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.

In traveling through the South one finds very many signs of coming prosperity, and they are more particularly noticeable in Georgia. I have met with few persons who are not satisfied that emancipation—whatever it may prove for the negro—was the very best thing that could have happened to the white population of the South. In slavery times, in proportion as a man's slaves increased, he had to increase the extent of his plantation; for Sambo was valued only according to his cotton-producing capacity. The natural tendency was an increasing negro population, and a decreasing white population with widening estates, to say nothing of the enervating and demoralizing effects of the institution. To-day the tendency is all the other way. The authorities recognize the value of intelligent white labor, and are making successful efforts to induce immigration. King Cotton has had his day, and while he will ever raise a proud head in this latitude, diversified farming is the motto of the more intelligent and far-seeing. I had the pleasure of riding up from Albany with Senator Gordon, who is deservedly popular. He had just come from his large sheep farm, and interests himself largely in the improvement of stock in the State and in the general advancement of agriculture within her borders; and he is but one of many prominent men equally alive to its advancement.

The great strides made in fruit culture since the war can hardly be appreciated by one who has not been here. The best evidence of its rapid growth, and of the spread of esthetic taste, may perhaps be found in the constantly increasing sales of the nurserymen, and especially of Mr. P. J. Berckman's, of Augusta, who is prominently identified with Georgia's advance in horticulture. The entrance to Mr. Berckman's "Fruitland Nurseries" is by a broad avenue of magnificent magnolias; and after spending a few hours among his greenhouses and his well kept stock of choice fruit and ornamental trees, many of them new to Northern eyes, the secret of his patronage is easy to discern. Exotic conifers are here made a specialty, and I have never witnessed anything more beautiful, outside the grounds of Messrs. Ellwanger & Barry, of Rochester, than his beautiful *Cupressus Knightiana elegans* and the fine *Cunninghamias* that lift their heads forty or fifty feet high.

Washington, D. C., October 14, 1878.

SOME MODIFICATIONS OF THE MICROPHONE AND TELEPHONE.

BY GEO. M. HOPKINS.

The microphone now exists in many forms, and is an exceedingly interesting instrument, although it has not, thus far, attained the usefulness of the telephone. The several forms of microphone are easily constructed, but all, so far as I know, are defective in some particular. An instrument of this sort that is sensitive enough to transmit the slightest sounds is too sensitive to transmit the heavier sounds properly. In the instruments shown in Figs. 1, 2, and 3, these defects are in a great measure remedied. These microphones are so simple and so easily made that I give a description of each, so that any one who wishes to experiment in this direction may be able to do so.

Fig. 1.

MICROPHONE WITH GRAPHITE RODS.

The instrument shown in Fig. 1 has a wooden diaphragm one eighth inch thick and four inches square, which is glued to a narrow frame supported by suitable legs. Two pieces of battery carbon, A B, are secured by means of sealing wax to the diaphragm about an inch apart and at equal distances from the center. They are both inclined downward at about the angle indicated in the engraving, say 30°. The carbon, A, is longer than the carbon, B, and has in its under surface three conical holes—made with a penknife point—which are large enough to receive the upper ends of the graphite pencils, C. The lower ends of the pencils rest in slight cavities in the lower carbon. The pencils, C, are simply pencil leads sharpened at each end and placed loosely between the carbons; they are inclined at different angles, so that the motion of the diaphragm which would jar one of them would simply move the others so as to transmit the sound properly. Battery wires, which are connected with a telephone*, are attached, one to the carbon, A, the other to the carbon, B.

The diaphragm and its support in Figs. 2 and 3 is the same as that already described. The microphone shown in Fig. 2 has a piece of battery carbon, D, secured in an inclined position to the diaphragm near the middle, by means of

Fig. 2.

MICROPHONE WITH PENDANTS.

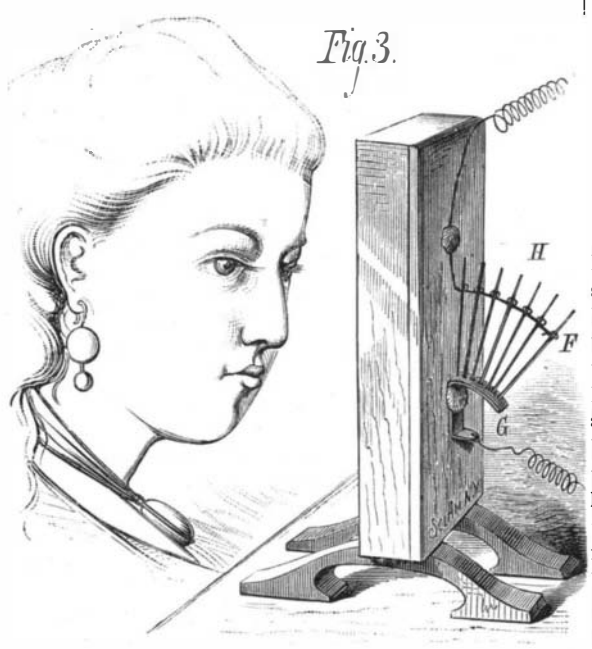
sealing wax. Three carbon pendants, E, of different sizes, are suspended by very fine wires, so that they rest upon the upper surface of the carbon, D. The three fine wires are all connected with one of the battery wires, and are fastened at suitable distances apart to the face of the diaphragm by a drop of sealing wax. A fine copper wire is wound around the carbon, D, and connected with the battery.

The construction of the microphone shown in Fig. 3 is so obvious as to require little description. One of the battery wires terminates in a series of coils, F, and is attached to the diaphragm above the middle. The other wire is connected with a strip of metal, G, which is secured to the diaphragm below the middle, and is curved and indented to receive the wires, H, which, by the way, must be quite fine, say No. 30.

These instruments are used as transmitters; a Bell telephone is used as a receiver. By using a number of rods, pencils, or pendants instead of a single pencil, as in the Hughes microphone, much if not all of the jarring is avoided, while it is capable of performing the feats usually expected from instruments of the name, such as the transmission of the sound of the ticking of a watch, the tramp of a fly or an ant, the crumpling of paper, whistling, instrumental and vocal music, and, under the proper conditions, articulate speech, whispering, etc.

The instrument shown in perspective in Fig. 4 and in section in Fig. 5 fulfills the requirements of both microphone and transmitting telephone, being capable of transmitting articulate speech as loudly and clearly as any of the well known forms of telephone. It is not necessary that one should speak directly into the instrument; it may be in one part of the room and the speaker in another. It will transmit a whisper, or the conversation of two or three persons.

Fig. 3.

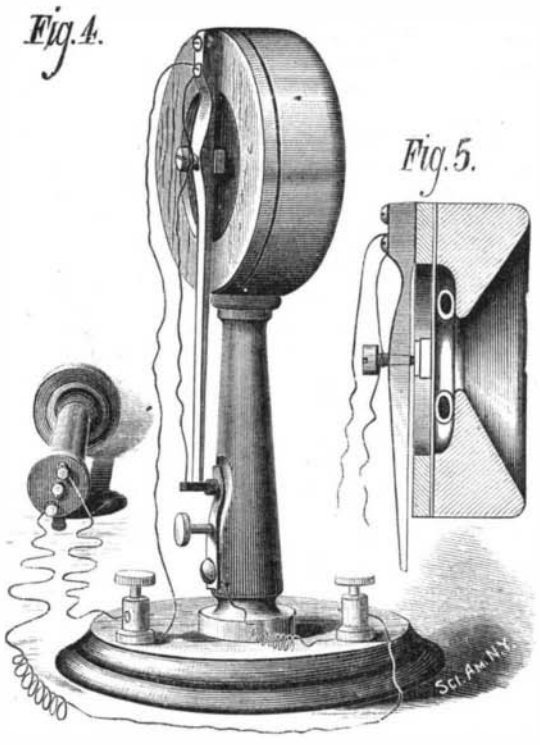


MICROPHONE WITHOUT CARBON.

* Full directions for making telephones in SCIENTIFIC AMERICAN SUPPLEMENT, No. 142.

and it is partial to violin and flute music or whistling. It seems almost incredible that an instrument of this construction should do these things, as everything is accomplished through the medium of a long lever actuated by the diaphragm; but this construction amplifies the vibrations of the diaphragm, and renders the instrument effective. The mouthpiece, which contains a ferrotype diaphragm, is mounted on a standard, and the diaphragm is damped as in the phonograph by means of short pieces of rubber tubing placed between it and the mouthpiece. A wooden spring is attached to the diaphragm support, and extends across the diaphragm downward toward the base of the standard. A small set screw passes through the spring and bears upon a thin metal plate that rests upon a soft rubber block, placed against the center of the diaphragm. The spring between the set screw and the fixed portion is reduced somewhat in thickness, and from the set screw to the lower end it is tapered to make it as light as possible. A small pencil of battery carbon is cemented to the extreme lower end of the spring, and a very fine copper wire is wound around it and carried upward to the fixed portion of the spring, thence downward to the binding post at the left. A small metallic spring is secured to the standard near the base, and carries at its free end a block of battery carbon, which is brought into light contact with the carbon on the end of the wooden spring by turning the adjusting screw that passes through the metal spring and bears against the standard. The metal spring is connected with the binding post at the right. This instrument, placed in an electrical circuit in which there is a Bell telephone, will transmit speech with considerable loudness. It requires no call or alarm, as a loud sound made directly into the mouthpiece will produce a noise in the receiving instrument which may be heard in any part of a room of ordinary size.

Fig. 4.



NEW FORM OF TELEPHONE.

The French Dam below Pittsburg, Ohio.

Three years ago Congress appropriated $100,000 for the construction of a Chamoin dam at Pittsburg, under the direction of the War Department. The construction was begun during the past summer. It is intended to form slack water to the two rivers which unite at Pittsburg and form the Ohio River, to create a harbor six miles long for the commerce of the city.

The peculiarity of the French dam is that it is the dam of low tides. That is, it is a dam which is set up against the stream when the stream is low, diverting the water into a lock, after the manner of a canal, and falling in ordinary times prone on the bottom of the river, allowing navigation to pass over it in its usual course. The dam is raised or lowered by means of a series of props which are handled by a simple process. The gate of the canal is opened and closed by hydraulic power operated from a gigantic tank at an elevation on the river bank. In detail, the French dam, which has received the name of Chamoin, after its inventor, is simply an extended series of wooden wickets from four to six feet in width, and from ten to fifteen in length, placed side by side on end on a stone platform, at an angle of eighty degrees (from the horizontal) across a river bed. Each wicket as it faces the stream has behind it a cast iron prop, whose lower end is adjusted when the dam is up in a hurter or catch, at the head of a slide on the platform of the structure, along which it can be lowered at pleasure, the wicket falling with its prop; the whole dam being let down by degrees according to the necessity made by the rising water. Such is the character of the dam which is everywhere employed for the improvement of the low tide rivers of France; which converts the Saone, the Meuse, the Marne, the Yonne, and the Oise into navigable slack water, and the Seine from its head waters to Rouen into a canal.