A FRENCH MODEL ACETYLENE LAMP.

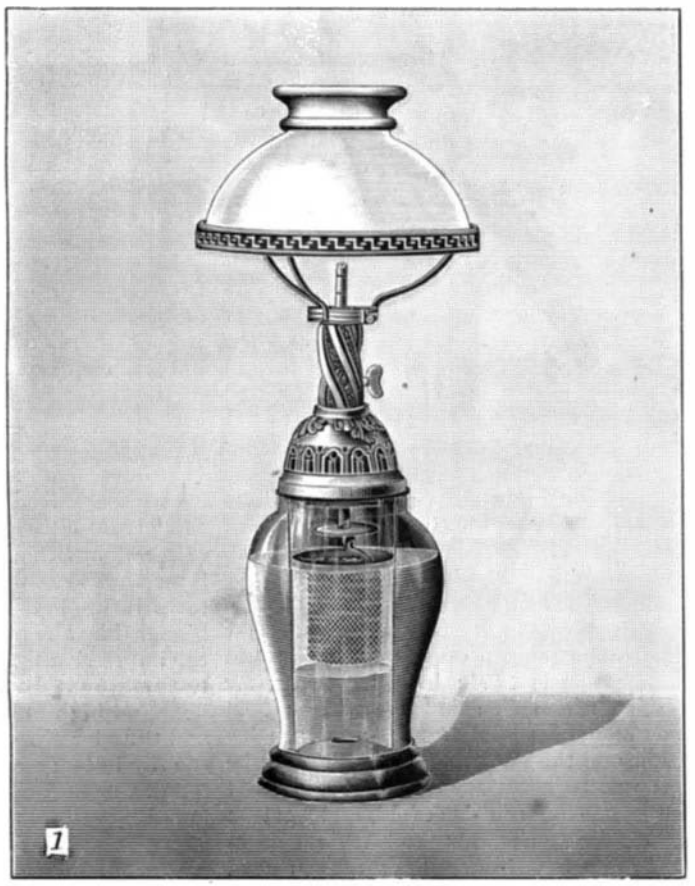
The rapidity with which acetylene has received commercial development is very remarkable. It is hardly a matter of surprise that one of the most artistic and convenient examples of the uses to which this new material as an illuminant can be put is due to the ingenuity and good taste of the French. The lamp shown in the accompanying illustration is from the laboratory of Mr. G. Trouvé, the well known French scientist, and shows the practical form in which the lamp may be constructed to render it available as a portable lamp for domestic uses. Before, however, such a lamp is introduced into general use in the family the fact of its absolute safety and impunity from accident must be assured, and such an end will be reached in time, no doubt, by experiment and by perfecting the apparatus.

It is interesting to notice the credit given in La Nature to the original simple apparatus, described by T. O'Conor Sloane, in our columns, as being the first acetylene lamp produced, which apparatus was given originally in the pages of the SCIENTIFIC AMERICAN of March 30, 1895. This appeared in the spring of 1895, and La Nature speaks of it as the first acetylene lamp ever made.

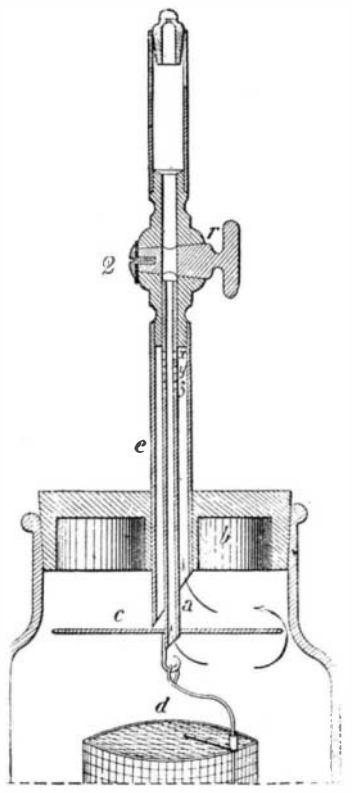
G. Trouvé's lamp, of an exceeding simplicity, consists of two glass vessels, one fitting within the other, and of a metal part closing the top, to the center of which top is connected the jet or burner tip.

In the interior vessel, which is practically a bottle with a large neck, is suspended a little metal basket which holds the calcium carbide; the bottle in question has a conical opening in its bottom, the size of which orifice depends on the use to be made of the lamp, so that the movements within this bottle, which acts as a bell jar, shall not be too sudden, depending as they do on the speed of entrance and outflow of the liquid. Under these conditions the flame and its intensity are fixed.

Acetylene, depending on contact with water for its formation, carries off a quantity of vapor of water, which must be instantly condensed so as not to interfere with the proper action of the lamp, whose burner, as in all portable lamps, is very near the generator. Mr. Trouve first tried to obtain this result by means of a condenser with large metallic surface, namely, a spiral ribbon, and later by a still simpler arrangement shown in Fig. 2.



TROUVE'S ACETYLENE LAMP.



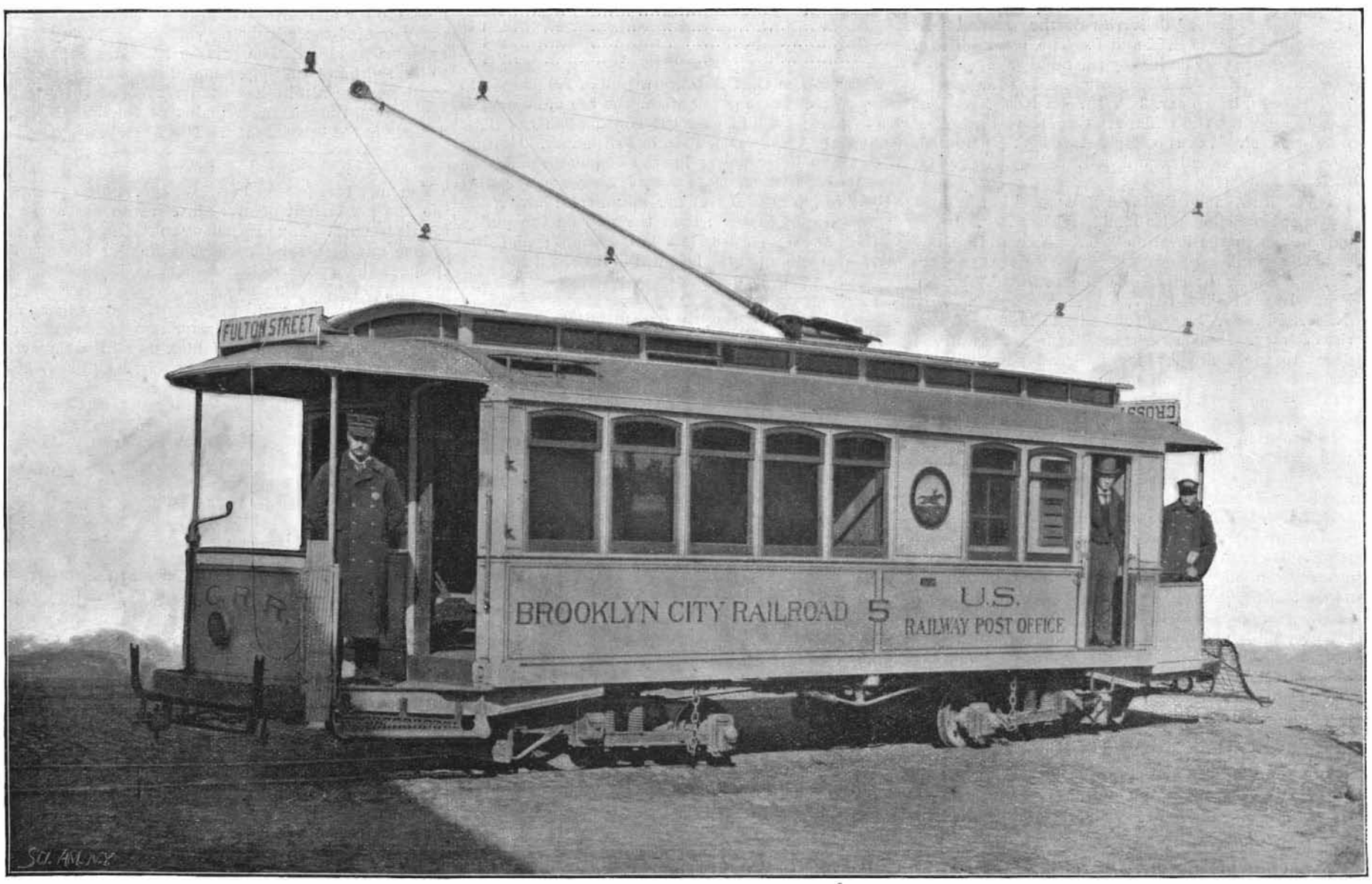
He uses two concentric tubes, a e, cut off obliquely and connecting with the cock, r. At first the gas passes by both tubes to the burner, as is shown by the arrows, but as soon as the vapor condenses in the central tube it seals it and it acts as a siphon. The acetylene continues to go through to the burner by the exterior tube, e, and by the little holes, x, y, z, by which the exterior tube communicates with the interior tube, a. As this siphon action is continuous, the interior tube carries off constantly the condensed vapor of water into the recipient whence it came. Furthermore, a disk, c, of large area, soldered to the tube, a, just above its lower opening, condenses the first vapor carried off by the gas. Furthermore, it enables one to withdraw this tube to get access to the entire system for cleaning and drying it.

It is very important to be able to govern the production of acetylene, because if the basket contains a large quantity of calcium carbide, the production of the gas would become more and more rapid. In spite of the regulation by successive immersions, the vapor of water traversing the calcium carbide from below upward finally moistens the whole mass. To govern adequately the production, Mr. Trouvé has adopted a system of superimposing the lumps of carbide in layers separated from each other by disks of glass. These act as diaphragms to prevent the vapor of water carried off by the gas from traversing the carbide which they support, and the automatic production of the acetylene is uniform from the beginning to the end of the lighting. First the lower layer is reduced to lime, then, as it softens, the second layer, descending, takes its place, and this action is repeated with the successive layers until the carbide is completely exhausted and the disks of glass rest one upon the other on the bottom of the basket.

Acetylene having almost the density of air, 0·92, burns best in a still atmosphere, so that the burner is placed in the center of the metallic disk, which tends to deprive the air of any upward draught, giving the flame proper steadiness. These lamps consume on an average 1,543 grains (about 3¼ ounces) of carbide for 38 candle hours.

STREET POSTAL CAR SYSTEMS OF NEW YORK AND BROOKLYN.

The establishment on February 3 of the street postal car service on Broadway, Brooklyn, again attracts public attention to one of the most important enterprises the United States postal service has undertaken. This is distinctly a novel development of the mail service, and the recent general awakening in this direction is due to the foresight and energy of Mr. Charles Neilson, the Second Assistant Postmaster-General, of Washington. Mr. Neilson's long experience as a manager of rail-



STREET POSTAL CAR SYSTEM—COMPARTED CAR

road systems and his studies as assistant general superintendent of the railway mail service for the United States led him to perceive the immense advantage to the commercial and social interests of the great cities which would come about from having post offices on wheels to keep up a continued and regular exchange and interchange of mails between the main post office and the branch post offices in the large cities of the country.

He has pushed this idea into practice with wonderful rapidity and has accomplished remarkable results in view of the comparatively limited appropriations made by the last Congress for the postal service generally. Mr. Neilson has recommended to the present Congress a specific appropriation of $200,000 for city railway mail service.

On June 30, 1895, there were in operation in the United States 82 street railway mail routes, covering a distance of 573 miles. These lines were performing a daily service aggregating yearly 1,144,201 miles of travel with closed mail pouches carried from one post office to another. The magnitude of this particular class of service is shown by the fact that these lines carried each day 1,856 pouches of mail matter.

The higher development of the work, however, is to have traveling post offices in the cars, in which the postal clerks postmark and assort the mail while it is always in transit, thus avoiding the detention for sorting in the post office where the matter is mailed.

At the close of the last fiscal year there were ten railway post offices of this kind in operation, of which seven were in Boston, one in Brooklyn, one in Philadelphia, and one in St. Louis.

In New York and Brooklyn great strides have been made since July 1, 1895. In New York City General Neilson's views were heartily appreciated and furthered by Postmaster Dayton and his chief of city delivery division, Mr. E. M. Morgan.

On October 1 the Third Avenue Railway post office was established to effect a rapid interchange by mail between the general post office and the great east side section of the city. The Third Avenue Railroad Company took up the subject with enthusiasm, determined to make the experiment a success. The postal cars are the handsomest that could be made.

There are twenty-five postal clerks assigned to the Third Avenue line. The cars run from the general post office every half hour, and make an equal number of trips southward. On the way they exchange mails with Branch D (Ninth Street), Branch F (Twenty-eighth Street), Branch H (Forty-fourth Street), Branch Y (Sixty-eighth Street), Branch K (Eighty-sixth Street), Branch L (East One Hundred and Twenty-fifth Street), Branch J (West One Hundred and Twenty-fifth Street), and Branch M (Amsterdam Avenue and One Hundred and Fifty-seventh Street). Mails are worked en route at present to connect directly with the carriers' deliveries at the general post office and Branches H, K and L. The possibilities of the service are only limited by the number of existing carrier deliveries. Letters postmarked at the general post office at, let us say, 3 P. M., can be delivered at the Metropolitan Club (Sixtieth Street and Fifth Avenue) at 4:15 P. M., thus being postmarked, distributed, transported four miles, and delivered by carrier in a little over one hour.

The Third Avenue Railroad post office is the most important mail line of its kind in the country. It not only advances the local mail, but also mail from out of town as well.

Mail reaching the city from the southwest by the Pennsylvania Railroad at 7:40 A. M. was not formerly delivered at, say, Branch H until the 10:45 A. M. carrier delivery. It is now sent directly from the railroad depot to the Third Avenue Railroad post office, is sorted going uptown and goes out to the public on the 9:15 A. M. delivery. Many other similar gains have been effected.

In Brooklyn Postmaster Sullivan has been very enthusiastic over the new service, and Assistant Postmaster McCooey and Superintendent Lyon have been earnest assistants in promoting the new scheme.

Brooklyn has now four street railway post offices as well as two other street car mail lines carrying closed mails. The railway post offices run: First, from the general post office to Coney Island; second, from the general post office to Long Island City; third, from the general post office to East New York via Fulton Street; and, fourth, from the Broadway Ferry to East New York via Broadway. All branches of the Brooklyn post office are connected by these lines, and the service is hourly.

The cars in use in the New York service are devoted entirely to post office business. The cars in use in Brooklyn are known as comparted cars; a compartment at one end being used for the mail service while passengers occupy about two-thirds of the car, as shown in the engraving. The mail cars in both New York and Brooklyn are painted white.

The clerks employed in these cars are appointed in the railway mail service and Superintendent V. J. Bradley—to whom we are indebted for the facts here given—has charge of their assignment and their work.

There is now a direct interchange of mails between the Third Avenue Railway post office in New York City and the Brooklyn Railway post offices via the Brooklyn Bridge without any of the old detention caused by the mails going through the main post offices in both cities.

Any one can see from this brief recital what a revolution has been accomplished in the methods of transmission and interchange and the possibilities of further and minute development which will not only expand and multiply mail communication in the metropolitan district, but also unify and interconnect the segments of Greater New York.

Belt Strain.

To find out whether the force carried by a belt is more than should be properly put upon it, or upon its fastening, we must know how much the arc of contact is, and what the tension on both the tight and the slack folds. The greatest tension upon it is that in the tight fold or side; and this is equal to that on the slack side, plus the pull which the belt gives to the pulley, or which the pulley gives to it. The greater the arc of contact the greater the ratio between the tight and the slack side, and the less the strain will be upon the belt and its fastening, to transmit a given power at a steady speed.

Thus if we have a pull of 10,000 pounds necessary to carry a certain horse power, when the arc of contact of the belt on the pulley is 90 degrees, that means that the ratio between the tension on the tight side and that on the slack side is 1·874; in other words, for every pound upon the slack side there will be 1·874 pounds on the tight side; and if the difference between the tensions on the slack and the tight sides be 1,000 pounds, it will be necessary to have 1,000 ÷ 0·874 = 1,144 pounds strain on the slack fold, and 2,144 on the tight one. (These figures apply to leather belts in good condition upon cast iron pulleys, also in good condition.)

Working from this we get the following table for various arcs of contact from 30 degrees to 300 degrees:

TABLE OF GREATEST STRAIN ON BELTS.

Arc. Degrees.	Ratio Between Strain and Transmitted Pull.
30	5·29
45	3·71
60	2·92
75	2·45
90	2·14
105	1·93
120	1·77
135	1·64
150	1·54
165	1·47
180	1·40
195	1·35
210	1·30
240	1·23
270	1·18
300	1·14

Now suppose that it takes a pull of 300 pounds to carry a given horse power when the arc of contact is 195 degrees; we find that the strain upon the tight side will be 1·35 × 300 pounds, or 405 pounds. Getting it down to horse power instead of pounds pull, suppose that it is necessary to carry 175 horse power with a belt running 2,000 feet per minute and having 210 degrees arc of contact; then the pull on the pulley will be 33,000 × 175 ÷ 2,000 = 2,887 pounds; and the greatest strain upon the belt will be 2,887 × 1·3 = 3,753 pounds.

Commerce with Great Britain.

The following figures of imports to and exports from the United States and dependencies for the fiscal year 1895 are given as follows by Bradstreet's:

	Imports from United States.	Exports to United States.
United Kingdom	$159,083,243	$387,125,458
Gibraltar	7,807	381,875
Bermuda (prior to 1892 included in British West Indies)	405,707	621,534
British Honduras	181,809	402,933
Dominion of Canada, Nova Scotia, New Brunswick, etc	5,851,615	4,041,775
Quebec, Ontario, etc	26,919,413	46,712,706
British Columbia	3,803,299	2,100,208
Newfoundland and Labrador	431,836	1,126.999
West Indies—British	9,777,444	7,764,178
Guiana—British	2,521,704	1,705,631
East Indies—British	21,266.013	2,853.941
Hong Kong	776,476	4,253,040
British Australasia	4.620,828	9,014,268
British Africa	776,114	5,203,378
All other British	1,382,673	637,797

ELECTRIC railroads are proving of great benefit to the farmers in all parts of the country. The trolley lines run out from the large cities and towns to villages far removed from steam railroad communication, and in several districts arrangements are making to run trolley milk trains, vegetable trains and the like, to enable the farmers to get their produce quickly to market. It is even proposed to run trolley coal trains, to supply coal to small towns that now use only wood.

Correspondence.

Local Causes of Rain.

To the Editor of the SCIENTIFIC AMERICAN:

Will the SCIENTIFIC AMERICAN kindly inform me whether rain is always preceded by a rise in the temperature; and if so, how much of a rise or how sudden a change is necessary to produce it? W. F. W.

Brooklyn, N. Y.

[The Weather Bureau, to whom the matter was referred, reports as follows:

In answer to the query submitted by Mr. W. F. W., Brooklyn, N. Y., I have the honor to inform you as follows: Meteorologists are now adopting the opinion that dynamic cooling, if not the sole cause of rain, is, at all events, the only cause of importance. Whatever, therefore, will bring about an ascensional movement of moist air may be said to produce rainfall. In the tropics, where the insolation is much more constant than in these latitudes, clouds are formed regularly in the morning and rise to great heights in the afternoon, generally causing rain. By nightfall the sky is clear, and on the succeeding day the process is repeated. Here there is no rise in temperature other than that due to the altitude of the sun above the horizon. In the middle latitudes much of the rainfall occurs in connection with a cyclonic circulation in which there is an upward as well as a horizontal component. The temperature in advance of cyclonic storms is generally higher than the normal, and to this fact may be due the impression that rain is generally preceded by high temperature. In the summer season a period of great heat and high humidity is generally broken by rain and thunder storms, but it is not correct to infer that the rise in temperature is the cause of the rain that follows, or that a rise in temperature is necessarily followed by rainfall. Very respectfully,

WILLIS L. MOORE, Chief of Bureau.]

Have Ants a Language?

Because incomprehensible to us, there is no reason to believe that animals have no direct means of communicating with one another. Even in the insect world investigation has practically proved the fallacy of this supposition.

Sir James Boyle, the great Irish naturalist, always contended that ants had a language of their own, by which they made known their wants and fears to others of their kind. One day he encountered a colony that were evidently moving to new quarters. All appeared in the very best of spirits, and whenever two met, the naturalist noted that they put their heads together as though chatting very earnestly. To settle the matter in his own mind as to whether they were really talking or not, he killed one of them to observe the effect it would have on the others. The eye witnesses to the murder hastened to the rear and halted every one of the advancing column by laying their antennæ together. The column instantly separated to the right and the left, none of the marchers afterward passing within less than six feet of their dead companion, though the remains of the insect were directly in the beaten path.—The Argosy.

Inequality in Eyes.

You are either left eyed or right eyed, unless you are the one person out of every fifteen who has eyes of equal strength. You also belong to the small minority of one out of every ten persons if your left eye is stronger than your right. As a rule, just as people are right handed, they are right eyed. This is probably due to the generally greater use of the organs of the right side of the body, as, for example, a gunner, using his right arm and shoulder, uses his right eye, thereby strengthening it with exercise. Old sea captains, after long use of the telescope, find their right eye much stronger than the left. This law is confirmed by the experience of aurists. If a person who has ears of equal hearing power has cause to use one ear more than the other for a long period, the ear brought into requisition is found to be much strengthened, and the ear which is not used loses its hearing in a corresponding degree.

Patent Injunction—Government Use.

In the case of Belknap vs. Schild et al., decided recently by the Supreme Court of the United States, it appeared that the defendants were the owners of a patent caisson gate used by Belknap in prosecuting government work without permission of or compensation to the owners, and they sued for an injunction and an accounting. The trial court granted the injunction and a master reported the damages at $40,000. The court held that the invention being used by an officer of the United States for the common defense and general welfare, no injunction could lie against him, and that the only damages proved being those in behalf of the United States, for which he could not be held liable, the judgment of the lower court must be reversed with instructions to dismiss the bill, without prejudice to a suit at law against the officer for damages or against the United States in the Court of Claims.