of the iron due to atmospheric influences, come up for debate, and where the strength has been materially lessened, new parts are advised to be inserted. The ties, rails, and guard rails, although not entering into the problem of the safety of the bridge in a direct manner, are, nevertheless, responsible for the care of the trains, and are reported upon.

The piers supporting the bridge, and their foundations, present a more difficult task. If the piers are of iron or masonry, the work is comparatively easy. Undue settlement is readily discernible. In the case of pile foundations, the ravages of worms, being below low water line, are hid from view, and the weight the piles will bear cannot always be accurately found. The removal of one pile or more, and the condition of the remainder reasoned from its condition, is safe within certain limits.

If the exact strength of any member be in doubt, or approach too near the limit of its strength, decision is invariably cast in favor of the traveler, and the member is unhesitatingly condemned. That it will probably stand the strain is of no moment and is not thought of; but that it might possibly give way decides the question of its banishment.

HEATING AND HARDENING OF STEEL.

To understand how to properly harden and temper steel tools and other articles is fully as necessary to the machinist now, when most small tools are kept in stock by dealers, as it was twenty years ago, when each shop made its own tools. Lathe and planer cutters, cold chisels, milling cutters, and several other tools and appliances are liable to breakage, and must be redressed at the anvil, refinished, and rehardened and tempered. But many of these tools are ruined in the attempt, and this destruction usually comes in the hardening.

Some mechanics attach much importance to a hardening pickle, but probably failure comes as often by injury in heating the article as by hardening and tempering. An evenly distributed heat of the proper temperature is absolutely requisite to success, and this it is not always possible to assure by heating in an open fire. One portion of the article is liable to be overheated, while another portion is underheated; judging of the amount of heat by color is not always to be trusted; a dark corner or a cloudy day changes the conditions from a light shop and a sunny day sufficiently to make a great and telling difference in the amount of heat judged by sight.

A perfectly reliable method of heating for hardening is by means of the lead bath. It is an easy matter to keep in the shop a crucible or iron pot of lead to be used as occasion demands. The article to be heated for hardening will not suffer when in the lead bath, even if not closely watched, as is necessary at the open fire; the melted lead cannot pass to a degree of heat injurious to the steel. But one condition must be strictly observed—the lead must be pure and clean; it is best to buy the mercantile pig for this purpose. A manufacturer of pipe threading and pipe cutting tools in a New England city. desiring to abandon his old time open fire method for the lead bath, melted a lot of old lead pipe partially corroded, and mixed with it a quantity of type metal. His hardening was a failure until he used pure lead.

In order to harden well it is necessary to heat the article through and through. If the piece is of unusual thickness, as a tap or reamer of three inches or more in diameter, it is better to drill a hole through it from end to end, so that the heating can be even and the hardening be equal. A tap of four inches diameter broke squarely across in the hardening. It was of solid steel. The drilling of an inch hole from end to end was practiced, and a large number of the same size taps were hardened without a failure. The surfaces of the fracture of the broken tap showed plainly the evidences of unequal heating and uneven cooling.

ASPECTS OF THE PLANETS FOR AUGUST.

NEPTUNE

is morning star, taking the precedence of four other planets playing the same role, for the planetary interest during August centers on the morning sky. Five members of the solar brotherhood make their appearance at the beginning of the month in the following order: Neptune, Saturn, Mars, Jupiter, and Venus. This order of precedence they retain throughout the month. Neptune, if he were near enough, would be seen above the horizon about half past 11 o'clock in the evening. Saturn peers above the eastern hills half an hour after midnight. Mars follows in about twenty minutes. Jupiter rises not far from a quarter after 3 o'clock, and Venus follows half an hour later. Thus at 4 o'clock the planetary quartet may all be seen making their shining way among the stars.

Neptune diversifies his course with an event. On the 14th, at 1 o'clock in the morning, he is in quadrature on the western side of the sun, that is, he has reached the half way house between conjunction and opposition, being 90° from either point. He then rises about midnight, is on the meridian at 6 o'clock in the morning and sets about noonday. The same is true of all the outer planets, their apparent movements being regulated by the same law. Observers who keep the run of their conjunctions, quadratures, and oppositions will find it easy to follow their paths.

The right ascension of Neptune is 3 h. 16 m., his declination is 16° 18′ north, and his diameter is 2·5″.

Neptune rises on the 1st about half past 11 o'clock in the evening; on the 31st, the rises about half past 9 o'clock.

SATURN

is morning star. Though second in the order of rising, he takes the lead in the order of interest during the month, being a beautiful object in the morning sky after midnight, while every successive rising adds to the brilliancy of his appearance, and makes him more conspicuous among his peers.

Saturn is in conjunction with Alpha Tauri on the 13th at 6 o'clock in the morning. This star is better known as Aldebaran, a brilliant red star of the first magnitude. The conjunction is not a close one, Saturn being, when nearest, 3° 40′ north of the star. Planet and star will however be near enough to make a fine exhibition on the celestial canvas as they gradually approach each other, the pale gold of Saturn being in charming contrast with the ruddy hue of Aldebaran. Heavenly bodies are in conjunction when they are in the same right ascension, a term nearly corresponding with terrestrial longitude. At the same time they may be many degrees north or south of each other.

The right ascension of Saturn is 4 h. 25 m., his declination is 19° 49′ north, and his diameter is 16·4″.

Saturn rises on the 1st at half past 12 o'clock in the morning; on the 31st, he rises about half past 10 o'clock in the evening.

MARS

is morning star, and adds to the interest of the month by an incident in his slow and monotonous course. On the 29th, at 5 o'clock in the afternoon, he is in conjunction with Mu Geminorum, a star of the third magnitude in the constellation of the Twins. Mu is very near the ecliptic, or sun's path in the heavens, and near the point the sun touches on the longest day of the year. The conjunction will not be visible, Mars passing at that time 1° 4′ north of the star. But planet and star will be near enough on the morning of the 30th to make it worth while to watch their approach. An opera glass or a small telescope will assist the observation.

The right ascension of Mars is 4 h. 55 m., his declination is 22° 25′, and his diameter is 5·6″.

Mars rises on the 1st about ten minutes before 1 o'clock in the morning; on the 31st, he rises soon after midnight.

JUPITER

is morning star, and before the month closes will outshine every other star in the firmament. He holds his court in the northeast, in the constellation Gemini, a few degrees south of Castor and Pollux; but no observer of the early morning sky will fail to detect him at a glance. He will soon be near enough for telescopic observation. His return to our vicinity will be a boon to astronomers, who hope to find out something about the intense activity that now agitates his surface.

The right ascension of Jupiter is 7 h. 23 m., his declination is 22° 11′ north, and his diameter is 30·6″.

Jupiter rises on the 1st about a quarter after 3 o'clock in the morning; on the 31st, he rises at ten minutes before 2 o'clock.

VENUS

is morning star, and the last on the list to appear above the horizon. She is traveling south at a rapid pace, being nearly ten degrees farther south at the close of the month than at the beginning. Venus is now near Jupiter, but is rapidly retreating from his neighborhood, approaching the sun so closely that at the end of the month she rises less than half an hour before the great orb in whose beams she will soon be hidden from sight. She has fallen from her high estate, but only for a time. Her peerless beauty will not long remain under a cloud.

The right ascension of Venus is 7 h. 49 m., her declination is 21° 36′ north, and her diameter is 10·4″.

Venus rises on the 1st about ten minutes before 4 o'clock in the morning; on the 31st, she rises at 5 o'clock.

MERCURY

is evening star during the month, presenting but one feature of interest. He is in conjunction with Uranus on the 24th at 10 o'clock in the morning, being at that time fifty minutes south. As both planets are invisible, the event will have to be observed in the mind's eye. To those familiar with the movements of the planets, the pictures visible to the eye of fancy are not always less enjoyable than those visible to the natural eye. They also possess this advantage: Neither clouds nor the great sun himself can obscure them. Mercury makes almost a plunge toward the south during August, his declination changing from 19° north at the beginning to nearly 2° south at the close.

The right ascension of Mercury is 8 h. 58 m., his declination is 19° north, and his diameter is 5″.

Mercury sets on the 1st at half past 7 o'clock in the evening; on the 31st, he sets at twenty-two minutes after 7 o'clock.

URANUS

is evening star, and plods on his way uninterrupted, save by his meeting with Mercury.

The right ascension of Uranus is 11 h. 28 m., his declination is 4° 11′ north, and his diameter is 3·5″.

Uranus sets on the 1st about 9 o'clock in the evening; on the 31st, he sets a few minutes after 7 o'clock.

THE MOON.

The August moon fulls on the 18th at a quarter before 8 o'clock in the morning, Washington mean time. The waning moon is in conjunction with Jupiter and Venus on the 1st, and with Jupiter for the second time on the 29th. She is at her nearest point to Mercury on the 3d, and to Uranus on the 6th. On the 24th, she is very near Neptune. On the 25th, she is in close conjunction with Saturn at half past one o'clock in the afternoon, passing 1° 3′ south. In some portions of the globe between 32° and 70° south declination, where the conditions are right for observation, the moon occults Saturn for the fifth time since the year commenced. The moon completes her circuit of the planets by her conjunction with Mars on the 27th.

STORING THE POWER OF THE WIND.

As suggested previously, no method seems within the range of our present knowledge which can enable us to store the energy exerted by wind currents during the very large proportion of time when we have no need of it, and thus make its whole average force available during working hours. This, which is one of the most important desiderata in mechanics, and which is sure eventually to be secured, debars us from the benefits of the full wind power sweeping around us. But it is perhaps worth our while to consider a plan by which a portion of that power can be utilized, and, of course, just so much steam power with its attendant expense saved.

The wind of this and the adjacent regions has, as the records show, an average velocity of 7·7 miles per hour, being 676 feet per minute. At this rate of motion its pressure per square foot is $\frac{5}{100}$ of a pound, and if we could store the power we might safely calculate on that amount. But for our present purpose this is of small avail. A wind wheel of such size as formerly assumed, 12 feet by 8, gives at that pressure an effect of nominally half a horse power, and whatever it gives during working hours we are prepared to turn to account; at other times it must be of no avail.

The manufacturer or other consumer builds as many of these wheels as he deems best; the more of them the better within certain limits. On the assumption of his needing twenty horse power as before, five of them in the fresh breeze of a summer afternoon will meet the demand, while, with a strong storm-wind, a single wheel will drive his full machinery without assistance. Each wheel sends by its own air-pump its stream of air to a common reservoir. This reservoir is not, on this plan, built to contain stores of energy for future use; it is barely as an equalizer of an unsteady power. It enables the consumer to carry on his work with perfect uniformity of motion, no matter how gusty or squally the wind may be.

He chooses to run his engine, for instance, at forty pounds; setting his safety valve at sixty or eighty, or whatever he may above, he draws a regular forty without change or interruption. The only requisite is that the reservoir pressure shall be maintained sufficiently high. If his wind wheels are doing that amount of work he needs nothing further, and he can easily so construct them that the number of days in which they will need no help will be greatly in the majority in the course of a year.

But days of partial or of total calm will of course occur, and here is where the auxiliary force is required. The steam engine which he would have in use, had he no wind wheels to take its place, is called at once into play, and the machinery runs on, as on other days. The engine drives an air-pump, or pumps, of suitable dimensions, compressing air into the reservoir, that is, it does precisely what the air pumps of the wind wheels failed to do at that moment. This, of course, can be done when there is no wind whatever, and will not unfrequently need to be done when the wheels are moving feebly, and are consequently unable to keep the pressure up to the requisite number of pounds. The two sources of energy are in no way associated; they barely supply compressed air to a common reservoir, for a common purpose; they can work alone or together.

With a sufficiently liberal construction of wind wheels it is not too much to assert that the engine fire would not be lighted on more than one in three of the working days of the year, and the days when it would be needed with its full power would scarcely be one in six. Experience would soon settle all the points required, and though the introduction of the new mode of working would be watched at the first. and very naturally, with distrust, a very short time would remove it, and the two go smoothly on together.

Can any one show any reasons why this theoretical plan cannot become a practical one? It utilizes only a portion of the wind power, it is true, but is it not worth while to save what we can? If a man can save the expense of running his steam engine for two-thirds to three-fourths of the time, at barely the cost of erecting his wind engines, which will run without subsequent expense, it surely does appear that a very decided gain has been made. A.

Nickel Crucibles.

M. Mermet recommends nickel crucibles instead of silver ones for use in chemical manipulations. Nickel is slightly attacked by melted potash, and so is silver itself. Nickel crucibles cost at first much less than those made of silver, and they have the great advantage of melting at a higher temperature. It often happens that inexperienced chemists melt their silver crucibles in heating them over a gas lamp; but such an accident is not to be feared in working with crucibles made of nickel.

A CORRESPONDENT says that files may be readily cleaned of grease by holding them for a moment in a steam jet from a blow off cock.

Kefir.

While during the last few years koumiss has been introduced into Western Europe, and even into America, a new drink prepared from cow's milk by a process of fermentation imperfectly understood is coming into use in Russia. This drink is kefir, and it has for long formed the chief article of diet among the mountaineers in the neighborhood of Mount Elbruz and Kasbek, in the Caucasus. It forms a thick white fluid, with a faintly acid flavor, said to resemble certain light wines. The mountaineers themselves call it "ghippo." The inhabitants of the plains near the Caucasus, and the Russian settlers, who term it kefir, kifir, or khiafar, make use of it, not for the table, but as a popular remedy for anæmia, struma, gastric catarrh, and chronic bronchitis.

According to the Moscow *Medical Gazette*, where a contribution on the subject has recently appeared, Dr. Kern being the author, the preparation of kefir is very simple. The mountaineers make it by filling a bag made of goatskin with milk; then a tenacious mass, of the size of a walnut, of a material which they term "kefir seed," and the precise origin of which is unknown, is added to the milk. In a few hours the process of fermentation sets in actively. When prepared in wooden or glass vessels, the kefir tastes better. After a lapse of twenty-four hours a weak kefir is produced; when the process is allowed to continue for three days, the kefir becomes very strong. The source of the ferment is scrupulously concealed by the Caucasian mountaineers, who, with the humor of the English cook who once sold a secret for making "fundied cheese," the "secret" being that the cheese must be fundied after toasting and before the addition of pepper, cannot be persuaded to enlighten strangers to any greater extent than in supplying a small sample of the ferment, in the form of dry, dark-brown, earth-like masses, but steadfastly refusing to say whence they are obtained. One of these fragments dropped into milk begins rapidly to effervesce, turns milk-white, and assumes the form of a mulberry, then fermentation proceeds at once. If a piece, thus transformed, be dropped into another bowl of milk, it rapidly increases in size, and also causes fermentation. Dr. Kern has carefully examined specimens of this "kefir seed," which consists chiefly of masses of zoogl[œ]a, holding together collections of a bacterium which he calls *Dispora caucasica.* The yeast-fungus, *Saccharomyces cerevisiæ*, is always found associated with this new germ. "Kefir seed" retains its vitality after remaining for months in its dry condition. Dr. Kern has a great belief in the future of kefir, which has all the virtues of koumiss, and possesses one great advantage over the latter fluid in that it is just as good when prepared from cow's as from mare's milk.—*British Medical Journal.*

Wood Finish.

The patented preparations known as wood fillers are prepared in different colors for the purpose of preparing the surface of wood previous to the varnishing. They fill up the pores of the wood, rendering the surface hard and smooth. For polishing mahogany, walnut, etc., the following is recommended: Dissolve beeswax by heat in spirits of turpentine until the mixture becomes viscid; then apply by a clean cloth, and rub thoroughly with a flannel or cloth. A common mode of polishing mahogany is by rubbing it first with linseed oil, and then holding trimmings or shavings of the same material against the work in the lathe. Glass paper followed by rubbing also gives a good luster. There are various means of toning or darkening woods for decorative effect. Logwood, lime, brown soft soap, dyed oil, sulphate of iron, nitrate of silver exposed to the sun's rays, carbonate of soda, bichromate and permanganate of potash, and other alkaline preparations are used for darkening the wood; the last three are specially recommended. The solution is applied by dissolving one ounce of the alkali in two gills of boiling water, diluted to the required tone. The surface is saturated with a sponge or flannel, and immediately dried with soft rags. The carbonate is used for dark woods. Oil tinged with rose madder may be applied to hard woods like birch, and a red oil is prepared from soaked alkanet root in linseed oil. The grain of yellow pine can be brought out by two or three coats of Japan much diluted with turpentine, and afterward oiled and rubbed. To give mahogany the appearance of age, lime water used before oiling is a good plan. In staining wood, the best and most transparent effect is obtained by repeated light coats of the same. For oak stain a strong solution of oxalic acid is employed; for mahogany, dilute nitrous acid. A primary coat or a coat of wood fillers is advantageous. For mahogany stains the following are given: 2 oz. of dragon's blood dissolved in one quart of rectified spirits of wine, well shaken; or raw sienna in beer, with burnt sienna to give the required tone; for darker stains boil half a pound of madder and 2 oz. of logwood chips in one gallon of water, and brush the decoction while hot over the wood. When dry, paint with a solution of 2 oz. of potash in one quart of water. A solution of permanganate of potash forms a rapid and excellent brown stain.—*Amateur Mechanics (London).*

SIMPLE CAN OPENER.

The engraving shows a very simple form of can opener adapted to all forms and sizes of cans, and capable of cutting out the entire end of the can. The opener is a plain, simple knife, with a lip to rest on the edge of the can, using the can as a fulcrum, as shown in the engraving. It will be noticed that the tool has neither joints nor adjustable parts, and is therefore not a thing to get out of order. Fig. 1 is a side view, Fig. 2 an end view, and Fig. 3 shows the opener in use.

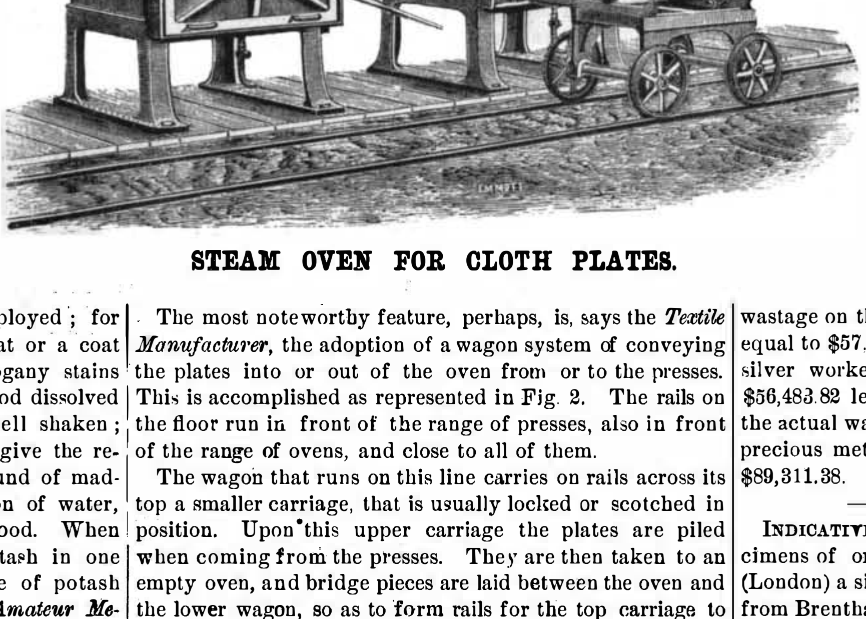
This useful invention has been patented by Mr. Augustus J. Leavitt, and is manufactured by the New England Specialty Company, of North Easton, Mass., of which Mr. Leavitt is manager.

LEAVITT'S CAN OPENER.

STEAM OVEN FOR CLOTH PLATES.

The illustrations given herewith represent a steam oven for use in heating iron plates used by cloth finishers in hydraulic presses. With this apparatus the plates are put inside, and after the door has been fastened steam-tight, steam is turned in and heats the plates to its own temperature. The great advantage of steam heating in this way is that perfect uniformity in the temperature of the plates can be relied on.

The door is balanced and suspended on chains, and opens the oven by lifting vertically in guides. This provides a clear front before the oven, which is not obtained with hinges. The oven, for purposes of strength, is cast from the same mixtures of metal as locomotive cylinders are usually made. To make the joint the faces of the door and oven are planed—a groove being made in the former, to contain an India rubber ring, and a tongue in the latter. The fastening of the door is made very expeditiously by means of the screw through the middle of a forged crossbar, one end of which is hinged to the right hand side of the oven, the other free end entering an eye before screwing up.



STEAM OVEN FOR CLOTH PLATES.

The most noteworthy feature, perhaps, is, says the *Textile Manufacturer*, the adoption of a wagon system of conveying the plates into or out of the oven from or to the presses. This is accomplished as represented in Fig. 2. The rails on the floor run in front of the range of presses, also in front of the range of ovens, and close to all of them.

The wagon that runs on this line carries on rails across its top a smaller carriage, that is usually locked or scotched in position. Upon this upper carriage the plates are piled when coming from the presses. They are then taken to an empty oven, and bridge pieces are laid between the oven and the lower wagon, so as to form rails for the top carriage to be run into the oven with the plates upon it. After heating the carriage the plates are withdrawn similarly. The separate handling of the plate with tongs at the oven is thus avoided, and the whole operation greatly expedited. The longer the plates remain in, up to a certain limit, the more uniformly they become heated, and the better is the finish obtained. It is, therefore, certainly better to utilize the time in heating that in the old plan is occupied in handling the plates.

Cholera.

In view of a possible, but we may still hope not very probable, invasion of cholera, it may be worth while to ask ourselves, seriously and urgently, in what condition will that formidable epidemic disease find us as regards the facilities provided for its rapid extension? In the history of previous epidemics there can be no doubt we may trace the record of progressive limitation and repression by sanitary improvements. The time has now arrived when, with all our light and knowledge, we ought to have no great dread of cholera. It is, in a very special sense, a perfectly controllable *in*fection; we do not say that it is so controllable as an *af*fection. It remains to be seen whether medicine, as a healing art, has discovered any new remedy, or learnt to apply any known and tried, but not perhaps thoroughly understood, principle of therapy in relief of the malady. What, however, we do assert is that medicine, as a preventive art, in its dealings with the germs of disease, ought to be able to grapple instantly and successfully with cholera. We know that it is propagated solely through excreta, and that water is the great carrier of the infective germs. Obviously, if the excreta of a cholera patient are allowed to dry in contact with the air, they may float away in the atmosphere, and the air will then become infected; but in a primary sense it is the water to which we must look.

In any case, it has been demonstrated that, provided all the excreta from a cholera patient are instantly destroyed—not merely disinfected—the disease will not spread. The malady can no more develop *de novo* than a plant can grow without seed. It is no use waiting until the disease has effected a lodgment in our midst. If choleraic dejecta have passed into the sewers before the nature of the disease has been recognized, as is most likely to happen, the seed has been already sown broadcast, and the production of a crop of cases in some locality—it may be seemingly far from the first case, but in connection with it—will be inevitable. The only effectual safeguard against the epidemic we desire to avoid is to begin at once to destroy *all* diarrhœa stools, lest too late they may be found to have been choleraic! As a matter of precaution we ought always to destroy the stools of fever and diarrhœa. It is wanton recklessness to allow them to pass into the sewers. This is how disease is spread and perpetuated, when it should be stamped out. Whatever disinfectant we employ should be used *at once*, and of strength sufficient to accomplish the object in view. These are hints which should be reduced to practice without delay.—*Lancet.*

Small Wastage on a Large Amount of Work.

The annual settlement of accounts of the Philadelphia Mint for the last fiscal year closed July 6. Representatives of the Treasury Department have for more than a week been weighing up enormous amounts of gold and silver on hand, and arrived at the actual loss in the operations of the institution for the period named. The result of the examination discloses the fact that the wastage of gold and silver in the operations of last year were the smallest on the amount of bullion operated upon in the history of the Mint. The total amount of gold bullion operated upon during the past year was 2,310,944$\frac{83}{100}$ ounces, equal to 76 tons. The total amount of silver operated upon was 45,591,338$\frac{72}{100}$ ounces, equal to 1,563 tons. The gold coinage for the year consisted of 415,486$\frac{56}{100}$ ounces, equal to 14 tons, the value being $7,729,982.50. The number of gold pieces struck and issued was 941,680. The total silver coinage issued weighed 10,551,908$\frac{88}{100}$ ounces, equal to 362 tons, value $12,325,470.15. The number of pieces of silver coined was 18,798,076. The total minor coins issued weighed 7,315,135$\frac{30}{100}$ ounces, equal to 251 tons, value $1,428,307.16. The number of minor coins was 60,951,526.

The legal wastage allowed by law on the gold operated on during the year was $32,018.33. The actual wastage was $20.77, showing the wastage on gold to be $31,997.56 less than the legal allowance. The legal wastage on the silver allowed by law was 57,293$\frac{5}{100}$ ounces, equal to $57,293.05, at $1 an ounce. The actual wastage on silver worked was, 809·23 ounces, equal to $809.23, or $56,483.82 less than the legal allowance. In other words, the actual wastage at the Mint upon the operations on the precious metals was $830.12, while the legal allowance was $89,311.38.

INDICATIVE of the enormous prices paid for rare specimens of orchids, at a recent auction sale at Stevens' (London) a single fine specimen of the Cattleya trianæ alba from Brentham Park collection sold for seventy guineas, or more than $400.