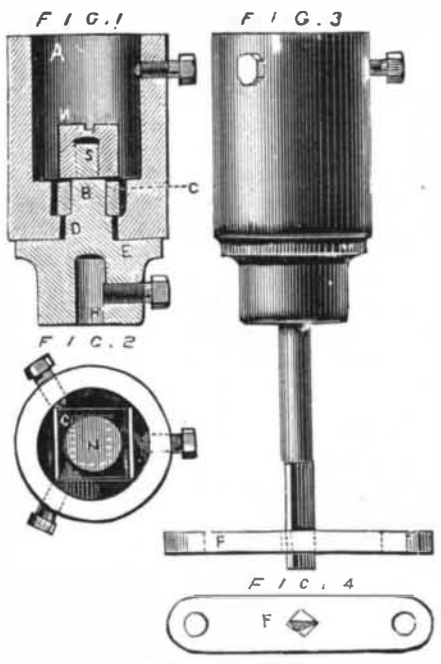
DRILLING SQUARE HOLES.

To drill a square hole with a rotary motion at one operation may seem to many a novelty in mechanics, but Mr. J. Hall, of Chancery Lane, has obtained a patent for a method of accomplishing the feat. For this purpose he employs a three sided drill, either flat or fluted, which, in cross section, is of the form of an equilateral triangle. He makes the bottom or cutting edges of the drill perfectly flat, and three in number, each cutting edge extending from one of the outer corners to the center of the triangle. The proposed method of using such drills in an ordinary vertical drilling machine is as follows: A special drill chuck, forming part of the invention, is provided, and attached to the lower end of the drilling spindle. The chuck is constructed in such manner as to admit of the drill traveling automatically in a horizontal plane some little distance. This is rendered necessary by the peculiar movement of the cutting edges of the drill, which does not operate or rotate on a fixed central point, but diverges somewhat in proportion to the size of the hole.



TOOL FOR DRILLING SQUARE HOLES.

The drill chuck is constructed in the following manner: The upper part of the cavity of a metal cylinder is bored out circularly, so as to fit on to the drilling spindle, to which it is screwed by one or more screws. Below the circular bore a square recess is made, and below this latter, and coming well within the limits of the square recess, there is a circular hole passing through the end of the cylinder. The drill holder or socket is in a separate piece, the bottom portion of which is provided with a square or round recess for holding the shank or upper end of the drill, which is held firmly in its place by means of a set screw. The device is shown in the accompanying engraving, which we take from the *English Mechanic*. The upper part consists, first, of a screw, S, at the top, Fig. 1; secondly, of a square shoulder, B; thirdly, of a circular shoulder, D; and, fourthly, of another but much larger circular shoulder, E. Through the circular hole at the bottom of the hollow cylinder the upper portion of the drill holder is inserted until the large circular shoulder meets the bottom of such cylinder. A loose square collar, A (Figs. 1 and 2), provided with an oblong rectangular slot, is then placed within the cylinder and over the square above mentioned, above and on to which is screwed down a nut, N, from the inside of the cylinder. The loose square is of such thickness that when the nut is tightened down on to the square shoulder the loose collar is left to work freely. When this is done the drill holder will readily travel in a horizontal plane such distance as the play between two of the sides of the loose collar, and two of the sides of the square recess, in one direction, and in another direction the distance of the play between two of the sides of the small square shoulder of the drill holder and the ends of the rectangular slot in the loose collar. The horizontal travel or play is proportionate to the size of the hole to be drilled. Near to the lower end or cutting edges of the drill is fixed rigidly a metal guide bar or plate, F. The guide bar is provided with a square hole similar to the hole it is required to drill, the dimensions of the three sides of the drill being such that the distance from the base to the apex of the triangle, which such three sides form, is the same as of the sides of the square holes it is required to drill.

Mr. Hall prefers to make the guide bar of steel, which he hardens at that part where the guide hole is made. The method of operation is then as follows: The three sided drill being fixed in the self-adjusting chuck, the guide bar with the square guide hole therein rigidly fixed above the point where it is required to drill, the drilling spindle carrying the chuck drill is made to revolve, and is screwed or pressed downwards, upon which the drill works downwards through the square guide hole, and drills holes similar in size and form to that in the guide. The triangular drill for drilling dead square holes may also be used without the self-adjusting drill chuck in any ordinary chuck, when the substance operated upon is not very heavy nor stationary; then, instead of the lateral movement of the drill, such lateral movement will be communicated to the drill by the substance operated upon

Although the patentee only cites the case of a vertical drilling machine in connection with this invention, he declares that the specified improvements are equally applicable to lathes, ordinary braces, ratchet braces, and all other descriptions of drilling apparatus. In making oblong dead square cornered holes, either the substance to be operated upon must be allowed to move in one direction more than another, or the hole in the guide plate must be made to the shape required, and the drill chuck made to give the drill greater play in one direction. Fig. 1 shows a vertical section of the improved chuck, in which A is the hollow cylinder, which may be attached to any ordinary drilling machine; H is the drill holder; S is a screw; B is a square shoulder; D is a circular shoulder; E is a circular shoulder of a larger dimension; N is a screw nut for tightening on to the square shoulder, B, and the loose square collar. Fig. 2 is a plan view of Fig. 1. Fig. 3 is an elevation of the improved chuck; C showing the three sided drill and the guide bar, F, complete. Fig. 4 is a plan of the guide bar, F, showing the three sided drill in cross section.

Indications of Progress.

While Paris has been reveling in excess of light, and, according to many, paying pretty heavily for it, we, says the *Electrician* (London) in issue of October 16th, have been waiting the results of the experiments. However, amidst the confusion of cries, there seems to be a general consensus of opinion that electricity is the best method of lighting under certain circumstances. This being the case, efforts are being made to supply any demand that may arise. No less than three electric light companies have been registered within the last few days, with a total capital of over £200,000. The British Electric Light Company, promoted by Mr. E. J. Reed, takes up Rapieff's patent, and is patronized by the *Times*. The Electric Lighting Company, promoted by Mr. Hollingshead, is to work the Lontin system, and is patronized by the frequenters of the Gayety, and all who walk through the Strand during certain portions of the evening. These two have a nominal capital of £100,000 each. The Sun Electric Light Company is the third and last, with a capital of £5,000 only. Mr. Strickland is the promoter, and the company is formed for the development of the Harrison system, about which little has been publicly said, but which private report mentions in the highest terms. The candles are said to surpass the Jablochkoff, and the division of the light seems to anticipate Mr. Edison. The public will soon be able to judge the value of these reports for themselves, as arrangements are being made to use the light on a very large scale.

RUSSIAN POTTERY.

We present engravings of two examples of unglazed Russian pottery of quaint design. It resembles in texture and material the old black Wedgwood ware so much admired by connoisseurs.

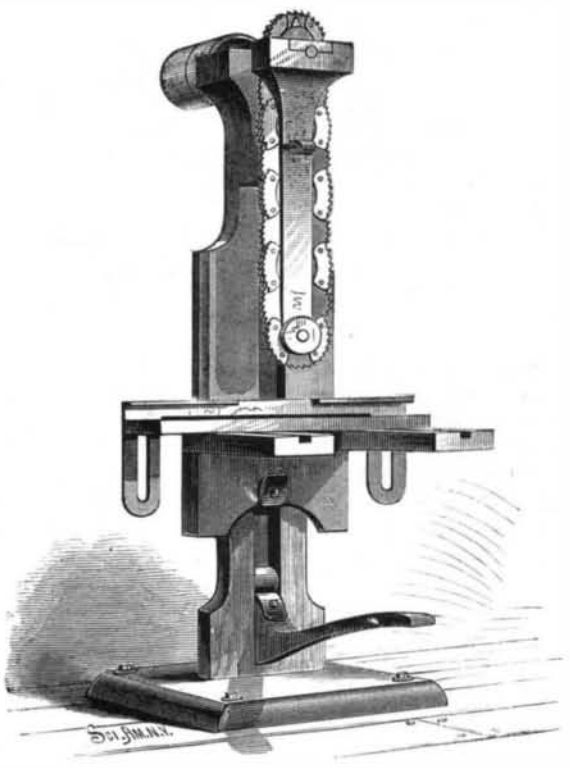
RUSSIAN POTTERY.

Practical Education in Russia.

In a letter from the Paris Exhibition, Col. Forney, of the Philadelphia *Press*, remarks that while American progress has astonished Europe, yet "Germany, Switzerland, and France have methods and systems that deserve to be studied. Even Russia may be a model for all of us. Yesterday I saw some Russian machinery at the Exhibition; and my admiration increased as I was told that much of this exquisite work was made by the youth, many of them sons of the best families, sent into the machine shops to learn trades as a part of their education. There was no alternative; they were compelled to pass this ordeal. The government is the master, and young Russia must obey; and now obedience becomes a delight; and it is as much the fashion to finish a practical education in this way, as formerly it was the fashion to pass through a school, or an academy, or college, for the easy acquisition of superficial accomplishments."

NEW MORTISING MACHINE.

A novel form of mortising machine, the invention of Mr. Wm. W. Green, Jr., of Chicago, Ill., is shown in the accompanying engraving. In this machine the usual vertically reciprocating chisel is replaced by an endless chain consisting of saw sections jointed together and running over two pulleys, the upper one of which is spurred, and acts as a driver. The lower pulley is journaled in the end of a vertical arm, which is of the same thickness as the endless chain saw.



GREEN'S MORTISING MACHINE.

The vertically sliding table which supports the work is of the usual description; but it is raised by very simple means. To the pedal is attached a strap, which passes under one pulley and over another, and is attached to the table. A downward pressure on the pedal raises the latter and carries the work up to the cutter. The width of the mortise may be varied by using pulleys of different diameters.

Recent Engineering Inventions.

Mr. William P. Barclay, of Virginia City, Nev., has patented an improvement in Hydraulic and Wire Rope Pumping Systems. In pumping machinery, such as is commonly employed in freeing mines from water, heavy rods of wood, jointed and bolted together by iron plates, are used. These rods, to have the requisite strength, become excessively heavy, requiring counterbalancing, thus throwing into the pumping apparatus a quantity of heavy material that requires to be oscillated at each stroke of the pumps, thereby consuming a great amount of power and rendering the action of the pump slow. By this improvement these difficulties are overcome and the pumping is effected economically. This invention employs as many force pumps in the mine or shaft as may be required, placing them one above the other at suitable distances apart. These pumps are provided with the usual inlet and discharge valves placed one above the other.

Mr. Frederick Bowen, of Barnhart's Mills, Pa., has patented an improved Pump for Oil Wells. The object of this invention is to provide for withdrawing and replacing the packing of the pump plunger in oil or artesian wells without disturbing the tubing or valves. It consists in the arrangement of the upper valves in connection with the cell containing the stuffing box, and in the manner of securing and removing the packing ring of Babbitt metal.

Comstock Silver Lodes.

The survey of the silver mines situated on the Comstock lode was carried on in 1877 by Professor I. A. Church, of Lieut. Wheeler's party. The character of the vein was carefully mapped from one thousand to two thousand feet deep. The heat varied from 84° Fah. in old drifts to 116° in freshly opened ones. The source of the heat is, it is believed by those in charge of the works, ascertained to be the decomposition of the rocks under the agency of atmospheric influences. This was observed of the thick sheets of lava

lying upon the vein in the upper one thousand feet of rock. Below this it is known to be going on for fifteen hundred feet further. At 2,400 feet it is nearly uniform, neither increase nor decrease being observed. The miners cut through singular bands of hot and cold rocks, a fact which seems to suggest that the origin of the local heat is the motion which is taking place in tangential and orthogonal directions in the earth's crust as the result of its slow contraction by cooling. It is thought the lode will continue hot, but not increasingly so.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, November 16, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated:

PLANETS.

	H.M.		H.M.
Venus rises	6 28 mo.	Saturn in meridian	8 06 eve.
Mars rises	5 11 mo.	Uranus rises	0 06 mo.
Jupiter sets	9 19 eve.	Neptune in meridian	10 40 eve.

FIRST MAGNITUDE STARS, ETC.

	H.M.		H.M.
Alpheratz in meridian	8 18 eve.	Procyon rises	9 30 eve.
Mira (var.) in meridian	10 29 eve.	Regulus rises	11 33 eve.
Algol (var.) in meridian	11 16 eve.	Spica rises	4 14 mo.
7 stars (Pleiades) in merid.	11 56 eve.	Arcturus rises	3 17 mo.
Aldebaran in meridian	0 48 mo.	Antares sets	4 59 eve.
Capella in meridian	1 27 mo.	Vega sets	11 42 eve.
Rigel rises	7 53 eve.	Altair sets	10 30 eve.
Betelgeuse rises	7 39 eve.	Deneb sets	2 52 mo.
Sirius rises	9 55 eve.	Fomalhaut in meridian	7 07 eve.

REMARKS.

The moon at rising November 17 will be about 5° northeast of Regulus, and a few hours later will be 3° south of Uranus. Thursday morning she will be very near Spica, and several degrees southwest of Mars.

Venus now rises 20 minutes before the sun; she can nevertheless be seen, as we have seen her when only seven days from conjunction.

MOON'S PATH THROUGH THE CONSTELLATIONS.

Saturday, *Cancer*	15°	Wednesday, *Virgo*	12°
Sunday, "	29°	Thursday, "	26°
Monday, *Leo*	13°	Friday, *Libra*	11°
Tuesday, "	27°		

NOTE.—The number of degrees the moon has advanced in each constellation at 7h. 0m. evening, is given, being a convenient hour for observation.

Progress of Horticulture.

The members of the Massachusetts Horticultural Society celebrated the eightieth year of their oldest living fellow member, Colonel Marshall P. Wilder, by a fête at the Parker House, Boston, on the 21st of September. Colonel Wilder in response to remarks by Alderman Charles Breck, spoke as follows:

"Mr. President: I thank you for your kind expressions of respect, and you, my dear, dear friends, for the very cordial reception you have given me. Nothing could be more grateful to my feelings than these warm demonstrations of friendship and regard, coming, as they do, from those who have known me for many years and are conversant with my many frailties and faults. Yes, the wheels of time move on and tell the story of our bygone days; and if I live to see the opening of another Sabbath morn I shall have passed the bounds of fourscore years. Most devoutly would I render thanks to the Giver of all good that he has prolonged my life, and that I am able to be here with you on this joyous occasion—here in the presence of my beloved pastor, who for thirty years has been my spiritual adviser—here with so many kind friends and co-laborers, with whom I have taken sweet counsel these many years—here to receive your friendly salutations and, perhaps for the last time, to enjoy the sweet melody of your voices and breathe in the still sweeter consolation which arises like incense from off the altar of sympathizing souls. When we reflect upon our past labors, our thoughts naturally revert to the Massachusetts Horticultural Society, whose fiftieth annual exhibition has just closed, and for which you, Mr. President, and your good father have done so much. Well do I remember its first exhibition in the old Exchange Coffee House in this city. Well do I remember the scene, with its two small side tables and one at the head of the hall. Well do I recollect the contribution of fruits when Robert Manning, the great pomologist of America, contributed only two baskets of fruit, and the subsequent growth of his enterprise, when he donated many hundred varieties, and afterwards had in the Pomological Garden at Salem 2,000 varieties of fruit trees. Thank God, his son, bearing his own name, is with us to-day. Well do I remember the dinner at which sixty gentlemen participated, and the speeches which succeeded it. The scene is before me now. There sat at the head of the table the eloquent Dearborn; there on his right and left sat His Honor, Lieutenant Governor Thomas L. Winthrop (father of our beloved Hon. Robert C. Winthrop), and His Honor the then Mayor of the city, Harrison Gray Otis, and the accomplished statesman and orator, Daniel Webster of immortal fame. [Applause.] There, too, were Hon. John C. Gray, vice president, Dr. Jacob Bigelow, corresponding secretary of the society, and John B. Russell, all of whom still survive; and here to-day, much to our joy, are the brothers Hovey, who were present on that occasion. Well do I remember the toast of General Dearborn—'Intelligence and industry, the only true promoters of the public good'—a sentiment which deserves to be written in letters of living gold. I thank you, Mr. President, for your kind allusion to me as one who has done something to promote the interests and welfare of my fellow men. My friends, I have lived to see great progress and improvement in the agriculture and horticulture of our country, much of which may be primarily traced to the enterprise and labors of Massachusetts men. Suffice it to say, that, from the day when Governor Endicott planted his pear tree at Salem, which still lives; from the day that Perigrine White planted his apple tree at Marshfield, Mass.; from the day when our society was formed it has stood prominently before the world as a leader and patron of agricultural and horticultural science. How marvelous the progress in our own day! How grand the march of horticulture since the establishment of our own society! It is scarcely fifty years since the Massachusetts Horticultural Society was formed. Then there were but few horticultural and agricultural societies in our land; now they are counted by thousands, and are scattered over the continent, all working harmoniously for the promotion of these arts. Then there was scarcely a nursery of any note west, and only a few east of the Hudson river; now they are planted from one shore of our country to the other, and among them many of the largest in the world. Then Mr. Hovey had not sowed the seed of his strawberry and other fruits, which have since immortalized his name, or commenced laying out his extensive grounds and building his houses in Cambridge. Then I had not planted a seed of the camellia, the azalea, pear or grape, nor even attempted the hybridization of a plant; now our American fruits and plants enrich the gardens and adorn the catalogues of foreign lands. Then we had no such splendid villas as those of Hunneywell, Payson, Gray and others, with their broad lawns, extensive glass structures and magnificent plants, which are such an honor to our land. Then we had many old and fine homes and gardens, such as Governor Gore's, Mr. Lyman's, Mr. Preble's, Mr. Cushings's, the Perkinses and others; but very little in the way of landscape gardening or in new or rare plants or fruits. Then our exhibitions were confined to a few days of the year, and were for many years held in small rooms; now many of our exhibitions are the best given in any State in the Union. Then we had no building of our own; now we possess the most costly and magnificent temple of horticulture that the world can boast. Then the American Pomological Society, whose president, by the mercy of God, in his 28th year of service now stands before you, had never been dreamed of—a society that emanated primarily from the influence of the Massachusetts Horticultural Society—a society that embraces not only our national domain, but whose jurisdiction extends over our continent—whose catalogue prescribes the appropriate fruit for fifty States, Territories, and districts, and at whose quarter-centennial in this city, the far off State of Nebraska, with her governor at her head, carried off triumphantly the Wilder medal for the best collection of fruits. Then there were few exports of fruits; now we send 400,000 barrels of apples in good years to foreign lands. Then the grape was scarcely cultivated; now, in addition to all that are used for the table, we make 15,000,000 gallons of wine, and wine, too, that took the first prize at the World's Exhibition at Vienna, in 1873. Then the statistics of our fruit crop were not thought worthy of record; now it amounts to $140,000,000, or nearly the average annual value of our wheat crop. But I must bring these remarks to a close. I thank you for the kind references to me as a pioneer in rural affairs. You do me no more than justice, for I cannot, as I have told you before, remember the time when I was not fond of the cultivation of the soil. But, gentlemen, my labors are mostly over. Soon I shall be resting in the bosom of my mother earth; but if I can believe I have done anything to advance the great interests of our land, and which shall contribute to the happiness of my fellow men, I shall, so far as this world is concerned, die content, feeling that I have not lived in vain."

Mr. Wilder resumed his seat amid a storm of applause.

Notes from the South.—Facts about the Cotton Worm.

BY PROFESSOR C. V. RILEY.

The readers of the SCIENTIFIC AMERICAN may not be uninterested in a few notes of a trip recently made through the land of sub-tropical products—the land of cotton, of the long-leaved pine, the *Tillandsia* or hanging moss, the beautiful crape myrtle (*Lagerstræmia indica*), the magnolia, the cypress, and the China berry (*Melia azedarach*)—the land where the cow pea comes to perfection, and where side by side with such products of the farther north as corn, wheat, and oats, may be seen growing the sugar cane and rice.

My mission south is the direction of the investigation now being carried on by the Commissioner of Agriculture into the insects injuriously affecting the cotton plant, and the best means of counteracting their ravages. The Commission of Inquiry was organized by the appointment of Prof. A. R. Grote, of Buffalo, N. Y., and Prof. J. H. Comstock, of Cornell University, as special assistants, and of Prof. J. E. Willet, of Macon, Ga., Prof. E. A. Smith, of Tuscaloosa, Ala., Dr. E. H. Anderson, of Kirkwood, Miss., and Wm. J. Jones, of Virginia Point, Texas, as local agents and observers.

Two circumstances have somewhat interfered with the inquiry, namely, the yellow fever and the general freedom of the plant from the cotton worm, the serious injuries of this last being restricted to the "cane break" regions of Alabama and to the southwest counties of Georgia, especially the country between the forks of the Flint and Chattahoochie rivers—the more malarious portions of either State. Yet many interesting and important facts have already been ascertained. The general want of knowledge among cotton planters (or rather among their superintendents, for the planters are mostly away from home at this season) on the most noticeable and important habits of the cotton worm is the more remarkable, considering the losses sustained by them from this insect in the past. I find that the opinions of the most observant are seldom founded on intelligent observation, and that such opinions are, consequently, of little value. This state of things is due to three evident causes: First, the general unhealthiness of the regions in which the insect does most damage, and the intense heat that prevails during the months when most of the observations must be made; second, the fact that the culture of the crop is turned over to uneducated and unobserving negroes; third, the failure to discriminate between the cotton worm (*Aletia argillacea*) and the boll worm (*Heliothis armigera*) in their later stages, and the natural difficulty that besets the solution of some of the questions, such as the winter habits of the *Aletia*.

It had often been a wonder to me that no true parasites had ever been found infesting this insect, since there scarcely exists a plant-feeding species that is not attacked by some parasite. Several such have been discovered on *Aletia* this summer. Again, I wondered what plants the moth naturally fed from, since it was known to be fond of sweets and had, to my knowledge, done considerable injury in Kansas by boring into peaches.

The cotton plant is peculiar for having a gland on from one to three of the larger ribs of the more mature leaves, and a still larger gland at the base of each of the three lobes of the involucre. As soon as I learned that these glands secreted a sweetened liquid I inferred that the plant would be found to furnish nourishment to the moth as well as to the larva, and drew attention to this belief in the Atlanta *Constitution*. It was with no small degree of pleasure that at Baconton subsequently, in company with Professors Comstock and Willet, I was able to prove my anticipation correct by studying the normal habits of the moth with a dark lantern at night. The moth is, therefore, attracted to the plant by the sweets which this last affords, and as these sweets are first produced when the plant begins to flower and fruit, we have here a possible explanation of the well-known fact that the worm is never noticed on the young plants, but first appears about the time of fruiting. We have also discovered that the moth feeds on the honey copiously secreted from glands occurring at the apex of the peduncle, just above the pods, of the cow pea (*Dolichos*), extensively grown through the South as a forage plant; also on the sweet exudation from the rachis of the flowers of *Paspalum læve*, a tolerably common grass.

It is by taking advantage of this love for sweets which the moth possesses, that we shall probably arrive at one of the most effectual ways of preventing the ravages of the worm; for if we can allure the first moths of the season to certain death we nip the evil in the bud; and I am now having experiments made to test the effects of different poisons mixed with sweets to use as bait. These baits may be applied to the trunks of the dead pine trees that occur in so many cotton plantations, or to the trunks of any other trees; or they may be used in pans, upon which perforated platforms of wood or tin are made to float.

I have also discovered that the worm affecting the cotton in the southwestern portion of the cotton belt, as in Southern Texas, is often another species (apparently *Anomis exacta*, Gn.), though belonging to the same genus as that which is already so well known. We shall most likely find, as a consequence, corresponding difference of habit.

The use of Paris green, either in water or powder, which I first recommended for the insect in 1873, is now the general and, in reality, the only satisfactory mode of killing the worms, though some other preparations of arsenic are to a limited extent employed. We may yet discover something as effectual and less dangerous; but in any event there is a great deal to be learned in the more economical, safer, and more effectual use of the green poison. It is now either sprinkled in water through coarse sprinklers that waste the bulk of the liquid on the ground, or dusted from equally coarse and crude sieves. The carelessness with which it is generally used has, also, prejudiced the negroes against it; for the powder settles on their persons and is carried by perspiration to the nether parts, causing swelling of the groins and other troubles. The cost averages $1 per acre for a single application, and this great cost naturally deters many from attempting to save the crop. Lastly, few planters begin to poison until the worms are nearly full grown and have fairly begun to strip the plant, by which time it is often too late to go over a large plantation successfully. I have no doubt whatever that all this can be materially changed.

For some days after the worms hatch they feed on the underside of the leaf, confining themselves to the parenchyma without eating through. There they may be in large numbers without attracting attention, and there, before they have an opportunity to riddle and devour the foliage, they should be killed, and might be with the minimum expenditure of poison, if this were applied from beneath instead of from above. We shall endeavor to perfect a machine for this purpose. By means of a force pump, to which an atomizer is attached, the liquid may also be sprayed on to several rows of the plants at once, thus greatly reducing the cost of labor and material, as has been proved in parts of Alabama.