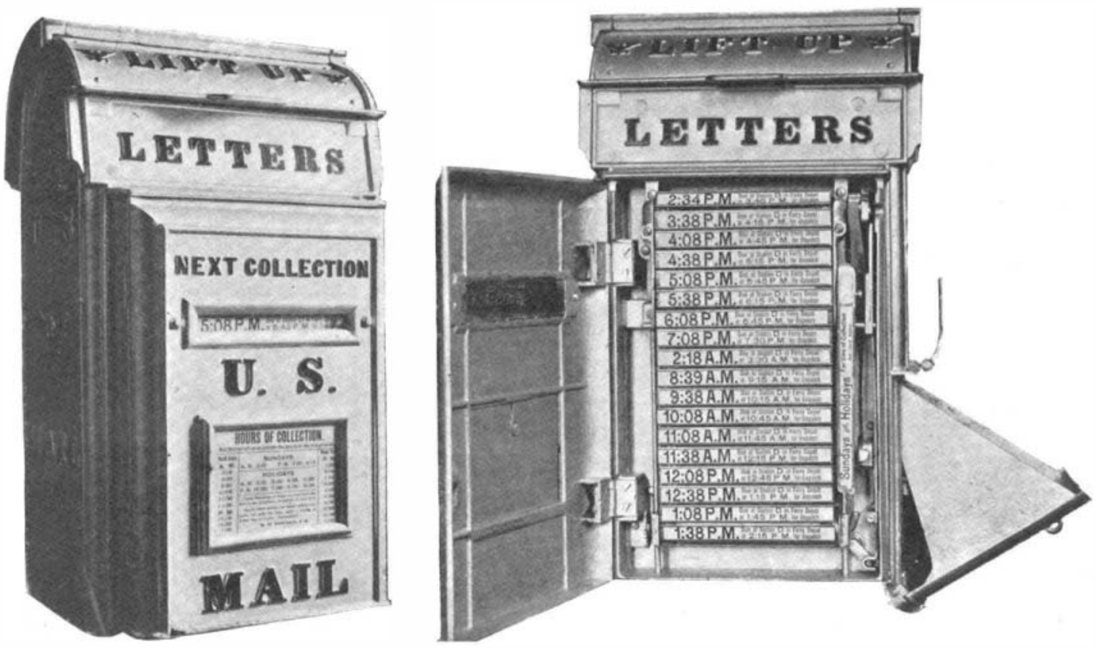
NEW LETTER-BOX INDICATOR.

A San Francisco, Cal., inventor has produced a novel and complete time indicator for letter-boxes that will give assistance and information to the general public besides being of great benefit to the business world. This indicator is the invention of D. S. Richardson, superintendent of the San Francisco post office, together with others who have had much experience in this branch of the government service.

The indicator can be attached to any ordinary street letter-box, and will stand as much rough usage as the box itself. Regarding the construction of the indicator, its outer shell is a casting which takes the shape and dimensions of the front of the box to which it is attached. Its depth is about two inches, and its ornamental design adds to the symmetry and general appearance of the ordinary letter-box. A glass-covered slot, or window, about one by six inches, adorns the front. An endless chain, or belt, passes immediately behind this on the inside. The latter travels over the two rollers and carries the time announcements, which are displayed automatically and in regular sequence before the little window.

The mechanism is actuated by a crank and lever leading from a pawl and ratchet attachment to the upper roller down to the tray or drop door of the letter box. The rollers are set in motion by the simple act of opening the box, which carries the belt around just far enough to expose the next announcement or time of the next collection. The chain or belt is constructed so that it may be adjusted for any number of collections, and the card announcements may be easily changed to meet any requirements of the service. A very novel device has been introduced to overcome the difficulty resulting from the broken and irregular time of intervening Sundays and holidays for boxes from which collections are made from five to thirty times a day.



NEW TYPE OF LETTER-BOX BEING TESTED IN SAN FRANCISCO.

A box, for instance, from which twenty collections are made daily, will run automatically from Monday morning until Saturday night, or six full days. No attention whatever is required from the collector during that time. On Saturday night the collector moves a small lever which extends backward from the indicator into the main chamber of the letter box, and this throws an arm, very much like a railroad semaphore, directly across the slot opening, completely hiding the time announcement behind it. Any announcement may be printed upon the exposed arm of the semaphore, such as showing the Sunday collection hours, or else calling attention to the Sunday and holiday time as shown on an ordinary time card just below.

The act of throwing this semaphore into position disengages the gearing of the mechanism of the indicator without actuating the latter or moving the rollers. While the semaphore is up and exposed in the slot, the mechanism of the indicator is resting, holding itself in readiness for Monday morning and the next week's run. The last collector on Sunday night must throw down the lever, which was put up by the last collector on Saturday night, and then the hour of the first collection on Monday morning is in plain view in the slot. Not only does it show the collection hours, but also when each collection will reach the main post office or point of distribution, and when it will be sent out or dispatched from there to the trains or steamers. It makes each box a complete little bureau of information, besides acting as a check on the collector, and does away with the old method of detecting irregularities by means of decoys. The indicator always announces advance time, and is somewhat like a Bundy clock, telling its own story to the public and postal officials who may be acting as spotters to detect any lack of the faithful discharge of duties imposed on box collectors. The latter are required to make but two motions a week to make the indicator automatic in every detail, as the lever is thrown up on the last Saturday night collection and thrown down again on the last collection Sunday night. This duty is always to be performed about midnight and when the fewest number of men are on duty. The day collectors have no care in the matter whatever.

San Francisco, for example, has five mounted men who take up the night mail from the boxes throughout the entire city, and they would have to be charged with the duty of changing the arm or semaphore on Saturday and Sunday nights. Should they fail to do so, the first caller in the morning would discover it by the false time on the box. Its adoption does not call for the abandonment of any part of the present box equipment, it being designed for attachment to any box now in use by the government.

HERBERT I. BENNETT.

METHODS OF REVOLVING THE OPTICAL APPARATUS FOR LIGHTHOUSES.

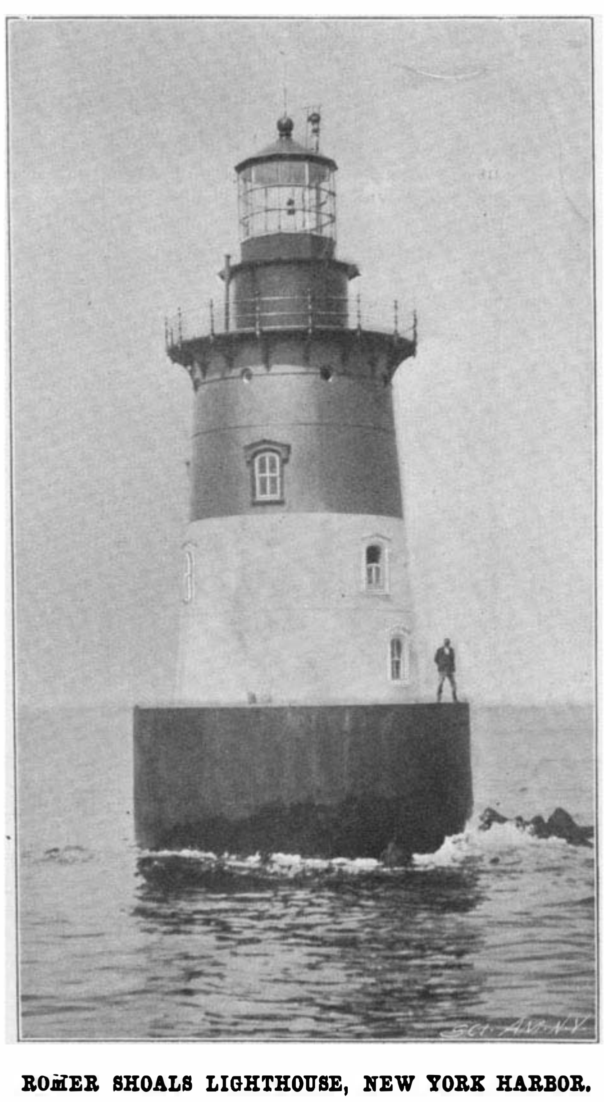
BY COL. D. P. HEAP.

Whenever a stretch of coast is to be lighted, it is necessary to differentiate the lights from one another, so that the mariner may know positively where the lights visible to him are located, so that he may be able to properly lay his course. To do this various methods are possible: one by giving different colors to the lights, and another by some arrangement which will make the light invisible at determined intervals. The former method is accomplished by interposing red or in some rare instances green glass screens in front of the light; but it is objectionable, as the loss of light is respectively 75 and 80 per cent, and, especially when green glass is used, the color, under some conditions, is difficult to distinguish from the ordinary light.

In the second method the light can be eclipsed by interposing an opaque screen moved at regular intervals by clockwork. During the obscuration, the light, of course, is lost, but this method has the advantage of economy and can be applied to any existing fixed light without affecting its range of visibility. A number of lights in Delaware Bay are so arranged.

The method which gives the most powerful light is to use an optical apparatus which will project a number of horizontal beams of light like the spokes of a wheel, and then to revolve the apparatus.

It is evident that the observer, wherever situated, will see as many flashes during one revolution of the apparatus as there are beams of light, and that these flashes will be separated by intervals of darkness. It is also evident that the power of these beams will vary inversely as their number; for example, if there are but two beams, each beam will be twice as powerful as if there were four; on the other hand, if the speed of revolution of the apparatus in each case is the same, the interval between flashes with two beams will be twice as great as if four were used, which is a serious defect when the speed of revolution is slow, as the mariner may have to wait one or even two minutes before he sees the flash, which is now the case in a number of the lighthouses in this country.


ROMER SHOALS LIGHTHOUSE, NEW YORK HARBOR.

Before the invention of the Fresnel lens, metallic reflectors were used. Mr. Thomas Stevenson describes a revolving light of this character in "Lighthouse Illumination," published in 1859. The following is an extract:

"The characteristic requirements of a revolving light are the alternation of light and darkness in every azimuth. In the catoptric system this is generally effected by means of a revolving frame, on which the reflectors are placed, each having its own lamp attached to it. Whenever, by the revolution of the frame, the axes of the reflectors are pointed to the eye of a distant observer, he receives the full effect of the light. From this description it is obvious that if the revolving frame has four, six, or eight faces, with one or more reflectors on each, as shown in plan and elevation, Figs. 1 and 2, there will be constantly illuminated four, six, or eight corresponding portions of the horizon; and as the frame that supports the reflectors which produce their corresponding beams of light revolves on its axis through 360°, the luminous patches will, in like manner, traverse along the distant horizon. The action of the optical agents in this instance must obviously differ from that required for fixed lights."

In this case the framework carrying the lights revolves around a central shaft, the power being applied by means of a bevel gear at *m*.

With the advent of the Fresnel lens now in use a special support became necessary. The first was known as the chariot and it is still largely in use. It consists of a steel ring supporting a number of wheels. The base plate of the lens rests on these wheels, which, in their turn, run on a steel track on top of the pedestal. Other wheels with vertical axes are in contact with the vertical collar and prevent lateral motion. This device answers well enough where slow speed is required, but there is too much friction developed when the speed is greater than one revolution per minute, especially with the heavy apparatus of the highest orders; moreover, the chariot wheels are expensive to manufacture, and the track on which they run soon becomes deteriorated.

The late Brig.-Gen. James C. Duane, when he was engineer of the third lighthouse district, devised a pivot to support lenses of the fourth order and smaller. This pivot, which was of hardened steel, rested on a hardened steel plate, both being submerged in oil. This materially reduced the friction, but the lateral motion had to be prevented by a shaft running in a brass collar, and there was considerable friction between the collar and shaft. In 1893 I substituted ball bearings for the pivots, but retained the collar and shaft, and thus did not reduce the friction as much as was desirable. The necessary speed of rotation had in the meantime much increased, in fact, the speed of rotation of a "lightning light" was not infrequently one complete revolution in ten seconds. To get this speed with lenses weighing as much as three tons supported on chariot wheels was impossible without increasing the power and size of the rotating apparatus beyond reasonable limits.

The French engineers, however, solved this problem in a most satisfactory manner by supporting the lens apparatus in a bath of mercury. This allowed the use of "feux eclairs," or "lightning lights."

I quote the following from a recent pamphlet of Mr. W. T. Douglas, M. Inst. C. E.:

"Such was the position of affairs when the invention of Mr. Bourdelles inaugurated a revolution the full extent of which has perhaps hardly yet been realized, for the "feux eclairs," with its mercury float rotation, has, wherever it has been adopted, commended itself to the approval of the maritime world. It is universally admitted that, sufficient power being granted, the fixed light is, from the point of view of visibility, the light par excellence. It is kept constantly in view, and a bearing can be taken from it and a course steered to it with absolute certainty when it is once picked

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up. The same statement could not be made with reference to a slow-revolving light; the periods of darkness are so long that the sailor is apt to lose patience, and if he happens to miss one or more flashes from any cause, as, for example, from the vessel falling into the trough of the sea, or from the obscuration of the light by masses of spray or even possibly by a passing vessel, his nerve may become unstrung, he wavers, and a disaster may result. Now this danger and difficulty the feux eclairs readily surmounts, as its lightning flash or flashes, occurring every five seconds with persistency, renders it for all practical purposes a fixed light, while it confers the further advantage of a positive characteristic."

The use of the mercury bath for rapidly revolving lenses of the 1st and 2d order seems at present to be a necessity. At least no satisfactory substitute has yet been found. The objection to it is its cost, while the objection to chariot wheels is the friction developed, and also their cost—though the latter is not so great as with the mercury bath system.

As ball bearings had been successfully used for thrust bearings, it occurred to me that they might be satisfactorily applied to lens apparatus of the fourth and fifth order whose weight is not excessive. After a series of experiments, I found that I could revolve apparatus of this kind at moderately fast speeds, say one complete revolution in twenty seconds. This allowed the use of lens apparatus with an increase in the size and dimension of the number of panels without prolonging the interval between flashes. For example, these intervals, with a four panel lens, need not exceed five seconds.

The use of the ball bearings necessitated an entire change in the pedestal supporting the lens, in the clock for revolving it, the method of raising it, and in the lamp. These changes are as follows: The pedestal (Fig. 5) consists of four wrought-iron pipes covered with brass tubing for a finish. These pipes are secured to a base ring which is to be screwed to the lantern floor and support a cast-iron plate. Below this is a brass plate on which the clock rests. The pedestal must be carefully leveled.

On the cast-iron plate is a brass cylinder, threaded to receive a collar, and on the cylinder is an iron plate on which the ball bearing plates rest. This method of construction brings the ball bearings as nearly as possible to the center of gravity of the lens. Another iron plate rests on the upper ball bearing plate, and on the former the lens is supported by three diagonal braces; this plate also carries the lamp. (See Fig. 5.)

The clock (Fig. 4) is regulated by a centrifugal governor. As the speed increases, the balls fly out and draw the disk on the left hand side of the clock to the right until this disk touches a small rawhide finger which can be moved back and forth by a screw; the farther this disk can travel, the greater will be the speed of the clock. The speed can be regulated to a nicety while the clock is in motion, which is not the case when fan governors are used.

The vertical spring on the left hand side has a brass finger which touches the disk when the clock is at rest, and by so doing makes an electric connection and rings a bell to warn the keeper that the clock has stopped; a switch is provided to open the circuit during the day.

The wire handle shown lying at base of clock in Fig. 4 can be secured around the groove in the lower ball bearing plate, and both plates and balls can be lifted out. The reverse of this process allows the ball bearings to be returned to their position and the lens made ready for use. The ball bearing plates and the balls are of the best tool steel, hardened, tempered and polished. The balls and grooves must be kept scrupulously clean and free from rust. When not in use the plates and balls are kept in a dust-proof brass box, the balls resting between two disks of chamois leather. A spare set of ball bearings and a spare governor are supplied with each apparatus. I find that there is less friction than with the mercury bath and the cost is less; the mercury alone for a fourth order lens costs about $100, while the cost of the ball bearings is $15 each.

The apparatus illustrated is a Chance Brothers fourth order flashing lens, three panels having been removed and replaced by silvered spherical reflectors. It is designed to make a complete revolution in 30 seconds and will give a flash of about ⅙ of a second duration every 10 seconds. A similar apparatus, but with six panels, is in successful operation at Romer Shoal Light Station, a view of which is herewith presented. It gives a flash every 4 seconds. I do not think that there is any other fourth order lens in our service with as short intervals between flashes.

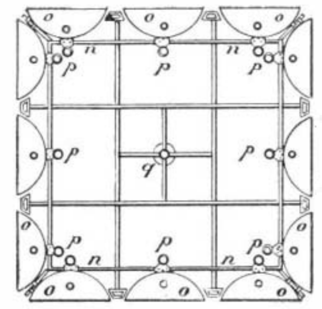

Fig. 1.

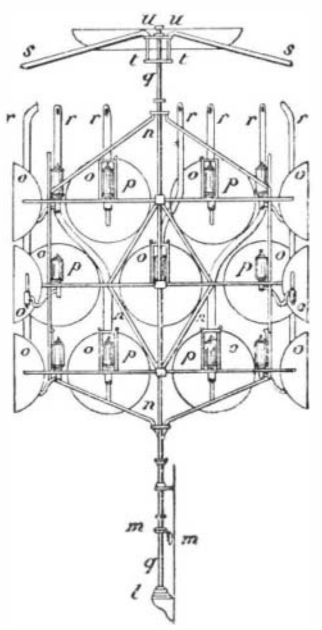

Fig. 2.

DIAGRAM OF REVOLVING LIGHT WITH METALLIC REFLECTORS.

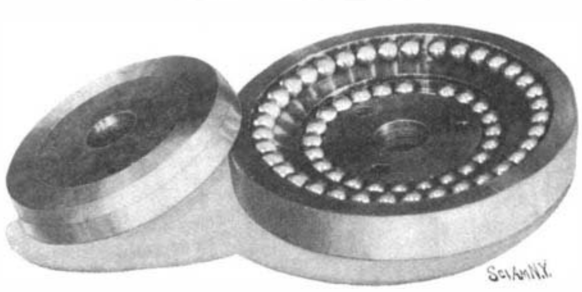

Fig. 3.—BALL BEARINGS FOR RAPIDLY REVOLVING LENSES.

The lower circle of balls carries the weight and the upper circle prevents lateral play.

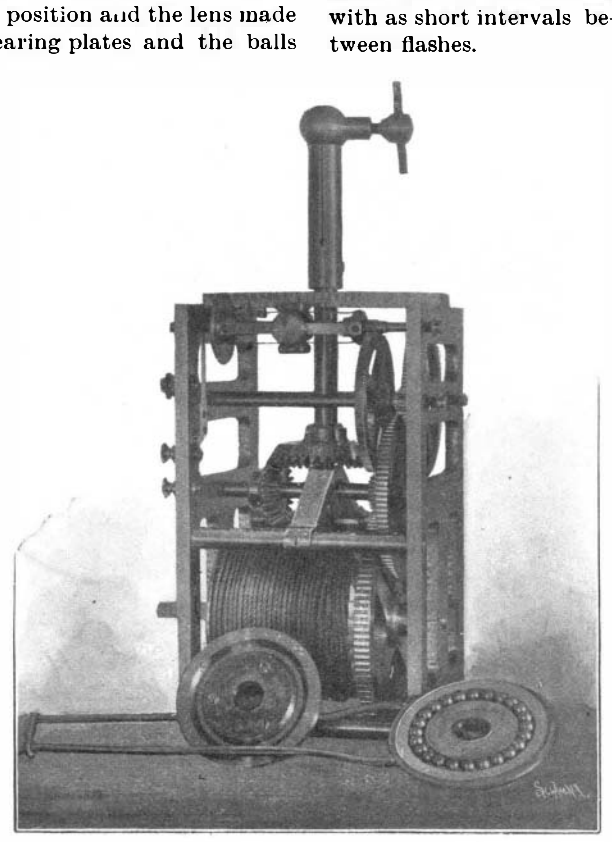

Fig. 4.—LAMP PEDESTAL AND CLOCK, SHOWING BALL BEARINGS REMOVED.

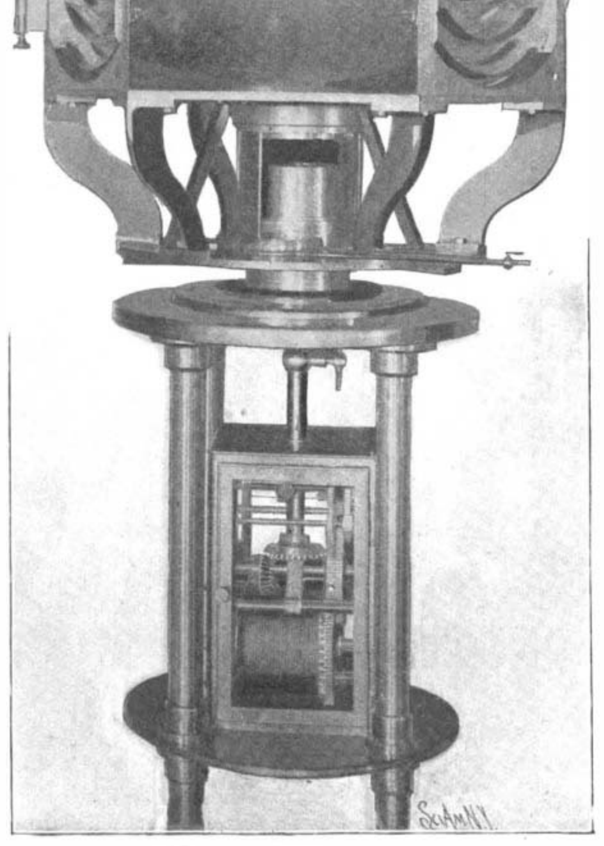

Fig. 5.—FOURTH ORDER FLASHING LENS LAMP FITTED WITH HEAP'S BALL BEARINGS.

The principal advantage is the speed of revolution which can be obtained by this system. Incidental advantages are the increased room in the lantern, the ease and certainty of regulating the speed while the lens is in motion, the facility with which the ball bearings can be removed and replaced, and the addition of the electric alarm to warn the keeper if the lens should slow down or stop from any cause.

A third order lens at Sturgeon Bay Canal Light Station is now revolved on this principle, but I do not consider that it has yet been in use long enough to have got beyond the experimental stage.

The Scientific Extermination of Locusts.

The locust or grasshopper inflicts enormous damage annually. Of late years it has been most destructive in Algeria and Morocco, and in South and East Africa. Its ravages in the United States have been most severe in cities west of the Mississippi, and the destruction in some areas has, at times, been so great that farmers have been compelled to leave their homes and seek a livelihood elsewhere. It is possible that a remedy discovered in South Africa may restrict if it does not wholly destroy the evil. There is ground for encouragement in the great success of the experiment.

In 1895, according to The New York Sun, the locusts in Cape Colony appeared to have been almost destroyed by an epidemic, and investigation carried on by Mr. M. S. Evans seemed to prove conclusively that the disease was the result of feeding upon a fungus growth now known as "locust fungus," and that a few insects affected with the malady might communicate it to millions. In the following year a similar epidemic occurred in Natal, and the idea began to prevail that the malady might be propagated among locusts wherever they became troublesome. After repeated experiments in the Bacteriological Institute at Grahamstown, Cape Colony, a pure culture was obtained from the locust fungus, and the insects that were brought in contact with it at the institute died.

In 1897, experiments on a large scale in the artificial propagation of this disease were carried on in Cape Colony, Natal and Rhodesia, with very satisfactory results. Immense swarms of locusts perished a few days after the infection of a number of individuals in each group. It was also found that the best results were obtained during the periods of rain, when the locusts remain a longer time in one place, and the spread of the infection was thus facilitated. On the contrary, in dry, hot weather, when the flight of the insects was rapid, the sick were left behind and the majority escaped contagion. The Bacteriological Institute now sends out the culture from the locust fungus in tubes which may be sent thousands of miles away.

It is applied in various ways; one is to smear several insects with the culture and let them rejoin their swarm; another is to drop the contents of the tube upon bits of humid earth where the insects are feeding; another is to bottle up the locusts with a little of the food which they prefer covered with the culture, and after they have eaten the food to set them at liberty. It has also been suggested, but presumably it has not been tried, to put the contents of the tube in a basin of warm water and immerse a number of insects in it and then set them free. The new remedy has been tried in the Kilimandjaro district. Ten locusts were treated from each of the five different swarms, and in four days after the infection the five swarms were lying dead in heaps. Locusts have been a great scourge in German East Africa and fresh culture tubes are to be supplied gratuitously to planters, missionaries and merchants, and will undoubtedly prove a great boon.

THE British government has chartered 109 vessels for the transportation of troops.

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