SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXIX.--No. 17. [NEW SERIES.] NEW YORK, OCTOBER 25, 1873. $3 per Annum. IN ADVANCE

APPARATUS FOR EMPTYING CESSPOOLS.

While the system of sewerage, or water carriage of night soil, as a means of removal, has been largely adopted in the more advanced cities of the world, still by far the larger portion is deposited in vaults and cesspools; to the sanitarian, therefore, the question of how this refuse shall be removed from such receptacles, without that violence to the senses and to decency and without that detriment to public health so long tolerated as an inevitable accompaniment of the well known and well nigh universal bucket system, is one of no small importance.

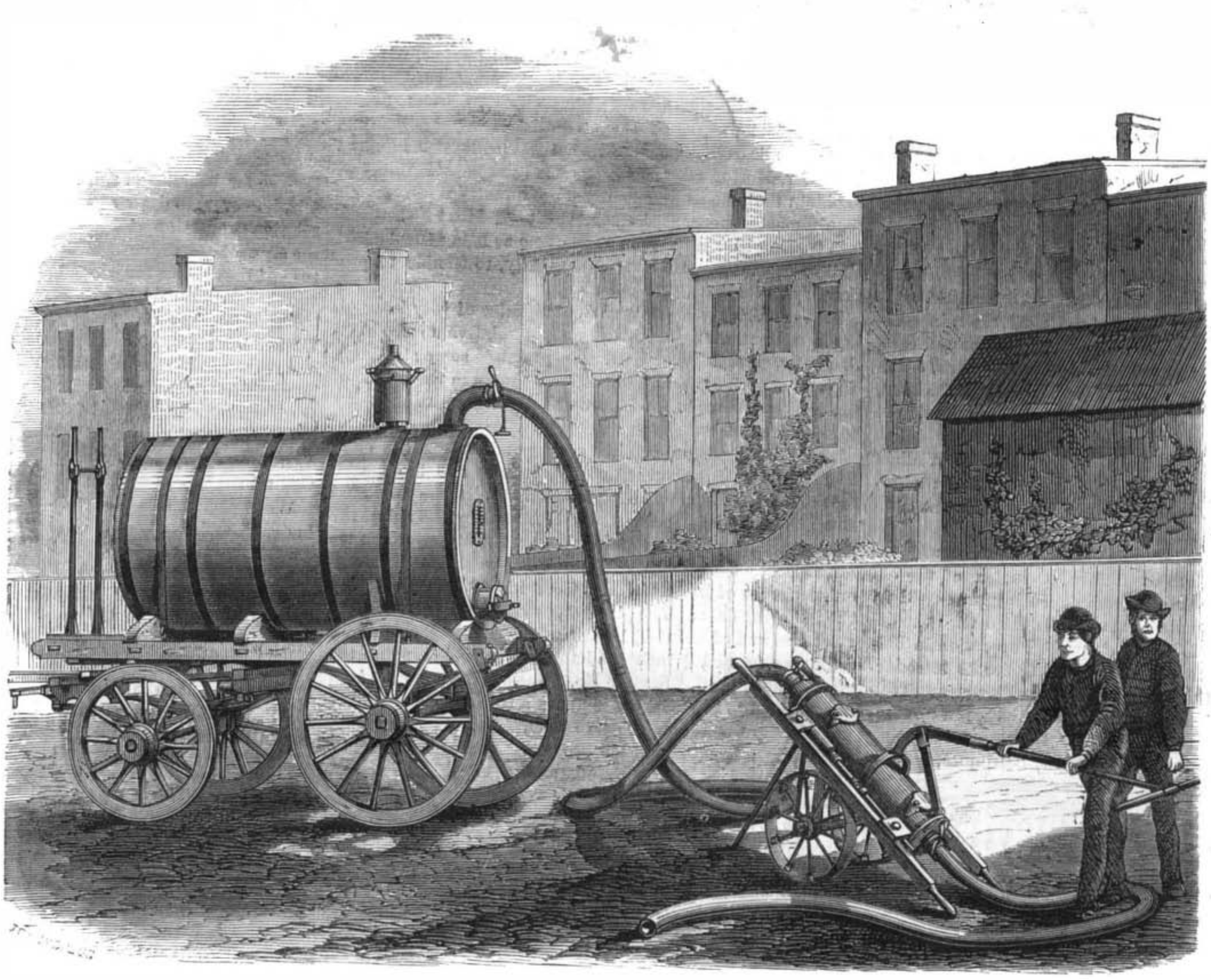
Up to the present time none of the various methods proposed have been largely adopted or attended with substantial success, although the most plausible solution would seem to be the use of some means of conveying the soil to an airtight tank without agitating or exposing it to the open air.

The principal mechanical difficulty has been the inevitable obstruction and choking, of the valves and working parts of the pumps usually employed, by the innumerable odds and ends that find their way into the depository. Strainers for excluding every thing from the pumps except the more fluid portions have been found of little avail, as the material, with its obstructions, is not only not removed, but is as much a clog to the strainers as to the pumps.

Various pneumatic systems have been proposed, and several methods of exhausting the tanks have been employed, among them the use of air pumps worked by hand or steam; or, when attached to the tank, such pumps have been made to exhaust the air from it by being geared directly to the wheels of the tank, so that while it was being drawn through the streets to the vault, the air would be exhausted and the tank be in readiness for filling.

In other cases exhaustion has been effected by injecting steam or heated air into the tank and subsequently condensing or cooling it, or by filling the tank with water and discharging it through a tube, having its outlet some 35 or 40 feet below. All of these systems, though excellent in theory, have encountered many practical difficulties. What is needed is a pump so constructed as to raise and force, by direct action and without obstruction to its working parts, the contents of sinks and cesspools, just as they occur. To this must be added the requirement that, in discharging the matter into the airtight receptacle, no offense be created by the escape of noxious gases.

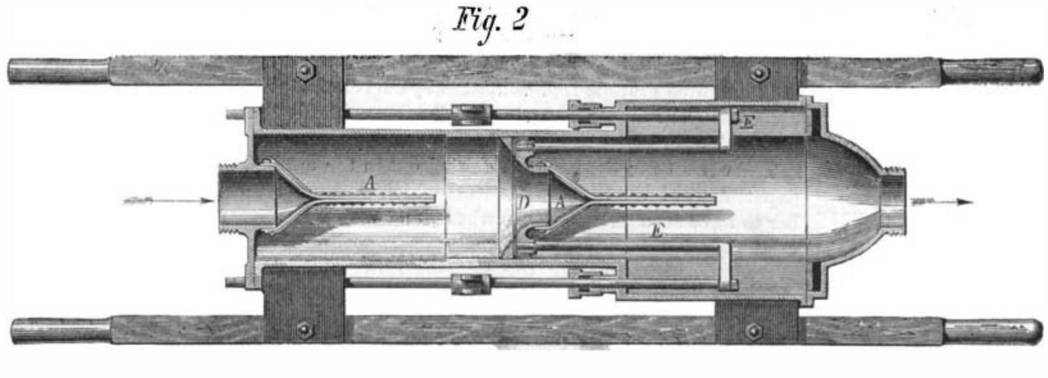
Such an efficient direct-acting pump, an airtight tank, and a deodorizing attachment are claimed to constitute the prominent features of the system of the "Odorless Excavating Apparatus Company," about to be described. By this plan, we are informed, the operation is performed during the working hours of the day, not only without offense but with the greatest efficiency and dispatch.



APPARATUS FOR EMPTYING VAULTS AND FOR THE REMOVAL OF NIGHT SOIL.

The chief point of novelty in the pump employed lies in the valves. Virtually, these appliances, by their construction and positions in the pump, form a continuation of the connecting hose leading from the vault to the tank, and, being in direct line with each other, offer little resistance to the passage of the material. The valve shown in the sectional view of the pump, Fig. 2, and in the smaller engravings, Figs. 3 and 4, is made of soft, elastic, vulcanized rubber, A, tubular in form; and being composed of two flat pieces placed face to face and riveted together at their edges, is, in its normal condition, collapsed. Its length is equal to some three diameters when open. One end is distended, and, embracing a collar, B, that surrounds the port, is securely fastened thereto by clamps and bolts. There is, therefore, a collapsible tube, one end of which is permanently distended to embrace the port through which the material passes. This passage, in one direction, is direct and unresisted through the valve, while it cannot take place in the opposite direction by reason of the collapse of the tube by the pressure on its sides. The valve, being of much greater length than diameter, presents an extended bearing or contact surface between its two sides, and therefore closely engage and surround whatever obstruction may be passing through it at the time of its collapse, forming about the obstruction an airtight joint, Fig. 2. At the succeeding stroke the valve is again distended, and the obstruction passes forward without in the least interfering with the action of the pump. Each valve is provided at its base with rigid straps or braces, C, which prevent it from being forced into the port by external pressure.

Fig. 2



The pump is single acting (Fig. 2), and in form a straight cylinder, provided with one fixed valve (the induction) and one movable, both marked A in the engraving, the latter attached to the piston, D, moving in the center of the cylinder. The passage of the material through the pump is therefore direct and without counter currents; and such is its capacity for passing obstructions that we have seen large pieces of cloth (and it is stated, an entire pair of heavy cloth pants may be) pumped through with ease. In fact, any obstacle not too large to enter the suction hose, and of whatever length, will pass freely through the valves without interfering with their action. This capacity for passing obstructions renders the use of a strainer on the end of the suction hose superfluous, and it is used with a clear, free opening. Usually this will not become obstructed, the hose being of three inches inside diameter; but in cases where a large quantity of tough and tangled material is present in the vault, such as masses of shavings and rags, a curved foot pipe is used, having an opening on its side of the full capacity of the hose. Should an accumulation of tough materials occur at this point, it is removed occasionally by the action of a sliding blade or cutter, attached to the foot pipe and operated by a rod. This device is only used in the worst cases, but by its use the capacity of the apparatus is greatly increased, and it is under more perfect control.

The rods, E, moving the piston, are placed at the sides of the pump, and do not obstruct the opening through it.

For convenience, the pump is mounted on wheels placed at the center. When in position for work, it stands at an angle of some thirty degrees elevation, and is conveniently operated by the brake or lever. By reason of its inclined position, the air contained in the pump is displaced with

Fig. 3.

Fig. 4.

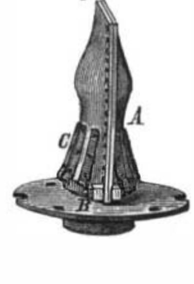
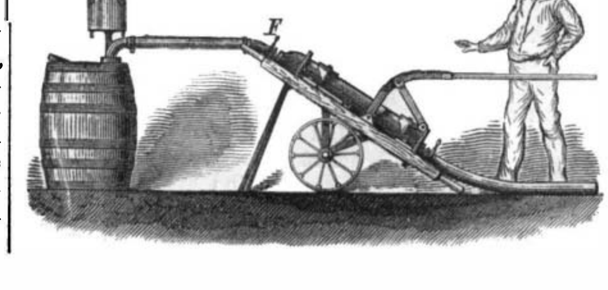


Fig. 5



facility and the valves retain their charge. The pump, therefore, seldom requires priming, even when used to raise the material a great distance. Two props in front serve to support the pump firmly while being operated. They are closed in when not in use. The balancing of the pump on two wheels at the center also renders the discharging of its contents and cleaning very convenient, by reversing the inclination, in which position it may also be readily charged, when necessary, through the induction port, the discharge being closed.

The couplings, F, used for connecting the sections of hose together and to the pump and tank, are of novel construction and designed especially for this purpose. Those attached to the pump and tank are furnished with fixed wrenches, by which the connection is quickly and perfectly effected. When the hose is detached, both portions of the coupling are sealed with suitable caps, and the entire apparatus rendered airtight. The receiving tank used is of ordinary construction and provided with inlet and discharge openings, and also with an indicator for showing correctly the quantity of material contained. The action is said to be sensitive and accurate.

A flanged collar, attached to the top of tank, supports the charcoal furnace in which the noisome gases, displaced from the tank while being filled, are deodorized and rendered inoffensive. This form of deodorizer is employed as being the most efficient and economical. The purifying action of the fire is intense, and the displaced gases, after passing through it, are entirely without odor.

In addition to its use for removing night soil, the apparatus is claimed to be equally efficient in removing the contents of sewers and traps in a like inoffensive manner.

The original patent for the use of the deodorizer, in combination with an airtight tank, for cleaning sinks and cesspools without offense, was granted to Louis Straus, January 28, 1868, but the apparatus has been in very limited use, owing to the inefficiency of the pumps heretofore designed for use in connection with it.

The patent on the pump valve was granted to William Painter, of Baltimore, August 5, 1873. Patents on other portions of the apparatus are now pending, and the company is about to apply for patents abroad.

The apparatus, we are informed, has already been adopted in the National Capital to the entire exclusion of the old bucket system. The plan there employed is represented in Fig. 5, the soil being pumped into barrels fitted with the deodorizing furnace. It is also in successful operation in Baltimore, and negotiations are now pending for its introduction in other cities. Our large engraving will give an excellent idea of the complete apparatus as it appears in use.

For further particulars, address The Odorless Excavating Apparatus Co., 44 North Holliday street, Baltimore, Md.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year	$3 00
One copy, six months	1 50
CLUB RATES: Ten copies, one year, each $2 50	25 00
CLUB RATES: Over ten copies, same rate, each	2 50

VOL. XXIX., NO. 17. [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, OCTOBER 25, 1873.

Contents.

(Illustrated articles are marked with an asterisk.)

TECHNICAL RESEARCH AND EDUCATION.

One of the most eminent English chemists is reported to have recently said, in response to a question relative to the progress of original investigation in England, that in that country such research seemed to be declining, while in the United States far more was being accomplished toward its pursuit. Were we disposed to doubt the latter part of this assertion, and even were we unaware of the constantly advancing labors of the scientists of Yale, of Harvard, of Cornell and of other seats of learning throughout the country, we should be strongly inclined to admit its truth from the evidence afforded by a recent visit to that model technical school, the Stevens Institute. In three laboratories we found original labor in virtually actual progress, and from three workers—professors, yet only students in that highest of colleges. Nature—we gleaned a few general words in explanation of the object to which the researches of each were directed.

President Morton's investigations into the beautiful phenomena of "fluorescence," and also his brilliant discoveries of thallene and petrolucene, we have already described in detail. We have also alluded to his spectroscopic researches in relation to the uranic salts, and we found him still engaged upon the same subject. We were shown his laboratory for the purification of the uranium, a process of some length, carried on by himself in order that he may obtain the metal free from impurities, with which he states it is always combined when obtained direct from commercial sources. From the result of this operation he obtains various compounds of the body, among which are several new salts; amongothers, thallio-uranic sulphate and rubidio-uranic sulphate. President Morton is also investigating the properties of chrysene and pyrene, both substances obtained from coal tar subsequent to the production of anthracene, and which differ from each other in many respects. We were also shown a specimen of pure anthracene, which appeared in delicate sheets of a pearly luster, almost perfectly white. Other specimens of the same substance, not so pure, had a decided greenish yellow tinge, while another preparation, by distillation; of the material resembled moist sugar, with, of course, the above noted difference in tinge. A very beautiful product also obtained was pure alizarine, from anthracene, the last process of the operation being sublimation, when the alizarine appears of its natural brilliant orange red hue. Dr. Morton tells us that he has been unable, thus far, to obtain thallene in sufficiently large quantities to meet his requirements—he wanted a barrel of it—and that he is therefore turning his attention to anthracene as being the nearest similar substance. He hopes, eventually, to be able to produce, from thallene, artificial alizarine.

Professor Mayer is engaged upon a series of very interesting investigations in acoustics, mainly relative to the relation between sound and heat. He promises some strikingly original experiments and important lectures in the course of the next month or two, which we shall take occasion to lay before our readers.

Professor Thurston, our late correspondent from the Vienna Exposition, has returned to this country and is engaged in the continuation of his experiments on the torsional strength of materials; obtaining his results by the aid of the testing machine of his own device, an invention which we have already described. His most recent work has been upon specimens of iron and steel, from which he has obtained the following data: The pieces were made in nearly uniform thickness and of about $3\frac{3}{4}$ inches in length. In the center, a neck was formed $\frac{5}{8}$ inch in diameter, to which point the strain was applied. Sample No. 1 was of Ulster iron, 1 inch bar, twisted to 220°; it broke under a torsional force of 225 pounds. No. 2, ordinary spike iron, nail rod, $\frac{3}{4}$ inch bar, angle 150°; it broke at 240 pounds. No. 3, French tool steel annealed, $1\frac{1}{2}$ inches round, angle 160°; it broke at 400 pounds. No. 4, Bessemer steel $1\frac{1}{2}$ inches round, angle 75°; it broke at 300 pounds. No. 5, Lowmoor iron, 1 inch square forged down from $1\frac{1}{2}$ inches, angle 220°; it broke at 200 pounds. No. 6, common American iron, make unknown, $\frac{5}{8}$ inch bar, angle 220°: it broke at 200 pounds. No. 7, Naylor's tool steel, $\frac{7}{8}$ inches octagon, angle 140°; it broke at 400 pounds.

It would be hardly fair to close this brief reference to the labors now in progress at the Stevens Institute without duly crediting the work of the students as well as that of the professors. Among the practical results of the instruction afforded, we were shown two admirably constructed magic lanterns, destined for use in the lecture room, made entirely by a pupil, and in a manner which would compare favorably with that of skilled instrument manufacturers. Besides these there were a large number of metal articles used in blowpipe operations, and also many other excellently made tools and instruments for the chemical and physical laboratories, all entirely the handiwork of the students. We also noticed several original designs for machinery, and an admirably executed graphic representation by curves of the results obtained by Professor Thurston in his late experiments upon the torsional resistance of wood.

There is an excellent system carried out in the mechanical department of the Stevens Institute which we do not remember to have seen practiced elsewhere, and which it appears might be advantageously followed in every technical school. We allude to instructing the student how to invent. It must be generally conceded that the young man who leaves his college, perhaps an able draftsman but withal a mere copyist of the original ideas of others, labors under disadvantages and will find greater obstacles in his path of progress than another student who graduates able to suggest, modify or even invent plans to suit the varying circumstances. Than this, no fact seems to be more thoroughly recognized in the course of study above referred to; and instead of requiring the pupil to duplicate completed plans or pro duce merely handsome drawings, he is called upon at once to use his own brains in direct origination, and thus to apply in practice the instruction he gains in theory in the class room. To each student the Professor assigns some special work; to one, for instance, he hands a rough general idea of a steam governor, and tells him to improve it and construct a finished machine, bringing in every requisite calculation; to another, he assigns a peculiar form of steam boiler; to a third, an anchor hoisting gear for the Stevens battery; and so on through the class, each individual being left free to design precisely as he chooses, working only from the mere crude hint given him in the beginning. If the articles are of such a nature as are capable of ready construction, they are actually made within the Institute in the machine or instrument shop, and afterwards utilized for their purposes; so that the pupil not only designs but in some cases sees embodied the result of his thought. It is needless to add that if the student has any inventive genius, this means developes it; and he leaves the school with a mind trained to think independently, or, in other words, to grapple at once with the problems which are constantly presenting themselves in the everyday practice of his profession.

THE VIENNA PRIZES.

Seventy thousand articles have been exhibited at the Vienna show, and 26,002 awards have been distributed. Of this aggregate number of premiums, 421 were diplomas of honor, 3,024 medals for progress, 8,800 medals for merit, 8,326 medals for good taste, 978 medals for art, 1,998 medals for coöperation, and 10,465 diplomas of merit or honorable mention. These were awarded as follows: Austria (without Hungary) 5,991, Germany 5,066, France 3,142, Italy 1,908, Hungary 1,604, Spain 1,157, England and colonies 1,156, Russia 1,018, Switzerland 722, Belgium 612, Norway and Sweden 534, Turkey 470, Portugal 441, United States 411, Denmark 309, Holland 284, Roumania 238, Japan 217, Brazil 202, Greece 183, China 118, Egypt 75, Republics of Central and South America 44, Persia 29, Morocco, Tunis, and Tripoli 20, Madagascar, etc., 10, Monaco 9, Mexico, Siam, and Turkestan, each 1.

It will be noticed that the United States ranks No. 14 on the list, and it will at first sight seem rather curious that we should be distanced in numbers of prizes gained by countries so far behind the age as Spain or Turkey. It is hardly fair, however, to draw any comparison except through the relative proportion of distinctions gained as compared with the number of exhibitors from each nationality, while the nature of the articles for which the honors were given must also be taken into consideration, regarding which facts accurate information has not yet appeared. The position of the United States is, of course, attributable to the paucity of our representation, a circumstance, however, which cannot be urged in the case of England; so that, so far as that country is concerned, and even considering everything, we are somewhat at a loss to understand how, not merely with its own fine display, but also with that of its dependencies, Great Britain managed to reach so low a place on the list.

We expected, as a matter of course, to see local industries fostered, and consequently the leading of the nations by Austria, followed closely by Hungary, does not surprise us. The proximity of Germany, France, and Italy also accounts for their large figures; but on what possible ground Spain, a country for the past three years in a constant state of turmoil, with what little industries it had all but paralyzed, and producing nothing of major importance either in manufactures or arts, is granted a higher number of prizes than England, is totally beyond our comprehension. We shall await the full reports of the exhibition with increased impatience, if only for a solution of this paradox.

FAILURE NO. 2 OF THE BALLOON TO EUROPE.

Soon after the collapse of the *Daily Graphic* advertising balloon, on the occasion of its original inflation preparatory to the start for Europe, the proprietors determined to make use of such portions of the cloth as might be serviceable in the manufacture of a smaller gas bag for another trial. They accordingly reduced the bag from a capacity of 500,000 cubic feet to 250,000; and on October 6th, at 9:30 A. M., Mr. Donaldson, the aeronaut accompanied by two newspaper men, Ford and Lunt, started from Brooklyn, N. Y., "direct for Europe." During the preceding week Donaldson had made a couple of short ascensions in a small balloon, and had no difficulty, he said, in reaching that "easterly current."

On this last excursion, the balloon was provided with a life boat, as a car, to be used in case the voyagers should, by any unforeseen circumstance, be compelled to descend upon the raging deep. The boat was stocked with water and provisions for 40 days, together with a considerable quantity of sand ballast. The morning of the ascent was fine, and the balloon rose majestically, passing northerly over the cities of Brooklyn and New York at an elevation of about a mile, and for some time formed a conspicuous object in the heavens, for the gaze of our citizens. But it finally faded away into a mere speck and then wholly disappeared, going northeasterly. At 3 P. M. intelligence was received that the balloon had come down in a furious rainstorm at New Canaan, Conn., 60 miles from New York; and from the accounts of the poor aeronauts, they narrowly escaped with their lives. They represent that they sailed along beautifully until about 1 P.M., when they suddenly entered the precincts of a violent rain storm, which, spite of all they could do in the way of throwing out ballast, drove the balloon down to the earth, upon which they were tumbled in great disorder and violence, while the big bag and boat brought up against the trees and rocks. The balloonists further admit that, almost from the beginning of the voyage, they had to continue throwing out ballast in order to keep themselves afloat, which would seem to indicate that the balloon was in a leaky condition at the start. The *Graphic* people, however, insist that the machine was sound and strong, and allege that the fall was due to the great weight of water which accumulated on the surface of the balloon. If this is the fact, it might be desirable to provide the balloon with an umbrella, on the next trip to Europe, to keep off both rain and sun.

CAOUTCHOUC FROM COMMON PLANTS.

The extensive demands for india rubber, and the comparative scarcity of the supply, has augmented the price until it now stands at nearly one dollar per pound in this market. The crude matter comes from tropical regions, and is derived mostly from certain trees, the nomenclature and localities whereof were presented in a recent article in the SCIENTIFIC AMERICAN.