stopping the pumps, it was found that the amount of oil used was a little over a hundred and nineteen gallons.

Three hours after the close of the trial, the Boulogne steamer passed broad strips of comparatively smooth water, on which the oil still lay.

After this experiment, two of Mr. Gordon's inventions were tried. One of these consists of a shell fired from a mortar, and so arranged that it bursts on striking the water, and frees its contents of oil. The shell is specially constructed, and has an ingenious device for insuring its explosion, which is effected by a fuze and gunpowder. This recommends itself as a practical means to render less dangerous the communication between ships by boats during heavy weather. In case of shipwreck, also, the approach of lifeboats could be greatly facilitated.

The second invention is an arrangement to make a lane of oil from the shore to a stranded ship. To effect this, an iron cylinder is fired from a mortar in the direction of the ship. The cylinder, which serves as an anchor, draws after it a leather hose fastened to it by a line. Oil is then pumped through the hose, and, being spread towards the shore by the wind, forms a quiet surface for the rescuing boat.

Various ingenious contrivances have been invented for applying the oil to the water; but the simplest and readiest, at the same time most effective, appliance is a canvas bag, either rather loosely sewed together, or pierced with small holes to allow the oil to escape. This has been the method adopted in the most successful cases reported from ships at sea, and has been found effectual in some of the lifeboats. It has the great advantage of being self-acting, insuring a regular stream of oil, and being easily renewed when exhausted.

In a vessel or boat running before a sea, one should be hung over each bow, which gives the oil time to spread before reaching far astern. In a ship, when hove to, one or more bags have sometimes been hung over the weather side, and sometimes been put overboard to windward, attached to light lines. This is the best plan, because, not drifting so fast as the ship, the bag will be carried to windward, and fulfil the condition of applying the oil to the water at some distance from the ship, in the direction from which the waves are advancing.

An open boat, unable to run before the sea, will always endeavor to put out some form of sea-anchor, with a rope attached to it: the bag of oil should be attached to this, and, failing every thing else, a boat's mast or a sail loosed is very effective.

When the boat is anchored, the bag could be attached by a light line to the anchor as a buoy. This appliance, in addition to being efficient, has the great merits of handiness and simplicity. Two such bags, holding about a gallon of oil each, with the line attached, might be kept full, and packed in a small cylinder similar to a paint-pot or a preserved-meat tin, and would form neither an expensive nor cumbersome article of equipment in a boat.

In the absence of these or similar contrivances, the oil could be poured from a bottle or can; but this would require a man's attention when one could be ill spared possibly, and might not insure so constant or regular a supply, which is of importance. This would not be applicable to a boat at anchor.

REPORT OF THE SUPERINTENDENT OF THE U. S. NAVAL OBSERVATORY.

THE report of Commodore S. R. Franklin, who succeeded Admiral Shufeldt as superintendent of the observatory on Feb. 21, gives, under date of Oct. 29, 1884, a summary of the work accomplished during the year. In organization a slight change has taken place by the appointment (by the superintendent) of a board consisting of the superintendent, the senior professor of mathematics, and the senior line-officer, to determine the scope and character of the work to be done. The board may be convened at the request of any member, and a weekly report is submitted to the superintendent every Monday by each officer in charge of an instrument.

The twenty-six inch equatorial, in charge of Professor Hall, has been employed mainly in observations of the satellites of Neptune, Uranus, Saturn, and Mars, and of double stars, with a few observations for stellar parallax. In the case of Uranus, the observations were confined mostly to the outer satellites; and it is proposed now to discontinue them, since the favorable time for determining the position of the orbit planes of these satellites has passed. The reductions are all well advanced.

The transit circle has been under the charge of Prof. J. R. Eastman, and has been employed in observations of the sun, moon, planets, comets, and a catalogue of miscellaneous stars, as in previous years. The nine-inch equatorial, in charge of Commander Sampson, has been used in observing comets, minor planets, and occultations. The series of observations with the prime vertical instrument was practically finished in May, 1884. The reductions are being carried on by Ensign Taylor. The meridian transit instrument has been used primarily to determine clock corrections, in connection with the daily time-service. Observations for the right ascensions of the sun, moon, and major planets, have also been made.

The time-service has been considerably extended. In addition to the lines already existing, the Baltimore and Ohio telegraph company looped two of its main circuits into the observatory, and the signal-service looped one. In March last a proposition was submitted to the heads of the several departments in Washington, to place in the more important offices of the government, including the executive mansion and the capitol, a clock that should be regulated and controlled every day from the observatory, which establishment should be responsible for the determination and transmission of correct time. This plan met with general approval; and an insulated circuit was established connecting the various offices, some twenty in number, with the observatory. In each

of these offices is a clock which is corrected daily, at noon of standard time, by means of an automatic attachment (the invention of Mr. W. F. Gardner, the instrument-maker of the observatory), actuated by the current which makes the signal for dropping the time-ball at the observatory, and on the Western union telegraph company's building in New York.

In the publication of its annual volumes, the observatory has been much embarrassed, owing to the limited amount of the printing-fund of the department. The volume for 1880, which it was expected would be ready by the 1st of January, was not received until October; and the computations, even with the small working force available, have been carried much beyond the printing.

In regard to the proposed new observatory, the superintendent says, —

"I cannot too earnestly urge upon the bureau the necessity of commencing the buildings for the new observatory. The ground having been purchased, and the plans made and approved, there seems to be no good reason why the construction should not begin. The present site is notoriously unhealthy, and the buildings are dilapidated and much in want of repair; and it would not be in the interest of economy to make any extensive repairs while the erection of new buildings is in contemplation. The delay is very prejudicial to this establishment in particular, and to the cause of science in general. I respectfully request, that, if all the money cannot be appropriated for the purpose aforesaid at the coming session of congress, a portion of it, at least, may be asked for, in order that this work, now so long delayed, may be begun."

An estimate of $586,138 is submitted for erecting the necessary buildings.

An appendix contains a report by Professor William Harkness, showing the progress made in the reduction of the transit of Venus observations. The photographic negatives (over fifteen hundred) have all been measured, and very considerable progress has been made in the computations necessary for the reduction of these measurements. An extended investigation is now being made of the focal lengths of the photographic objectives, and the radii of curvature of the heliostat mirrors.

BANDELIER'S ARCHEOLOGICAL TOUR IN MEXICO.

The author of the report before us is well known in New-England archeological circles, having won for himself a fair name through the publication of three essays, — on the art of war and mode of warfare, the distribution and tenure of land, and the social organization and mode of government, in ancient Mexico. In consequence of these scholarly discussions, the archeological institute, in 1880, commissioned Mr. Bandelier to investigate the condition of the sedentary Indians of New Mexico, and in 1881 a second time commissioned him to carry out an archeologic exploring-tour through Mexico proper. The report under consideration, profusely illustrated, and numbering three hundred and twenty-six pages, gives a full account of the results of Mr. Bandelier's studious researches on his second expedition.

Report on an archeological tour in Mexico, 1881. By Adolph F. Bandelier. Boston, 1884. Published in Papers of the Archaeological institute of America. Series II.

The account, it seems to us, has assumed rather the form of a scientific narrative than that of an official report made to a committee. The author was able to draw upon an immense stock of preparatory studies; and, accustomed to look at ancient Mexico through the spectacles of the chroniclers, the objects that strike his eye at each step on the classic soil remind him of some passage read, the true meaning of which he now strives to detect, with the help of ocular inspection and learned reasoning. Thus, also, the grandeur of the surrounding scenery invites him to give us data of hypsometry and meteorology, of vegetation and interesting culture-plants. He compares statistics of old with those of the present time, and cautiously avoids entering into controversy with the theories urged by other scholars or non-scholars to solve the origin of the mysterious temple and palace builders of Mexico. To be brief, by a very adroit interspersion into his text of nicely presented scientific *causeries*, Mr. Bandelier, it appears to us, may have secured for himself a larger number of readers than if he had chosen to offer a compact and matter-of-fact report.

The text is divided into four chapters. In the first chapter the author, reposing on a steamer's deck, calls us to his side, and, pointing toward the vast main, allows us to partake of the rich stock of his reminiscences. He tells us of the legends hovering around the ancient province of Huasteca, its forest-buried cities, the colossal structures of Papantla and Misantla, and deplores the fact that a thorough exploration of these hitherto but vaguely described ruins is beyond the limits of his mission. On his road from Vera Cruz to the capital, he engages in discussions on the *étapes* once taken by Mexico's first conqueror, the natural and artificial obstructions that Cortez met with, and the allies he was so fortunate as to secure in the Indians of Tlascala. After Mr. Bandelier's arrival in the capital, he very judiciously sets forth to acquaint himself with the best authorities in Mexican archeology. He takes their advice and suggestions, carefully examines the objects of antiquity preserved in the museum, and collects valuable data on the former expanse and limits of the renowned lagoons, and the modern efforts made for their regulation and draining (pp. 49–78). In the third chapter, Mr. Bandelier's independent and main work is given. It bears testimony to the most thorough exploration ever made of the often-described pyramid of Cholula, its structure, appendages, and surroundings. No hewn stone, no sculpture, no masonry or mound, remains unexamined; and no hint picked up from ancient reports, if serving his purposes of reconstruction, is slighted, but dexterously employed to give fuller shape and brighter color to the picture we are wont to form of the once stately and now decaying fabric. He succeeds, finally, in showing that in former times the giant pyramid did not stand isolated, but east and west of it were two companions, considerably smaller, however, and of the well-known teocalli-shape,