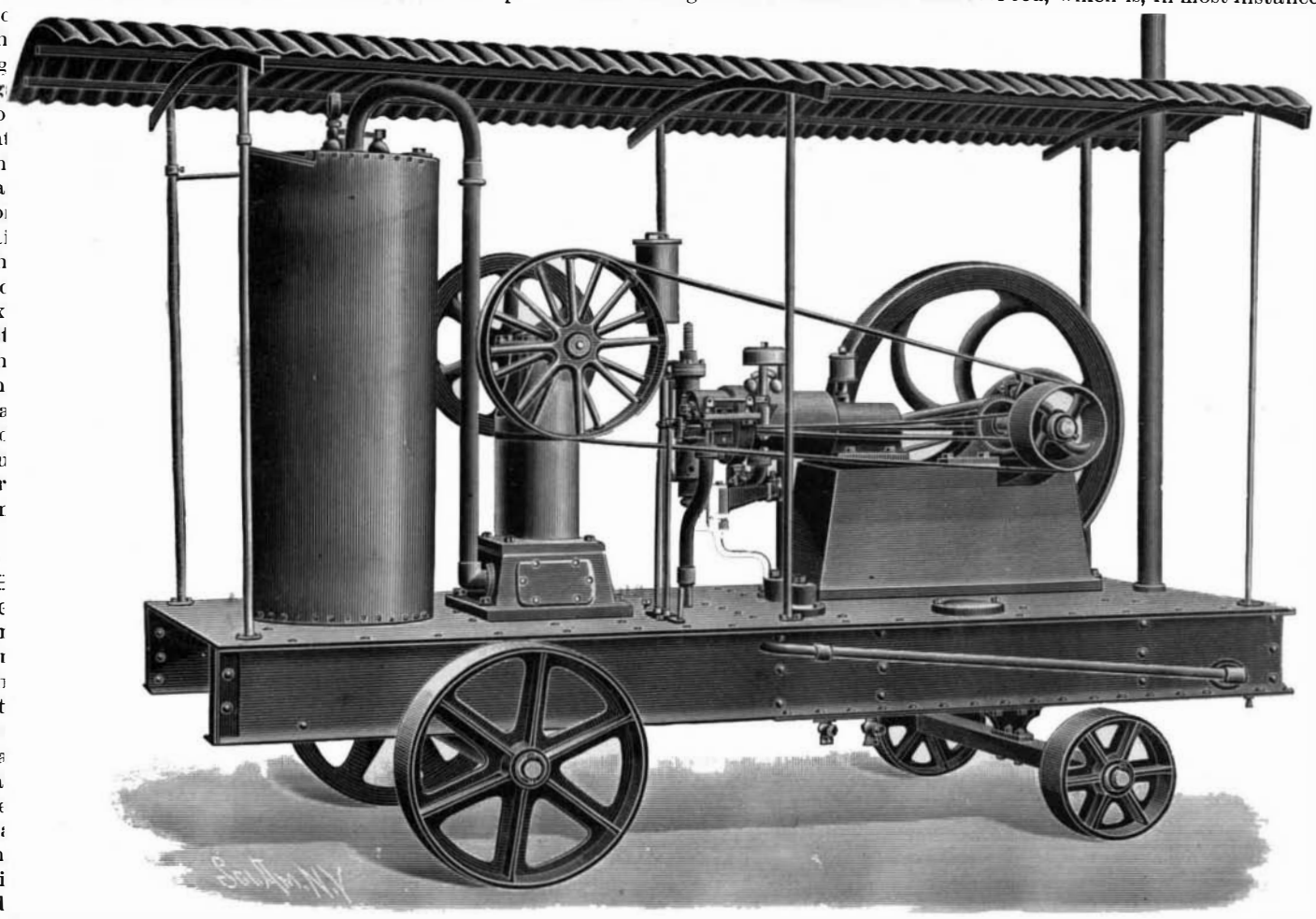
PORTABLE SAND BLAST APPARATUS.

The uses of the sand blast for ornamenting glass, metals, stone, and other materials is well known. A new application of the process for cleaning down the walls of buildings has been introduced in England, which is described in a recent number of Engineering, to which we are indebted for our illustration. It has been used fo cleaning th fronts of larg public building hotels, etc. Upo a truck is mount ed an oil engin which drives a air compresso which fills an ai reservoir to th desired degree c pressure. A flex ble pipe conduct the air to th point desired, an blows the sand a required. Build ing fronts are thu cleaned in a ver expeditious mar ner.



PORTABLE SAND BLAST APPARATUS

PROFESSOR E E. ARMSTRONG in a recent lectur at the Royal In stitution, on "Th Chemical Const tution of th Sugars," said tha Australians ea more sugar pe head of popula tion than an other people i the world Messrs. Cross and Bevan exhibited in the library some specimens of crystallized glycerine. One crystal of glycerine, about 1½ inches long, had a hole bored through it, by means of which it was suspended in some glycerine in a more fluid state than itself contained in a glass bottle.

THE SCOTTE STEAM CARRIAGE.

In the organization of the competition of automobile carriages held last year in Paris, the Petit Journal took the initiative. This journal has for a long time advocated the development of open air exercises. In our SUPPLEMENT, No. 979, we illustrated many of the automobile carriages which took part in the race. The steam carriage of M. Scotte, of Epernay, obtained a prize of 500 francs. In this vehicle, which is adapted for eight persons, the boiler is of the vertical type of the Field system and registered 120 pounds to the square inch. The two cylinder motor makes about 300 to 500 revolutions per minute and develops 5 horse power. The power is transmitted to the (rear) driving wheels through an endless chain and a differential gearing. The carriage is 15 feet in length, 6 in width, and weighs, when empty, 3,700 pounds. With 660 pounds of water, 440 pounds of coal, seven passengers and the engine driver the total weight reaches 5,940 pounds.

The carriage has the form of a brake, provided with a top and with curtains, for which windows may be substituted, thus rendering it a closed omnibus. A rail on the top permits of the carrying of baggage. The consumption of water is from three to four gallons a mile on a level stretch and from sixteen to twenty in mountainous districts. The consumption of coal also varies from six to ten pounds, according to the road and the speed. The carriage did not answer the conditions of the competition, as at Gaillon one of the Field tubes inside the vertical boiler burst and there was an explosion which caused some damage to the vehicle and slightly injured the driver. The judges, nevertheless, decided that the carriage of M. Scotte merited encouragement, so a prize was awarded to it. Without as yet realizing the dream of the tourist or the commercial traveler, the belief is now current in France that the automobile carriage has come to stay. The mechanism is being improved and simplified, and we may soon hope to find them coming into more general use.

THE SCOTTE STEAM OMNIBUS

THE chance of two finger-prints being alike is not 1 in 64,000,000,000.

How to Mount Botanical Specimens.

The secret of obtaining fine specimens lies in drying them before decomposition has had time to take place, and applying as much weight as possible without injuring the more delicate portions of the plant. The specimens should remain in the press till all moisture is absorbed, which is, in most instances, about a week. In herbaceous specimens the entire plant is easily preserved. Bulbous roots may be managed with very little trouble by sectioning the root when too bulky. Succulent plants should be immersed in boiling water before being placed in the press. Each sheet should show specimens of both flower and fruit if possible. In the case of herbs, this can usually be done with one and the same specimen. When the seasons of flowering and fruiting are separated by some weeks, leaves should be preserved with each specimen, as the foliage often changes materially in appearance during that time. Where it is impossible to show the entire plant on a single sheet, the root and leaves should be shown in connection with the branches. In drying, it is well to turn part of the leaves wrong side up, thus showing the appearance of both sides of the leaf; this is especially desirable in the fern family, if only one frond is shown. It is better to mount two or more leaves, and in that way give the different views. Never mount more than one species on a sheet; variations of the same species may be placed together, as the violet self-heal (Prunella vulgaris) with its freaks of blush and white. For mounting, Linnæus used sheets of foolscap, but that size is now universally conceded to be too small for practical purposes. Most botanists prefer sheets 12 × 17 inches, and some use a double sheet. While this method protects the plant more, it adds to the bulk of the herbarium and to its cost, and on the whole it is questionable whether the advantage gained by the use of the double sheet balances that lost.—American Gardening.

Saturn's Rings.

Prof. James E. Keeler has made the interesting discovery that the ring of Saturn is made up of many small bodies, and that the satellites of the inner edge of the ring move more rapidly than those of the outer edge. The motion of the different parts of the ring, in miles per second, can only be given after the photographs have been accurately measured under a microscope. In a few days Prof. Keeler will give accurately the rate of speed at which the different parts of the ring revolve.

The Cost of Power at Niagara.

The company which has undertaken to develop electricity, at Niagara, on a large scale, for manufacturing and other purposes, has acquired more real estate there than it needs for its own use, in order to furnish sites to such of its customers as wish to establish their business close to the source of their mechanical power supply. But the public has been led to expect that, in addition to serving local interests, the company would also furnish electricity to places scores, if not hundreds, of miles away, and there has been much speculation as to the feasibility of carrying such plans into effect. Owing to her proximity to the Falls and her great size and industrial activity, Buffalo has been regarded as the first center of population, removed from Niagara, to be provided for. It is not yet quite clear whether that city feels that it is enjoying a privilege or conferring a favor in letting the Power Company invade its precincts. Perhaps she has not determined that point herself. The matter is evidently still under consideration. In reply to some inquiries from representative Buffalonians, the Power Company recently offered the following terms: It would let the municipality or a private corporation come to Niagara, take water from the Power Company's canals at the rate of $10 a horse power and manufacture its own electricity; or it would furnish power off the turbine shafts at $13, or electricity at the power house at $18. But if the Power Company undertook to do anything of this sort, it would not contract to deliver less than 10,000 horse power; hence, Buffalo must agree to take, at least, that much or none at all. The Niagara people would not accept a franchise to operate a line to and in Buffalo for a shorter time than that for which its own bonds have been issued. No price is given for electricity delivered at a central station in the suburbs of that city, fifteen miles from the Falls, so that the company's own estimate of the probable waste and cost of transmission is still withheld. There would be four kinds of losses: (1) In transforming at the power house up to a high voltage, (2) on the line, (3) in transforming down at Buffalo, and (4) in distribution over street lines to consumers. These could not well amount to less than twenty or thirty per cent altogether, and they might, perhaps, reach fifty or sixty per cent. But if, for example, they amounted to just one-half, the $18 rate at the generator shaft would mean $36 to the consumer, without adding anything either for interest on the cost of the transmission plant or for operating expenses. This, however, is probably an extravagant estimate. The prices actually given, by the way, are for a twenty-four hour daily supply. Some establishments require power, however, for only ten or eleven hours. Whether it would pay to put in storage batteries to utilize the surplus is a question which their managers must naturally consider. Richard Hammond writes to the Buffalo Courier to say that steam power, on a scale of 1,000 horse power, for ten hours daily, can be generated in Buffalo, where coal is very cheap, for $21 per horse power. The Power Company, however, denies this, and estimates the cost at $32, besides quoting various experts as estimating the cost on a twenty-four hour basis at between $45 and $60. In some other cities, where coal is more expensive, it is said to be from $60 to $75. If, after this discussion, Buffalo decided neither to buy on the terms offered nor to let the Power Company bring in its own lines and supply the market, more distant cities may possibly be deterred by her example from patronizing the Niagara concern; but as the latter supplies its local customers with electricity at $20 per horse power, in large quantities, there may be a greater industrial development at the Falls than would otherwise result. --N. Y. Tribune.

The Lighting of the Brooklyn Bridge Cars.

The lighting of the cars of a cable road by electricity is a novelty and requires the use of some special apparatus. In the main, the plan adopted on the Brooklyn Bridge resembles the now familiar trolley system. A bare copper wire is suspended from poles and from the framework of the bridge. This wire is carefully insulated, the return is made through the rails in the usual way. The current is supplied from the power house in Brooklyn. It is led to the center of the bridge through a feeding cable, which there divides into two branches, one leading to each of the towers and there connecting with the overhead wire. The overhead wires are in turn connected together at intervals of 500 feet. The height of the wire above the car was regulated by the framework which extends over the three suspension spans. The distance that this framework clears the car only allowed the wire to be suspended nine inches above the roof of the car. At first it was thought that a regular trolley with a short pole could be used, but the rocking and swaying of the cars was so great in proportion to the distance of the car from the wire that it had to be abandoned. Springs were used to allow the trolley a certain amount of play, but this was not enough to keep the wheel on the wire. A roller was then substituted for the wheel. This roller is made eighteen inches long and is mounted in two arms, with which the roller forms a triangle, the apex being attached to the hinge and spring. The length of the roller is really greater than is necessary, but it allows a safe margin and there is very little chance of it ever jumping the wire. In the day time the roller is lowered to avoid unnecessary friction. When the lamps are to be lighted the trainman of each car pulls a lever at one end of the car which operates bell cranks and a connecting rod, which raises the roller into contact with the wire.

It has been found advantageous to have the roller trail, no matter in which direction the car may be going. On the Brooklyn Bridge the lighting trolley or roller is tripped and reversed automatically in the stations while the cars are being switched, by means of a rigid frame. The cars are all connected by wires, so that if the trolleys on all the cars but one should get out of order, that one would be sufficient to light the train. When the cars are being switched this system prevents the flickering of the lights. As in the bridge itself, there is a slip or expansion joint in three places to allow for the expansion and contraction caused by changes of temperature. Great care is taken to maintain an even tension on the line.

The former plan of lighting the cars was the kerosene lamp system, and the poorness of the illumination was the subject of considerable comment. The residents of New York and Brooklyn are pleased with the fine light given by the twelve incandescent lights with which each car is equipped, and are now asking why the same system cannot be applied to the extensive elevated railroad systems of both cities. The subject of lighting cars in cities is now receiving great attention, and the results obtained on the Brooklyn Bridge and on the Broadway and Third Avenue cable roads, which are lighted with gas, show that both gas and electricity are admirably adapted to city car lighting, without reference to the motive power employed.

Another Fire in the Patent Office.

The United States Patent Office was for the third time visited by fire at about 1:15 P. M., April 22. The scene of the blaze was in the southwest corner of the basement, in the photographic blue print room, close to a crowded public thoroughfare. Mr. Flint, chief of this room, was pouring ether into five gallon jugs, when some was spilled, and, running down the floor, came in contact with the stove and ignited. Mr. Flint was caught in the flames and severely burned about the face, arms, and shoulders. He was removed to a drug store across the street, where his wounds were dressed, and he was then taken to the Emergency Hospital.

Watchman Parkins, who ran into the room to see what the trouble was, was also caught in the flames, and received painful burns. Miss Nevius, in charge of the telephone lines in the building, whose office is in the adjoining room, was overcome by smoke and fainted, but was carried out uninjured by one of the employes. The room was filled with chemicals and explosives, which burned fiercely and emitted vast volumes of smoke, which caused a hasty stampede of the clerks employed in other portions of the building.

The photographers and assistants had many narrow escapes for their lives, and nearly all were on fire, as the explosives flew all about the room. Besides Mr. Flint, the chief, there were present at the time of the explosion, Assistant Photographer Theilkill, J. B. Wheat, Jr., J. E. Latimer, and Mr. Blackage, assistants. Mr. Theilkill's story of the occurrence was that while Mr. Flint was pouring about five gallons of ether into a bottle the bottle fell to the slate floor and broke, the contents running along the place. He began sweeping it toward the door, remarking to those about to be careful with the lamps, etc. Some of the fluid reached the stove and there was an explosion, which was quickly followed by a second with considerable force, blowing up about seventy-five bottles. Mr. Flint was blown through the door, his head striking a mass of papers piled in the hallway. He arose, his clothing in a blaze, and rushed for the area, calling for help.

J. B. Wheat, Jr., was standing near Mr. Flint, and was also blown through the door, his hair ablaze and clothing torn. He received no permanent injuries and attended to Mr. Flint. J. E. Latimer was blown through the open window onto the lawn, and was followed through the adjoining window by Mr. Blackage, who was in the dark room at the time.

Mr. Theilkill was blown across the room by the first explosion. He was blown through the window by the second. His escape from injuries was a miracle. His apron was on fire, his head singed, his hat blown into fragments, and his coat torn in many places.

Stored in the room were 18 gallons of collodion, 200 gallons of ether, and 100 pounds of gun cotton Of course these and everything else in the room were totally destroyed.

After half an hour's hard work the firemen extinguished the flames before they could spread to the adjoining offices. The loss was about $1,500, principally in photographic apparatus. Most of the original drawings were saved, and of those destroyed a good many can be replaced. Along the halls in the vicinity were stored a number of files which contained records of the office and other papers, and a great number of these were damaged by water.

The Patent Office has twice previously been on fire. In 1877 a fire occurred there which burned for twenty hours and totally destroyed the museum, necessitating the entire reconstruction of that portion of the Interior Department building.

Artificial Silk.

Patents for the production of artificial silk have been granted to Chardonnet, De Vivier, and Lehner. The only process now worked on the commercial scale is that of Chardonnet, whose first patent was taken out in 1885, although the method was not generally known until the Paris Exhibition of 1889. According to this first patent, cotton is treated with nitric and sulphuric acids, and the nitrocellulose obtained is dissolved in a mixture of ether and alcohol, with the addition of a small amount (0·2 per cent) of some metallic salt to lessen the danger of explosion. The solution is pressed through a system of fine capillary tubes, whose openings have the diameter of a natural silk fiber, into hot water, in which the ether and alcohol evaporate, leaving a fine thread capable of being spun. It possesses, however, great inflammability.

A company with a capital of 6,000,000 francs was formed at Besancon to work Chardonnet's process, in which several improvements were made. For cotton is substituted the cheaper wood cellulose. The nitrocellulose, after its solution in ether and alcohol, is denitrated with acetic and sulphuric acids, and its explosiveness thus removed.

The processes of De Vivier and of Lehner very closely resemble that of Chardonnet. De Vivier dissolves nitrocellulose in glacial acetic acid, with the addition of solutions of fish glue in glacial acetic acid, and gutta-percha in CS_2. Lehner dissolves a mixture of silk waste and nitrocellulose in ether and alcohol.

Chardonnet's artificial silk appears in commerce as a grayish-white, lustrous fiber, similar in appearance to boiled-off natural silk. It lacks the softness and the peculiar crackling feel of "boiled-off" silk. In tenacity and elasticity it compares unfavorably with the natural product. Experiments with fibers of similar thickness gave the following results:

	Strength (Tenacity).	Elasticity (Amount of stretch).
	Grms.	Mm. Meter.
Natural silk	214	189 in 1
Artificial silk	69	155 in 1

In a room of average dryness, dry artificial silk absorbed in two hours 16 per cent of moisture; the legal amount for natural silk is 11 per cent. The specific gravity of artificial is about 13 per cent higher than that of natural silk.

In dyeing properties the difference is very marked. On soaking with water the artificial silk fiber becomes very weak and must be handled with the greatest care. Soap solutions do not greatly injure the fiber, but free alakalies bring about an alteration which in concentrated alkaline liquids extends to complete solution of the fiber. Dilute acids are without injurious effect.

Dyeing is accomplished without addition of soap or acid to the bath, so that the number of dyestuffs applicable is somewhat limited; the most suitable are the basic dyes, with a few "direct cotton" coloring matters. Various shades may be obtained.

There is no doubt that artificial silk can be produced more cheaply than natural silk, and can replace it in many branches of the silk industry.

What Immigration Costs.

There is one aspect of the immigration question that appeals purely to business men. The social and moral influences on the American people of the unrestrained horde of Europeans pouring upon our shores are, of course, the most important, but the heavy tax in money thus levied upon the American people is not to be disregarded.

According to the last census, in addition to those of foreign parentage, the persons of foreign birth supported at the public charge of the people of the United States were divided as follows:

Insane	35,300
Criminal	15,932
Pauper	27,648
Total	78,880

The average annual cost of a pauper, a lunatic or a prisoner in the conservative and economically managed public institutions of Massachusetts is one hundred and fifty dollars.

The annual cost, then, of maintaining this standing army of foreign born vagabonds is not less than $11,832,000.

If to this could be added the expense of maintaining the American born children of foreign paupers, vagabonds, and criminals, the figures would be even more startling, but unfortunately the figures on parentage are defective.—Commercial Bulletin.