tablishing at the Central Park a first-class botanical garden, and we have no doubt that in the progress of time such will be the result, but we cannot concur in the suggestion that a zoological garden should not also be established. All the chief European cities have both, and we expect that New York will some day be favored with something like the *Jardin des Plantes*, of Paris, which not only combines horticulture and zoology, but has also valuable museums of botany, geology, and anatomy, and a school where the natural sciences are taught with a high degree of perfection. With regard to a plan for a garden our correspondent had better see the Central Park Commissioners.

Information Wanted.

MESSRS. EDITORS:—An immense number of intelligent persons in our country are now directing their attention to the production of valuable inventions; some for fame, but, it is reasonably to be supposed, the large majority for profit. Now what is wanted to know, especially by the latter class, is, What is needed? Inventors often waste much valuable time at churns and washing machines, who might produce a much-needed, valuable improvement.

Will you, Messrs. Editors, say what is called for urgently, and will your many readers, professional men, mechanics, or "any other man," do the same through the SCIENTIFIC AMERICAN? E. G. B.

Washington, D. C.

[This subject opens up a very broad field of inquiry, and affects almost every branch of our growing industries. We cannot specify any one article that is especially needed, but it is safe to say that more economical machines and processes are wanted in almost every department of manufacturing. The high price of labor at the present time renders it necessary that this labor should be supplemented by improved machines and processes to enable our manufacturers to produce articles more cheaply than is possible at the present time. The field for improvement is usually more general than specific, but with a view to meet the inquiry of our correspondent, we invite suggestions from others. Our columns are always open to make known the wants of manufacturers in the direction indicated.—EDS.]

The Poppy in Texas.

MESSRS. EDITORS:—The frequent mention of the poppy in the recent numbers of your paper, and of the possibility of its successful cultivation in America, reminds me of the acres of this flower that I have seen growing wild in Texas. In portions of Texas, at this season of the year, you will see whole acres covered with the white poppy in bloom, standing as thick as you ever saw wheat growing in a wheat field. About West Liberty, Columbus, and other towns, it grows spontaneously on every uncultivated spot. I was informed that very good opium had been made from this wild white poppy in Texas. If any one wishes to cultivate the poppy for opium, or the *Palma Christi* for castor oil, Western Texas is the country for him to go to find the proper soil and to buy land cheap.

JAMES BYARS.

Covington, Tenn.

CORNISH PUMPING ENGINES.

BY H. P. M. BIRKINBINE, ENGINEER.

The American character for independent thinking and acting is illustrated in the variety of pumping engines used in the water works throughout the country; their being no particular form or style that may be said to have precedence or that may be considered as the best, so far as any peculiar form of apparatus would indicate.

In England the Cornish engine is the one almost universally adopted where any considerable amount of water is to be raised, either for supplying towns or draining mines.

In this country there are but five cities where they are used exclusively; namely, Erie and Easton, Pa.; Louisville, Ky.; Cleveland, O.; and Jersey City, N. J.; there are also a few used in draining mines. We have several large pumping engines in use, which may be considered as modifications of the Cornish engine.

The Philadelphia Water Works have four Cornish engines (two overhead beam and two Bull engines) in use, and a side-lever Cornish engine is now in course of construction. The city has also in operation six engines of other form, and has contracted for two more (not Cornish).

Chicago has just completed two large pumping engines of another form.

St. Louis is having four new engines constructed, for the low lift two Bull Cornish, but for the high lift, where the most work is to be done, two engines of different construction.

Buffalo, N. Y., has two Bull Cornish engines, but the last engine placed in the works was of a different form, and it is now proposed to materially alter the Cornish engine.

From the above it is evident that in this country the Cornish engine is not a favorite; many of those constructed being failures. The Union Canal Company have one in use in connection with several high-pressure fly-wheel engines, in pumping water to supply the Summit level of their canal, which has been found to work so unsatisfactorily that it is never used when the work can possibly be done with the other engines.

At the zinc mines, near Bethlehem, Pa., there is one Cornish and several other engines used in draining the mines, and this company, whose engineer has had a large and successful experience in constructing Cornish engines, is now having a powerful engine built, which is not of this class.

This is in direct opposition to the usage of England; therefore, either English engineers adhere to the Cornish engine

from prejudice—it being old, and they know of no better—while we have progressed and found other and improved forms, or the construction and management of Cornish engines is not generally understood by the mechanics and engineers of this country.

The exhaustive works of Wickstead and Pole fully describe the construction and operation of these engines, and demonstrate theoretically, and by the actual working of engines in operation, that there is no other form which gives as high duty; that is, raises as much water with a given amount of coal.

The records of the running of a large number of these engines in Great Britain, extending through a long period of time, show that they work with surprising economy. Those running in this country, which are properly constructed and placed where their management is understood, give very favorable results.

Some of the patented pumps have duties claimed for them greater than the Cornish engine accomplishes, but as this claim is made by those pecuniarily interested in their success, and as it cannot be sustained, either by a theoretical examination of the patented peculiarities or by the actual working of the machines, we may be excused from entering into a discussion of their merits.

Engineers acquainted with pumping machinery generally accord to the Cornish engine superiority of duty, and theory and practice both demonstrate that no other form of engine can be worked so economically.

The question then occurs, "Why are they not more generally recommended and used in this country, and why do those who are experienced often adopt other forms when new engines are required?"

It is impossible to give the reasons which have led to the difference in practice between American and English engineers. In some instances (which we believe are but few) the royalties which patentees of pumps receive have undoubtedly influenced those having the selection of engines. Ignorance and want of experience is probably another cause, as is also the difficulty in finding machinists skilled in designing and constructing Cornish engines. Another reason may arise from the impatience which is characteristic of Americans, who are sometimes unwilling to wait until a substantial pumping engine can be built and set up—considering time as the most important element, and frequently neglecting efficiency and durability.

The first cost may also be used as an objection to these engines. We have so much to do in developing the immense resources of the country and comparatively so little capital to do it with, and labor is so high and dear, that this difficulty meets engineers at every undertaking. The above may be some of the reasons why Cornish engines are not more generally used.

In the water works of Philadelphia, there is a number of different forms of pumping engines in use, which may be considered as fair specimens, the following comparisons of the average work for the past five years may form a basis of the relative merits of the different forms of engines. These accounts have been kept uniformly and represent the total amount of coal and other supplies purchased as well as all amounts paid for labor, repairs, etc.

Philadelphia receives its supply of water from six different pumping stations,

1st, FAIRMOUNT. The pumps at this station are driven by water power.

2d, SCHUYLKILL WORKS have four pumping engines. One overhead beam Cornish engine; one bell-crank condensing engine with fly wheel, steam cylinder vertical, pump double acting, nearly horizontal. One overhead beam condensing engine with fly-wheel, steam cylinder vertical, double-acting pump (vertical) placed directly under steam cylinder connected to piston through lower cylinder head. An engine similar to this has been removed and a side lever Cornish engine is being erected to take its place.

3d, DELAWARE WORKS have two pumping engines one overhead beam condensing engine with fly wheel, steam cylinder vertical, pump double-acting, horizontal, connected to piston, (which is connected through lower cylinder head) by bell crank and connecting rods, and one high pressure engine, steam cylinder horizontal, connected to horizontal pump (double-acting) by vertical beam.

4th, TWENTY-FOURTH WARD WORKS have two Cornish Bull engines. New works are being constructed for the district now supplied by these engines, where pumping engines of a different kind are to be used.

5th, GERMANTOWN WORKS.—These have two high pressure engines, steam cylinder and double-acting pumps, horizontal, connected through fly wheel shaft by cranks placed at dead points.

6th, ROXBOROUGH WORKS.—These are just completed and contain a large overhead beam Cornish engine.

There is quite a variety of forms of boilers in use at the different works, in one of them four kinds; they may all be considered as of fair average efficiency.

The works are generally in good repair, except the Twenty-fourth Ward Works, there being no reservoir for this district and the engines are driven much beyond their safe-working speed, and, as a consequence, are rarely if ever in good condition.

The average duty for the past five years in foot-pounds (that is pounds of water raised one foot high with a pound of anthracite coal), is Schuylkill Works, 396,961 foot-pounds; Delaware Works, 210,570 foot-pounds; Twenty-fourth Ward Works, 470,092 foot-pounds; Germantown Works, 214,728 foot-pounds.

At the Schuylkill Works more than one half of the work is done by the Cornish engine. When the Twenty-fourth Ward

Works are in good condition; the average monthly duty has frequently been over 550,000 foot-pounds. The average cost of raising one million gallons one foot high, for the past five years, is at Schuylkill Works, 15.21 cents; Delaware Works, 24.80 cents; Twenty-fourth Ward Works, 9.72 cents; Germantown Works, 21.50 cents.

This includes salaries of engineers and firemen, coal, oil, tallow, gas or oil for lighting, packing, small stores, repairs, etc.

By making a calculation from this basis of the cost of raising an average of five million gallons per day, one hundred and fifty feet high, the relative value of the different forms of pumping engines will be made more apparent, thus: Schuylkill Works, \$41,637.37 per annum; Delaware Works, \$67,890.00 per annum; Twenty-fourth Ward Works, \$26,608.50 per annum; Germantown Works, \$58,856.25 per annum.

If all the water raised at the Schuylkill Works was pumped by the Cornish engine, it would show economy even greater than the Twenty-fourth Ward Works, and were it not for the large amount of repairs required by the Cornish engines at the Twenty-fourth Ward Works, they would exhibit more comparative economy than they do.

From the above it is evident that the Cornish engine is the most economical. An experience of nearly seven years as chief engineer of the Philadelphia Water Works, and an extensive connection with other water works, has satisfied the writer that where any considerable amount of water is to be raised the Cornish engine is not only the most economical in all items of running expenses, but also the most reliable, and that no other form of engine should be recommended.

Fossil Gums or Copals.

Professor W. H. Gunning contributes to the *Philadelphia Cochrane's Journal* an article on the above subject. He says: "Amber and copal are so entirely of the past that Nature, it would seem, has forgotten how to make them. They come down to us from out of the by-gone ages, although no place has been found for them on the page of the geologist. Commerce has made them known to the world; and science has at last interpreted their origin.

"Every one has seen gum bleeding from a cherry-tree. This gum is a hydro-carbon, inodorous and soluble in water. Imagine the gum, hard as the wood that bleeds it, soluble only in alcohol, and that only when oxidized, and you have amber or copal. In some olden time, trees long extinct—the *Pinus succinifer*—were standing on the shores of the Baltic. Another species, with a more formidable name—the *Blacocarpus copalifer*—was growing over the desert of Africa and in South America. If now we approach the Baltic, and dig down to the old tree-bearing soil, we find clumps of amber gum bled from the *succinifer*. Specimens are found now and then on our continent, at Cape Sable and Gay Head. Gum from the *copalifer* is called copal. Copal does not differ essentially from amber. It is more abundant and more accessible. The beginning was far back in the golden age of Africa, before the wind and the sand had made a desolation of her great plain. How impenetrable the gloom and mystery which veil this land of the sun! Here is a desert, parched and blasted, the same to-day as when the caravans tracked it, with the stars for chart and compass, in the days of the Pharaohs. Men have thought of it as a primal blight, a brand of some great curse on the new-created world. And yet that plain, so desolate now, was covered once with a majestic forest. The trees have perished, and their sap alone remains to tell that they were. Under a burning sun these trees were bleeding gum; insects came to sip it, lit, mired; the nectar flowed around them and entombed them; the trees perished, but time has wrought their blood into gems, and here are the insects to-day embalmed in their crystal tombs forever. A hundred thousand deaths could not disturb even the dust upon their wings.

"Our fathers used to puzzle over these insects in amber. The amber itself was a mystery, and then the insect—how did it ever get there. We no longer wonder how the insect got there, but how long it has been there. Negroes find the copal down even eighty feet in the desert sand. We infer that in places the soil from which the copal tree grew was buried under eighty feet of sand and clay. We have no data by which we can fix the time demanded for such a change, but we know enough to assure us that it must be reckoned in thousands of years. The revolutions of nature, from forest to desert, are never achieved in a day.

"In general the greatness of a change is a measure of the time. In general, we say. Where man comes in as a disturbing force, desolation or abundance follows quickly in his path. The plains of Babylonia, so fertile in the days of the great Babylon, the borders of Lake Galilee, so beautiful when the Saviour was wont to seek them, are now desolate.

"The crimes of men 'have dried up realms to deserts.' Nature has done the same, but she is never a swift architect of ruin. To have wrought the extinction of a race of trees from Africa, and buried the soil which bore them under eighty feet of sand, must have required many ages. The fly or moth, which looks as if it had just lit in its crystal coffin, may have been there a hundred thousand years. We are very sure it was there, just as you see it to-day, long before there was any man upon the earth.

"A race of trees perished from the earth, and left no wood or bark to tell that they lived, no seed or scion to perpetuate their kind, but their sap, their spirit—a mere aroma which exhaled from their wounds—this remains, a thing of beauty, while everything that was earthly has crumbled to dust."

GOOD WHOLESOME BREAD.—Professor Stohmann advises to mix to $\frac{2}{3}$ parts of rye meal, $\frac{1}{3}$ part of bean, or pea meal, and 2 per cent, by weight, of the mixture, of ordinary common salt. It appears that bread thus made is of excellent quality, taking its constituents into consideration, and easily digestible.

Improvement in Hoisting Apparatus.

This invention is an improvement on the common hoisting machine by which it is rendered self-sustaining, beside having the advantages over contrivances of this nature heretofore made of being free from extra friction while hoisting, and still under control of the check line when lowering. This is accomplished in the following manner reference being made to the drawings, Figs. 1 and 2.

A, represents a suitable frame of wood to which the other parts of the machine are fastened. B represents fixed bearings in which are pivoted the levers, C, carrying the hoisting drum, D, and pinion shaft, E; these levers being so placed in the fixed bearings, B, that a portion of the load sustained by the drum, D, shall act upon the brake, I. F is the large gear attached to the drum. G is a pinion meshing into F. H is the rope wheel on the periphery of which is the brake flange as usual. I is an iron brake shoe bolted to the frame, A, which is extended for the purpose.

This shoe is provided with a good friction surface, by being faced with rawhide or leather. J is an L-shaped lever pivoted at K, to the suspending lever, C, and carrying at its longer end a rope pulley, L. M is the endless rope passing from the wheel, H, at an angle over the pulley, L; N is the check line leading from the lever, J, over a small pulley at O; P is the fulcrum to the lever, J; Q is the draft rope.

In operation a load being suspended from Q, the act of hoisting by the rope, M, will cause a lateral motion of the same toward the lever, J, which, bearing upon the fulcrum, O, will raise the wheel, H, from contact with the brake surface on I, allowing the load to be lifted until the pull ceases, when it is instantly held in place. To lower, the check line is pulled so as to free the brake flange wholly, or in part as desired.

This machine is now tested in practice and found to answer the ends sought. It is a valuable improvement, since it furnishes a more safe and convenient arrangement in the laborious process of hoisting, permits the use of a platform when required, loading or unloading at any floor, and for power hoists, provides at once for the slipping off, stretching or breaking of belt.

For State rights to manufacture (except N. E.), or for further particulars, address F. P. Canfield, 71 Sudbury street, Boston, Mass.

Beet-root Sugar in California.

The *Mining and Scientific Press* says, the question of producing beet-root sugar in this State is gradually increasing in interest, and we are pleased to note that an important experiment has been made by Mr. Justus Beplar, of San Mateo county, to ascertain definitely the capacities of the soil and climate of California for this valuable product. Mr. Beplar has produced a sample of sugar pronounced to be equal to the best brands of imported cane sugar. It is well granulated, pure, and presents a thoroughly marketable appearance. This experiment is considered one of much importance and significance. Some idea of the value to which this interest may attain on this coast may be inferred from the fact that the sales of sugar by our local refineries for the quarter ending March 31, amounted to an aggregate value of \$748,598; or within a fraction of three millions a year. It is now pretty well settled that the Sacramento beet-root sugar factory will go into operation during the current year, and the company will be prepared to purchase all the beets which may be produced in the present season. There can be little doubt that within a few years beet-root sugar will form an important item in the already long list of California productions.

Signal Drill--Field Telegraphs.

At the recent examination of the West Point graduating class, one of the most interesting features of the occasion was, what is called a signal and telegraph drill--signaling by means of flags, and building a field telegraph. Although very few persons, but those immediately concerned in the drill, were able to comprehend much about the thing, it attracted considerable attention, and was looked upon with a great deal of interest by the officers of the post. The signaling was probably the most attractive feature of the whole affair. A certain number of the second class were detailed with the flags, which were of the ordinary size, nailed to poles about four feet long. Several of the signalers went up to the heights of Fort Putnam, and across the river, and signaled to others on the parade ground, with the flags, and for several minutes orders were communicated from point to point, and conversations held by the aid of the simple movements made

by the moving of the flags. The orders were communicated and repeated with a rapidity which was actually astonishing. The building of the field telegraph, which was done by the first class, was also a great feature of the drill. Lines were run from Fort Putnam down in the direction of Cozzens' West Hotel and back to the post, and messages were sent over the wires without the slightest hindrance, although on the plains the lines were laid at the rate of three miles an hour. The batteries that were used in the drill differ very much from the ordinary batteries common to most telegraph companies,

ulation by means of a stop-cock placed in the course of B. In order to obtain the maximum exhaustion with the pump, the length of D should be about thirty-three feet, but a fall of twenty feet I find to be more than sufficient for ordinary water. As this form of Bunsen's pump can be constructed by any intelligent plumber for a few shillings, no chemist need be deterred, either on account of expense or trouble, from fitting his laboratory with the new apparatus.

I have had the pump in operation in my laboratory for about two months, and gladly bear testimony to the great practical value of Professor Bunsen's admirable arrangement.

The First Iron Founders in St. Louis.

The proximity of St. Louis to the vast ore-yielding fields of Missouri so closely identifies it with the iron interest as to make anything connected with the subject of special importance to the city; and it is not a matter at all surprising that the citizens watch with the deep interest any enterprise looking to the development of the great wealth garnered up by nature in those immense storehouses of iron ore, the Iron Mountain and Pilot Knob. With this idea we propose, says the *St. Louis Republican*, to give some few notes on the history of iron founding in St. Louis.

The history of founding iron in St. Louis dates back far as 1824, though it was then done in a rude way. In the year 1817 a man named Louis Newell landed in St. Louis, then, as many know, a small village compared with its present proportions. Newell commenced the business of blacksmithing, giving special attention to the making of edge tools. His fame soon spread abroad as a great ax-maker. At this time St. Louis was an important center of the fur trade of the West;

CANFIELDS, IMPROVED PATENT ELEVATOR.

one of their principal advantages over the ordinary kind being the impunity with which they can be thrown into and carried in the wagons. Everybody who knows anything about telegraphing is aware that ordinary batteries, after being tossed about over a rough road for a short time, refuse to work; but all the rough usage which the batteries received during the drill that day, appeared in nowise to impair their efficiency. They consist simply of a peculiar apparatus to be attached to the wires, and contain sulphate of copper in crystals, a piece of zinc, and a sponge. When they are used, the copper, zinc, and sponge are wetted, and, it is said, after once being put in readiness for action, that they will work steadily for at least a month. During the drill, hard-rubber was used about the poles as insulators, instead of glass.

Laboratory Pump.

Mr. J. Emerson Reynolds writes to the editor of the *Chemical News* a description of a simple form of a Bunsen's valuable filter pump, which has been fitted up in his laboratory by Mr. Stephen Yeates, of Dublin.

The accompanying diagram shows the essential parts of the pump. A is a tube of tin, about eight inches long, and of nearly one inch internal diameter; within three inches of one end, the tube, B, is soldered. The diameter of this tube should be about three eighths of an inch. The end of the wide tube most distant from B is now contracted so as to form a portion of a cone, and D then soldered in. A small tube, C, is now selected, one extremity of which enters, but must not at all close, the cone formed by the junction of A and D; and at this point its orifice is contracted so as not to exceed one eighth of an inch in diameter. It is then soldered, as shown, into the upper end of A. The whole arrangement is fitted to a board by the straps, S S.

The tube, C, is connected with the vessel to be exhausted of air. B is the delivery pipe for water, obtained from a cistern or from the street main; the supply should admit of reg-

the demand for wolf traps, beaver traps, and squaw axes was very considerable, and Newell soon made a specialty of the manufacture of these implements, the production of a good quality of which brought him at once wealth and a wider fame. About that time, too, the old French cart began to be superseded by the Yankee wagon, all the cast-iron hub boxes for which had to be brought from Pittsburgh, as indeed all other iron castings.

Then it was that the idea of founding first entered the brain of the first St. Louis founder. Newell saw that if he could make the hub boxes he could make a wagon out and out, thus saving a heavy expense in their manufacture and adding greater facility to their production; a desideratum much to be desired by the farmers and settlers around St. Louis. So Newell went to racking his brain for a plan to overcome the inconvenience of having to import wagon boxes.

He was not a practical iron founder; but his genius and indomitable courage made up for the want. Having completed a pattern, he went to work with a common blacksmith's forge to make wagon boxes; he melted his iron and molded them with the most perfect success. This was the first melting of iron west of the Mississippi river. For four years Newell proceeded with this slow process to turn out boxes for the wagons he made.

In 1828, Mr. Samuel Gaty--then a mere boy--left his home in Kentucky, and pitched his tent in St. Louis. In connection with two other men, named Richards and Martin, he rented a piece of ground from Colonel Martin Thomas, and put up a small foundry on what is now the corner of Second and Cherry streets, and the trio went to work. Young Gaty had all the capital (\$250), and acted as molder and financier; Richards was furnace man and Martin pattern maker. Under this arrangement matters progressed satisfactorily, and they made money. Colonel Thomas, looking upon Richards as the man of the concern, and seeing the profit in the business, made overtures to buy out Gaty's interest; and the latter looking a little deeper into matters than the Colonel could see, sold out to him. The sequel proved the sagacity of Gaty, for the two men, Richards and Martin, without business management, and being given to dissipation, soon let the concern run down. Colonel Thomas then declared he had bought out the wrong man. Gaty went back to Louisville.

ETHER Spray is used successfully in Lyons, France, to render painless the operation of uprooting hair, when necessary, in cases of cutaneous disease.