as upon many other subjects upon which we write frequently, we must repeat our lessons often. There is no subject upon which we receive so many inquiries.

First, then, the fundamental law upon which ventilation is based is, that hot air rises and cold air descends. It follows if the pure air admitted to a room be heated by a furnace, the impure air which is cooler will settle to the bottom of the apartment, at which the registers for its escape ought to be placed. If the room be heated by radiation, as with steam apparatus, stoves, etc., and the pure air be admitted cold, the registers should be at the top of the room.

Second, good ventilation can not be secured by using long flues, unless mechanical appliances, as fans, etc., or apparatus for heating them are employed. The air gets cold before it passes through them, and consequently ceases to rise, or rises but slowly. The best thing for this purpose is an open grate at the bottom of the room having for its chimney the flue through which the foul air is desired to pass.

Third, strong winds over the unprotected external mouths of flues, are apt to reverse or obstruct currents. The mouth of every flue should be covered with a hood so adjusted that it can rotate with the wind. The winds blowing from any quarter will thus aid rather than impede the egress of air from them.

Fourth, they, as well well as the flues for the admission of pure air, should be made of a size proportionate to the requirements of each particular case. Here the arithmetic comes in, and the data are as follows:

The number of respirations in a healthy adult per minute, is from 14 to 18. The average amount of air taken into the lungs at each respiration is about twenty inches. From this air the oxygen is removed, and its place supplied with carbonic acid at the mean rate of ·0435. From these figures it is easy to calculate the rate at which fresh air must be admitted to supply the demand or (as admission of fresh air implies in any proper system of ventilation the removal of foul air) the rate at which the foul air ought to be removed. The size of the escape flues ought to be proportioned to the size of the room, and the number of people it is intended to contain, which can be easily done by any competent architect. To those who are not competent we say, err if you must on the safe side, make the hole large enough for the adult cat and the kitten will also be accommodated. Of course if a building is not constructed so as to admit of proper ventilation, it will be impossible to ventilate it properly, a statement so logical that even Dr. Edward Smith, F. R. S., will not dispute it.

Fifth, the admission of pure air should be so adjusted when the air is not previously heated that all sharp drafts shall be avoided. This can easily be done by causing it to enter through wire gauze, breaking the currents by screens, etc., in the application of which means, common sense is of much more value than large scholastic acquirements. Thus ends our discourse upon ventilation, which if not so learned, will, we are confident, do more good than that of Dr. Edward Smith, F. R. S., before the Society of Arts, above mentioned.

TASTE AND SMELL--A NEW THEORY.

A scientific gentleman, in a recent conversation, broached to us a theory of taste and smell, which, so far as taste is concerned, is, we think, new. A similar theory in regard to smell has been propounded by Piesse, and is, we think, the true one.

The theory of odors hitherto accepted, has been, that invisible particles, emanating from bodies, and coming in contact with the olfactory nerves, produce the sensation of smell. Substances to be odoriferous, need, therefore, to be volatile to a certain extent.

Taste, says one author, "is merely a more delicate kind of touch." The nerves of the whole interior of the mouth are the ones supposed by some to be endowed with this "delicate touch," while others limit the nerves of taste to certain parts of the mouth, of which the tongue is chief. In general, substances insoluble in the fluids of the mouth, are regarded as being destitute of taste.

The nerves of special sensation have been a subject of most profound study on the part of physiologists, who have never yet been able to find in their anatomy or composition anything to account for their peculiar functions. Knowledge bearing upon the subject, therefore, relates principally to the external phenomena of special sensation, and it is to these that the theory of which we write entirely pertains.

The phenomena of sound have all been referred to vibrations of sonorous bodies, transmitted to the complex mechanism of the ear, by solid, liquid, or gaseous media, or a combination of such media. The phenomena of sight are also referred to vibrations of luminous bodies, transmitted to the eye by a medium called ether. In these sensations actual contact of the body, which is the primary cause of them, is known to be unessential. The new theory of taste and smell brings these sensations also into the category of impressions produced by vibration. In other words, these sensations are attributed to vibratory motions in external bodies, a knowledge of which is communicated to the mind through the nerves of taste and smell, in a manner analogous to that in which impressions caused by light and sound, are transmitted to the mind. In the case of taste, it is possible that no medium exists that can convey its impressions; the communication of such impressions must, if this be the case, be immediate, that is, the tongue must touch, in the popular sense, the thing tasted. There are, however, difficulties connected with this hypothesis, viz.: How are we to account for the absence of taste when insoluble substances are placed on the tongue? How, if fine division and intimate contact with the nerves of taste is essential to this sense, are we to account for the absence of taste when certain gases are taken into the mouth? Certainly, in the latter case, we have the minutest subdivision and as perfect contact, as is physically possible to obtain. It becomes evident, then, that there are bodies incapable of affecting this sense, as there are bodies which are non-luminous to the eye, and others which, to the ear, are deficient in sonorousness.

But, supposing no known medium to be able to convey impressions of taste to the nerves of that sense, the theory of vibrations does not, on that account, become untenable. We are far from believing, however, that the subject has been studied sufficiently to pronounce with certainty upon this point.

The corpuscular theory of light has been discarded as failing wholly to account for optical phenomena. In like manner have the theories of phlogiston and caloric successively given way to more enlightened views. Both light and heat are now considered as modes of motion.

If now we retain the corpuscular hypothesis for the sense of smell, we suppose that to be the most delicate of all the senses, for by it we may, without artificial help, detect quantities of matter so small that they can be detected by no other sense, even though aided by the most powerful instruments science has been able to devise or art to construct. If we consider the act of smelling as only a more delicate kind of touch, as it has hitherto been thought, we suppose the power of sensation in the olfactory nerves infinitely superior to any others. Some illustrations will make this appear in a stronger light. A grain of musk exposed for six months in a large room, communicates its odor to all the bodies in the room, *without any sensible loss of weight*. If a handkerchief thus perfumed with musk, be exposed to the most critical examination by the microscope, no musk can be detected deposited in its fibers. But, it may be said, the odoriferous principle exists in a gaseous state. If this were so, it might be reasonably supposed that delicate chemical tests would afford a trace of its presence, but they do not. Does not, then, the vibratory theory conflict less with the facts in this case than the theory of emanations? The only grounds we have upon which to base the hypothesis of emanations is a sensation produced, and we have the same ground for believing that light and heat are emanations.

But, it may be asked, how can the smell in the handkerchief be accounted for if the musk be not present? To this it is answered, in the same way that sensible heat in a body is accounted for, after it is removed from a contact with another heated body, or fluorescence in bodies after exposure to sunlight. These phenomena are referred to the continuance of vibrations in bodies after the exciting cause is removed. It does no violence to analogy to suppose the same cause as continuing the effect of an odor, after the primary cause is removed.

A bar of block tin, when rubbed, emits a peculiar smell. No test, however delicate, can demonstrate the presence of metallic particles in the air or of the oxide or salts of tin, in this experiment. Applying the same reasoning adopted in relation to sound, heat, and light, it is extremely difficult to believe that smell, in this case, in produced by actual contact.

It is well known that perfumes blend harmoniously when combined according to a scale, which may be represented by a gamut, in which different odors correspond to different musical sounds; and the other analogies between smell and sound are indeed very striking, as is shown by Piesse, in his work on "The Art of Perfumery," second section.

A wide field of study and experiment is here opened, and, we have no doubt, that in future works on physics, the subjects of odor and taste are destined to find a place by the side of heat, light, sound, and electricity.

BEET ROOT SUGAR.

No. III.

CULTURE OF THE BEET.

CLIMATE.—Few of our cultivated plants thrive under more varied conditions of climate than does the beet. It is grown in Europe, from the shores of the Mediterranean to very near the Arctic circle, and from the Atlantic to the Caspian Sea, so that in few portions of the United States would meteorological conditions offer any obstacle to its successful cultivation. The relative season for sowing, so that it can be harvested in the right time, can be so regulated by the intelligent cultivator, according to the degree of latitude, so as to suit the exigences of the manufacturer.

Heat and moisture being needed in considerable quantities for its perfect development, very cold or very dry localities will alone prove antagonistic to its profitable production as a sugar plant.

The seed germinates at a temperature of 44° Fah.; the root rots on thawing if exposed to a cold much below the freezing point.

SOIL.—The beet vegetates in all soils, but a sandy loam or an argillaceous soil is the best suited to its nature. In chalky soils or very sandy ones, its development is stunted. It prospers in light, silicious ground if this be rich in humus or in manure. A medium consistence between stiff and light is the best for it, but too stiff soils are preferable to too light ones.

The soil for beets must be loose, fresh, and free from stones. If water is contained in the subsoil, it must be artificially drained.

A certain amount of lime in the soil is advantageous, but it must contain no *excess* of potash or soda, as these salts have a deleterious influence on the ulterior production of sugar during the process of manufacture.

It is best, for many reasons, not to grow beet as a first crop on newly-cleared lands. This plant having a long, taper root, the radicles of which penetrate far down into the ground, the necessity of a deep and well-pulverized soil is apparent.

PREPARATION OF THE GROUND.—The instructions for this purpose may be summed up as follows: Plow deep in the autumn or early winter; better twice than once. This may best be done by means of two successive plowings with an ordinary plow or by the use of a subsoil plow. The following spring pass a heavy iron-toothed harrow over the land, and follow this soon after by a scarifier. After this, spread your manure equally over the land and plow it in to a depth of four or five inches.

Harrow and roll with an iron roller so as to equalize the surface and break up clods, and the field is ready to receive the seed. These last operations must, if possible, be performed before the month of April.

SOWING.—Our instructions in this case are: In the first place, purchase your seed, fresh imported, from a reliable dealer, or import it yourself until you can make your own (which will require two years). The amount needed per acre will be from ten to twelve pounds, which can be purchased in New York, at present prices, at 50 cents per pound, for small quantities of from ten to fifty pounds, with a very liberal discount for larger amounts.

The seed, before sowing, is soaked in water for 24 hours, and piled up into small heaps until signs of approaching germination are manifested. It is then rolled in fine dust-bone black, which forms a dry adherent coating.

The land by this time must have been very carefully "marked," or laid out in regular superficial lines or grooves running at right angles to each other. This is done by means of a special implement drawn by a horse. These lines are so distanced that those in one parallel series are placed at one foot six inches, and those in the other at one foot ten inches from one another. One beet root is destined to be grown at the angle of each quadrangle formed by these intersections, so that one acre of land produces between 21,000 and 22,000 beets. The marking has to be done with great accuracy, as the subsequent horse hoeings would be impossible if the regularity of the rows was imperfect.

The seed is sown by manual labor or by horse power. In the first case this is done by special hand machines, which rapidly deposit the seed along with a minute quantity of some dry, pulverulent fertilizer at the angle of the square "marked," as above described. It is then covered by passing a roller over the ground.

More generally, however, the seed is drilled into the land by a sowing machine, drawn by one or two horses, that sows several rows at a time. These machines, of which many various kinds are at present in use in Europe, generally open a groove in the ground, drop the seed in a continuous stream into this groove, deposit along with it a small amount of superphosphate or other finely-comminuted fertilizer, and finally cover the seed, all in one operation. The seed ought to be buried at a depth of from 1½ to 2 inches.

If the season is propitious, the young plants will show themselves above the surface in from eight to twelve days.

The time of year for sowing the seed must, in the United States, vary according to localities, from the 1st of March in the Southern States to the first week in May in the Northern. The average for our Middle States, East and West, would correspond to about the 15th of April, or as near to this date as circumstances will allow.

CARE OF THE GROWING CROP.—Very soon after the young beets have fairly shown themselves, or even before this, if weeds are thick, and the original drill lines or marks are still visible, a horse hoe is lightly run across the field between the 18-inch rows.

This implement is made to take from three to five rows at one time, in which cases it is, respectively, drawn by one or by two horses. As soon as this operation has been performed, the small beet plants are "thinned" in the rows by means of a broad-bladed hand hoe, which is by two successive strokes of the laborer made to clear a little less than one foot ten inches of the space to be left between two plants in the same row. With skillful drivers this operation may also be performed by the horse hoe; the implement in this case being so constructed as to allow of varying at will the distance between the hoes.

A workman, or woman, with a small, short-handled grubber now follows, and stirs the earth carefully around each plant, so as to loosen the soil, and to leave only one beet at the end of each determined interval.

A few rows of young beets must be left in each field untouched, or only "thinned," in order to allow by transplantation the filling up at some future period (generally after the second hoeing, or when the root has attained about half an inch in diameter) of any vacant spaces in the line produced by the non-germination of seed, late severe frosts, or other accidental causes. The transplanting is done by hand, and the replanting with a blunt-pointed, hard, wooden borer, great care being taken not to injure the young roots when taking them up or during their transportation. These last operations are often satisfactorily performed by means of a "*deplantoir*," or "transplanter," a special instrument constructed for the purpose.

After this period, two successive horse hoeings will, in most cases, generally suffice to keep the ground clear of weeds until the foliage of the beet itself will become a self-protector by smothering all spontaneous vegetation between the rows. In some instances, however, when the soil is particularly foul, or when it has become caked by the combined influence of excess of rain and heat, it may become necessary to repeat the hoeings once or twice more, and it may prove beneficial to "earth up" the beets, either by means of special contrivances adapted to the horse hoe itself or by using a very light mold-board plow.

As the plant is a biennial, harvested during the first year of its growth, it cannot be called ripe or mature at any time before maturation of seed, but the proper season for its extraction is indicated when the thermometer in the autumn months has, during several successive days, fallen as low as 45 or 50 degrees of Fahrenheit's thermometer, and when consequently the first frosts may be anticipated.

HARVESTING.—This is done with hand graips, or much better with a mold-board or gridiron plow, the coulter of which has been removed.

The plants are taken up, well shaken, and laid in rows, with the roots pointed all one way. The tops, or collars, are then cut off by means of a strong, heavy, sharp knife, which does the work by one stroke.

Care must be taken to "decapitate" the beet root fully, so as to prevent vegetation or sprouting of new leaf buds during the winter months, which would develop themselves at the expense of the sugar. The roots must be cleaned, but without excess, as a little dirt left on them will hurt them much less than rough handling and bruising.

The season for harvesting will vary from the beginning of September to the end of October, according to localities, seasons, and periods of sowing the seed. The later the harvest is gathered the more advantageous will it prove to be in the end to the manufacturer.

PRESERVATION.—The beginning of the beet root harvest and of sugar making for the campaign are simultaneous. The beets needed for immediate consumption, or for use within a few days after the gathering, are laid in the open air in layers, which must not exceed three feet in thickness, and must be frequently stirred if their sojourn is accidentally prolonged beyond this length of time.

The roots destined to be worked during the winter months must be preserved from frost, and are placed in long trenches dug in the ground near the factory buildings. These trenches are generally made about ten feet wide and seven and a half feet deep. Their bottoms have a gentle slope from each side toward the center, where longitudinal drains are dug out for the purpose of collecting any water which might percolate through the pile of beets. This water is carried off by a long, narrow ditch, dug at a lower level than the trench, and put into connection with it by means of drainage pipes.

The bottom of the trench is next covered with small poles or faggots, laid across so as to bridge the central drain, and the beet roots are carefully filled in, care being taken to leave air holes or chimneys (made by converging poles or boards) at distances of every twelve or fifteen feet. The beets are piled somewhat higher than the upper level of the trench.

As long as the weather remains fine, and no frost is apprehended, all that has to be done is to cover the upper surface of the beets with a few inches of straw, or dried leaves, in order to protect them from the action of the sun, which is apt to induce heating and consequent fermentation and putrefaction.

As soon as the cold weather sets in, a portion of the earth dug up in making the trenches is placed in a layer of from 1 to 2½ feet in thickness on the top of the covering of straw or dried leaves. This protection is only removed as the beets are needed for the supply of the works. One single thing has to be attended to during the winter, namely, to close the air holes or chimneys whenever the weather is frosty, and to open them on mild or rainy days.

PLACE IN ROTATION OF CROPS.—It is improvident, and bad farming to cultivate the beet root twice or more years in succession on the same piece of land.

In Europe it is brought once only in a triennial or quadrennial system, this last being preferable as requiring the labor of only one manuring during a period of four years.

Here are examples of rotations such as we can conscientiously recommend:

I.

1st year	Beets, manured.
2d "	Barley or oats.
3d "	Clover or sainfoin.
4th "	Wheat.
5th "	Beets, manured.

II.

1st year	Beets, manured.
2d "	Wheat.
3d "	Clover.
4th "	Rye or oats.
5th "	Beets, manured.

III.

1st year	Potatoes, well manured.
2d "	Beets, not manured.
3d "	Wheat.
4th "	Clover, hay, or some forage crop.
5th "	Potatoes, manured.

MANURE AND FERTILIZERS.—In order to obtain a twenty-tun crop of beet root without impoverishing the soil on which it has been grown, we have to return to it the whole of the leaves which were cut off at the period of harvesting, and further, to add by means of farm-yard manure, and by other fertilizers, either natural or artificial, the following substances per acre in the quantities here given:

Nitrogen	747	pounds.
Sulphuric acid	45	"
Phosphoric acid	166·5	"
Lime	189	"
Potash	1,125	

These figures, with a large allowance for waste and losses, will allow intelligent agriculturists to make their own calculations as regards the needed quantities of the manure they may choose to employ. Let us remark, in conclusion, that during the processes of making beet root sugar many very valuable refuse, or so-called waste substances are produced, all of which are of the highest value as fertilizers, and are carefully collected as such. These are: The waste dust or refuse bone-black left after washing; the exhausted lime of defecation; the pressed scums; the worn-out woolen sacks from the pulp presses; the ashes from under the boilers; the small roots and rootlets from the root washer; and, finally, the dung of the animals fed upon the beet root pulp after the sugar has been manufactured therefrom.

Editorial Summary.

WE learn that a bill for the inspection of steam boilers has been introduced into the Pennsylvania Legislature. It provides that within thirty days the Governor shall appoint one suitable person, to serve for three years, in each Congressional district, as inspectors. They shall examine all except locomotive and low-pressure boilers, and shall keep a "lock-up" safety valve on each boiler. The owners shall have their boilers ready for inspection when notified, and shall pay four dollars for inspection, and shall attach a low-water indicator, connected with the steam whistle.

WORKMEN AND THEIR TOOLS.—A good test of a good workman—one of the best apart from his workmanship—is his care of tools. If he leaves a worn out or dilapidated tool in its imperfect state until he gets time to put it into shape, he he lacks in the organ of order, which should be the shop's, as Pope says it is Heaven's first law. But if he repairs the tool soon as it is injured, whether wanted for use at the time or not, he can be depended upon. A carpenter may be known by his chips; but a workman at any business may be known by the state of his tools.

EFFECT OF TREES ON CLIMATE.—The dryness of the Egyptian climate is such that rain is unknown in Upper Egypt, and in olden time it never rained oftener than five or six days in a year on the Nile delta. The viceroy, Mehemed Ali, caused twenty millions of trees to be planted on this delta; these have now attained their full size, and the number of rainy days has increased to forty annually. Such is the power which man can exert over nature in the matter of varying meteorological conditions.

A "NEW England Mechanics' and Art Association" has been organized at Boston, of which ex-Governor Bullock, of Worcester, Mass., is President. The circular before us, which we are requested to notice, does not give any information respecting the purposes of the association, but we should judge, from the number and character of the gentlemen who are its sponsors, that a good deal may be expected from it.

MONUMENT TO HUMBOLDT.—It is proposed by a number of our citizens to commemorate the centennial birthday of Humboldt by the erection of a monument to his memory, in the Central Park, at a cost of $2,500. Subscriptions are solicited in behalf of this commendable undertaking by a committee of well-known gentlemen, of which Christian E. Detmold, of this city, is the treasurer.

IMPROVED PRINTING MECHANISM.—One of Bullock's patent presses, at the Government printing office, Washington, attended by two persons, does the entire work which recently required for its execution no less than eighteen of the Adams presses, coupled with the labor of twenty persons. The steam power used to drive the Bullock press is not much greater than that needed for one of the old presses.

INK FROM ELDER.—In a receipt for making ink from elder, on page 180, an incongruity has crept in. The sentence reading "add to 12½ *parts* of the filtered juice one ounce of sulphate of iron," etc., should read, add to 12½ ounces of the filtered juice one ounce of sulphate of iron, etc.

A NEW chemical laboratory, just completed at the University of Leipsic, is the largest and most perfect, in regard to its internal arrangements, of any in Germany. The corner stone was laid in August, 1867, and the building was opened to students in last November.

THERE are only seventy-five miles of rail remaining to be laid on the Pacific Railroad, and it is expected that a locomotive will run through to San Francisco early in the summer. The highest point on the road is 7,500 feet above the sea.

WE are out of some of the back numbers of this volume. Subscribers who write for missing numbers will always be supplied when it is possible for us to do so. We make this statement to answer several applications.

WE are indebted to General H. A. Barnum, of Syracuse, N. Y., for a copy of Report of the Inspectors of State Prisons, for 1869, for which he will please accept our acknowledgments.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The new American Print Works, at Fall River, Mass., are nearly finished, and are filling with machinery. The Mechanics' Mills, in the same town, are receiving machinery, and will commence running in about three months. They will run 50,000 spindles, 1,200 looms, and will weave 13,000,000 yards of print cloths per annum.

A powerful steam saw mill on wheels is building at Worcester, Mass., It is to be moved about the country and used wherever wanted. The machine weighs twelve tuns.

Almost one thousand passengers were delayed along the line of the Union Pacific Railroad by the recent snow blockade.

It has been estimated that at present rates of cutting, the pine timber of Michigan will be exhausted in 17 years.

The Georgia White Oak Lumber Company have now in operation a floating steam factory turning out 1,500 finished staves per day.

Part of a brewery at Morrisiana, N. Y., was crushed on Saturday by several thousand tuns of rock and earth falling upon it from a hill in the rear.

The Turner's Falls (Mass.) Water Power Company have leased 200-horse power, with privilege of 400 more, to a gentleman of New York, who will employ it in making paper pulp from poplar wood.

Two millions of cattle are, upon the authority of Letheby, killed annually in South America for the fat skins and bones solely.

A green corn company is erecting at Farmington, Me., a factory 100 feet by 60 feet and three stories in hight.

There are 107 cabinet manufacturing establishments in New York city, employing in the aggregate 3,000 men.

The Philadelphia Water Works supply water to 959 manufacturing establishments.

Kansas has already 600 miles of railroad in active operation.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

C. L. H., of Ohio.—An aqueous solution of gum-arabic is the best varnish for leaves and flowers.

W. S. S., of N. Y.—Your communication upon rat-proof buildings fails to explain how they should be constructed. In its present shape we cannot regard it in any other light than as an advertisement of a patent.

E. J. F. of Me.—An application of glycerin to the tubs will not injure the taste of butter, and the article is harmless. You can get it at the druggists.

L. O. B., of Ind., wishes to know a practical method of scouring wool oil containing petroleum, out of cloth or yarn. He says the yarn when this oil has been used, turns yellow after standing awhile, and never comes out as white as when pure lard oil has been used, and when he attempted to scour with lye or country soap, he could not get good results. Can any of our correspondents give the desired information.

Wm. S. C., of———The usual estimate of a horse power, 33,000 lbs. raised one foot in one minute, is the work that average horses will perform steadily with suitable machinery. The best method of applying the power of a horse to propulsion of machinery is in our opinion, the endless chain horse power in common use if properly made and set with reference to the machinery to be driven.

J. Van O., of Pa.—We have practiced the following method for drying chlorine gas, with excellent results. Take of pumice stone a quantity of small fragments the size of a pea, soak them in strong sulphuric acid, then calcine them until acid fumes cease to be disengaged. These fragments are then re-saturated with sulphuric acid and inclosed in a tube through which the gas is passed in the ordinary manner of drying other gases. The sulphuric acid will seize the water contained in the gas the latter passing over in a dry state.

J. E. C., of Iowa.—When the same length of belt is to be used to give different speeds, the centers of the pulleys remaining equi-distant, the diameter of the driver must be increased as that of the driven is diminished, or *vice versa* and the speed of the circumference of both the driver and driven pulley will increase exactly as the diameter of the driver is increased. The number of revolutions made by the driven pulley will be to the number of revolutions made by the driver, as the diameter of the driven pulley is to that of the driver. Thus if the diameter of the driver be 4 and that of the driven 2, and the number of revolutions of the driver be 60, the proportion will be, 2 : 4 : : 60 : 120 the number of revolutions made by the driven pulley.

F. P. H., of Mass.—We know of no "water-proof glue" for uniting wood. Many recipes are published which assume to be waterproof, but we do not believe in any of them, as glues are dissolved in water, and of course water will re-dissolve them. India rubber (virgin) dissolved, 4 parts in 30 parts naphtha, or benzine, and 65 parts ground or powdered shellac melted in it make as near an approach to water-proof glue as anything we know. It will also unite metal and wood if the surfaces are clean. Molesworth, in his "Engineer's Pocket Book" gives the following: "For a glue to resist moisture, melt 1 lb. of glue in two quarts o skimmed milk. A strong glue, add powdered chalk to common glue. His marine glue is similar to that, the formula of which is given above. We cannot tell you where "machines for plaiting silk fishing lines" are to be obtained.

J. S. C., of Pa.—We do not consider the question of the precise instant when the gun receives the recoil of the explosion—whether at the time of ignition of the powder, or when the bullet leaves the barrel, thus creating a vacuum—of sufficient value to occupy a space in our columns.

H. A. S., of Me., says he saw in the SCIENTIFIC AMERICAN about two years ago a statement of the erection of a flour mill in New York, to hull the wheat before grinding. He asks "What became of it and why don't the owners advertise?"

S. W. H., and Bro., of Mo., say that they use an exhaust pipe of tin, four inches diameter, for leading their exhaust to a heater. It drops two feet from the engine cylinder, traverses ten feet horizontally, and then rises four feet to the heater. In starting the engine March 5th, the horizontal portion collapsed. "What" they ask "is the reason?" The only cause is the pressure of the atmosphere without, and a vacuum within the pipe. Probably an examination would show that the communication with the atmosphere was closed either by the action of the back pressure valve opening outward or by the water. Sheet tin is *in any case* a poor material for conducting steam.

W. S. T., of N. H.—Number of feet traversed by minute of your little engine is 562; pressure, about 4 lbs. on piston, result less than one-sixteenth of one horse power.

T. F. H., of Conn.—A good dark bronze dip is made by dissolving iron scales (scales from the forge) 1 lb., arsenic 1 oz., zinc 1 oz. in 1 lb., muriatic acid; the zinc to be added to the solution just before using. The metal to receive it should be cleaned by diluted acid.

L. V. G., of Ohio.—For an ordinary foot lathe for wood or light metal work, a wheel of iron from 30 to 36 inches diameter is sufficient for a driver, weighing 150 to 175 lbs. The live spindle should run in brass composition or Babbitt metal.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

BUOY FOR RAISING SUNKEN VESSELS.—Joseph C. Fuller, executor of the estate of Elisha Fitzgerald, deceased, has petitioned for the extension of the above patent. Day of hearing, May 31, 1869.

MACHINE FOR PEGGING BOOTS AND SHOES.—Alpheus C. Gallahue, of New York city, has petitioned for the extension of the above patent. Day of hearing, May 31, 1869.

MACHINE FOR MITERING PRINTERS' RULE.—William McDonald, of Morrisania, N. Y., has applied for an extension of the above patent. Day of hearing, June 14, 1869.

CARD EXHIBITOR.—Wright Duryea, of New York city, has applied for an extension of the above patent. Day of hearing May 31, 1869.