessarily follow. We have received a prospectus of the enterprise, which gives full particulars. Information may be obtained from Mr. Stephen Rogers, Consul for Chili, 249 West 42d street, New York city.

STEAM ON THE CANALS.

The commissioners appointed to examine the inventions submitted as appliances for steam navigation of the canals, and in competition for the reward of \$100,000 offered by the State of New York, have made their final report to the Legislature. The committee were not unanimous, owing, as they state, to the ambiguity and extreme stringency of the law creating the commission, and were unable to make the award under the circumstances, and they leave to the Legislature the question of compensation. Mr. Baxter's boat, they admit, distanced all competitors, but it is believed that Mr. Dobbin's device also possesses great merits, so the matter is compromised by suggesting that \$35,000 be paid to the first named inventor on his placing upon the canals seven vessels, built and equipped in like manner as the boat tested, and \$15,000 to Mr. Dobbin on his supplying three, constructed according to his plan. It seems to be the general opinion that the act providing for the above mentioned sums will be passed and the matter thus ended.

THE RAPID PROPULSION OF FLOATING BODIES.

It has been remarked in England that, on the canals, the boats, when drawn by horses at a considerable degree of speed, float higher in consequence of the oblique action exercised by the water. Impelled at an enormous velocity, floating bodies would merely scrape along the water, like a *ricochet* bullet.

The English Admiralty recently charged Mr. Froude to examine into the phenomenon; and he finds that the laws of the resistance of a plane surface, A, placed in the water under an angle, θ , are the following: $P = 3.43 A v^2 \sin \theta$ for a plane deeply immersed, and $P' = 2.14 A v^2 \sin \theta$ for a plane placed at the surface. The vertical component is $P \cos \theta$.

An example will render this clearer: A floating body displacing 2,500 tons, of which the bottom has an inclination of 4 inches to a foot, is given a velocity of 16 knots, that is 26.4 feet per second, and thus causes an emersion of 171 tons. Substituting the latter number in the formula, the velocity gained will be 7.6 feet per second.