

half its length from the center of the crank pin to the center of the crank shaft, is because it moves so quickly into its leverage and retains the same so long, and, furthermore, that the piston movement, and therefore the consumption of steam in the cylinder, during that part of the crank movement in which the crank is at a leverage of less than one half its length, is comparatively very small indeed.

It will be further observed that, as the momentum of the fly wheel causes the crank to travel at (nearly) an equal speed during all parts of the revolution, the piston is traveling much faster at one than at another part of the stroke. For instance, suppose the crank to make a revolution in a second, it will move from each of the divisions (in the diagram) to the next division in the one-eighteenth of a second. The piston, then, while the crank was moving from point 5 to point 6, traveled at the rate of (referring to the table of piston movements) one and one half inches in one eighteenth of a second; while on the other hand, the crank moved from point 1 on one side of the dead center to point 1 on the other side of the dead center, that is two divisions, the piston moved one eighth of an inch only, and had (since the crank moved two divisions) two eightieths or one ninth of a second to do it in; so that the reversal of the direction of the movement of the piston is not so sudden as it would at first sight appear to be, or as to cause any violent shock, or entail any appreciable loss of power.

The difference between the amount of power transmitted to the piston and that delivered by the crank shaft may be appreciated when it is stated that in large engines it is computed at nearly two pounds per square inch of the piston area, and in small engines to from ten to fifteen per cent of the total mean pressure on the piston throughout the stroke; to which must be added the amount of friction due to the load which the engine may be driving, the allowance made for this latter being about seven per cent. This difference is accountable for in the power required to operate the slide valve and other working parts of the engine, although there is no doubt that the strain placed by the blocks upon the guide bars when the crank is at and near its points of full power is also very great, in consequence of the angle at which the center line of the connecting rod stands to the faces of the guide bars.

Not so much power is consumed in moving the connecting rod as might, at first sight, appear, because the movement of the crank pin end, which is the heaviest end of the rod, is circular, and it is only at the very center of the crosshead bearing of the rod that its movement is a purely reciprocating one. The movement of the rod as a whole is, as stated, a circular one at the crank pin end, and an oval one between the crank pin and crosshead, which oval becomes longer and narrower as the point on the rod, at which the movement is considered, is located nearer to the crosshead journal.

But little expenditure of power is involved in reversing the motion of the piston, piston rod, crosshead, and guide blocks, because whatever amount of power is required to move them in the first half of the stroke, during which their speed is accelerated, is delivered back by them in the effort to arrest their movement which takes place during the last half of the stroke; hence we find that there is no foundation for any supposition of a loss of power due to the movement of a crank as applied to an engine.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations of the following notes (which are approximate only) and for most of the observations, I am indebted to students. M.M.

Positions of Planets for March, 1875.

Mercury.

Mercury has been seen after sunset in the twilight from February 1 to the present time (February 18), and will probably be visible for some few more evenings.

After March 10, it should be looked for in the early morning before sunrise, and on March 28 it should be readily seen, as it is then at its greatest elongation west of the sun.

March 1, Mercury rises at 6h. 23m. A. M., and sets at 5h. 53m. P. M. On the 31st, Mercury rises 4h. 54m. A. M., and sets 3h. 56m. P. M.

Venus.

Venus, although past its greatest brilliancy, is still a beautiful object in the morning. It rises at 4h. 18m. A. M. on March 1, and sets at 1h. 56m. P. M. It passes the meridian about 9 A. M., and to good eyes is still visible at that time.

On the 31st, Venus rises at 4h. 10m. A. M., and sets at 2h. 40m. P. M. On the 27th, Venus is so near Saturn that the latter can be easily found.

Mars.

Mars can be seen in the early morning hours. It rises on March 1 at 1h. 15m. A. M., and sets at 10h. 33m. A. M., being far south in declination, and above our horizon only a little more than nine hours. On the 31st, Mars rises at 0h. 25m. A. M., and sets at 9h. 27m. A. M.

Jupiter.

On March 1, Jupiter rises at 10 in the evening, and sets the next morning at 8h. 43m. On the 31st, Jupiter rises at 7h. 47m. P. M., and sets at 6h. 37m. the next morning. As Jupiter comes into better and better position, the varying phenomena which its satellites present should be carefully noted.

Between 10 P. M. of March 18 and 2 A. M. of the 19th, the third satellite and its shadow and the first satellite and its shadow may be seen projected on the disk of Jupiter.

Saturn.

Saturn rises at 5h. 52m. A. M. on the 1st, and sets at 3h.

54m. P. M. On the 31st, Saturn rises at 4h. 2m. A. M., and sets at 2h. 12m. P. M.

According to the American Nautical Almanac, Venus and Saturn are in conjunction (have the same right ascension) on the 27th, Venus being 1° 16' north of Saturn. As Venus is well known to every one, this position will enable observers to recognize Saturn.

Uranus.

Uranus rises on March 1 at 3h. 14m. P. M., and sets at 5h. 28m. the next morning. On the 31st, Uranus rises at 1h. 12m. A. M., and sets at 3h. 28m. the next morning. Seen through a telescope, Uranus presents the appearance of a small full moon, bluish white in color. Its satellites are seen as exceedingly minute points of light.

Neptune.

Neptune rises and sets so nearly with the sun that it cannot be seen.

Sun Spots.

The record is from January 24 to February 18 inclusive. During this time, on account of cold weather and clouds, only nine photographs have been taken. In the picture of the 24th are two spots of medium size, near the end of their passage across the disk. From this time until February 16 photographs and observations with the telescope show that spots were remarkably few and small. To day (February 18), the preceding day having been cloudy, the photograph shows a very large spot just within the eastern limb. At present the spot appears narrow but of unusual length, and, if it follows the ordinary changes in passing across the disk, must be visible to the naked eye when it reaches the middle of the passage.

Correspondence.

Can Ants Talk?

To the Editor of the Scientific American:

The following may perhaps answer the above question: During a ramble over the mountains last spring, I was attracted by a low, shrill, squeak close by, when, upon looking in the direction of the sound, I saw on the ground, evidently hastening from me, a large insect of the ant species, about 2/3 of an inch in length, its hinder part of a bright red color, and covered with hair. I saw nothing peculiar in its shape, it being similar, as nearly as I could tell, to a common ant, only much larger. Struck by the novelty of the sound, I stopped it with my stick, and tantalized it for some minutes, during the whole of which time it emitted its scream, which I can describe in no other way than that it was similar to the sound which one would make when calling the attention of a bird in its cage, and that it was sufficiently loud to have been heard at a distance of 40 or 50 feet. I finally secured the insect and have kept it ever since, preserved in alcohol.

From the above it can be seen that the vocal power of the ant is sometimes far from inaudible; for in proportion to its size, I should estimate that the cry of my ant would exceed the bellow of a bull, or the roar of a lion.

Salt Lake city, Utah.

H. L. A. C.

New Telegraph Alphabet.

To the Editor of the Scientific American:

The ordinary Morse telegraph alphabet, consisting of dots, dashes, and spaces, answers very well when a register is used, and the signals are recorded on paper; but since the sounder instrument has almost entirely superseded the register, this alphabet is defective, as the sound of a dash is very much like the sound of a dot with a succeeding space. This fact suggested to my mind the idea of forming an alphabet which would consist entirely of dots and spaces, and thus lessen the liability to mistakes in transmitting messages by sound. I selected an article in a newspaper, ascertained how many times each letter occurred in it, and arranged them in tabular form, placing the letter which occurred most frequently, first, thus:

Table with 2 columns: Letter and Frequency. E..... 154 times, N..... 112, T..... 108, A..... 99, I..... 82, S..... 69, R..... 69, L..... 57, C..... 52, O..... 52, D..... 51, H..... 49, U..... 40, G..... 25 times, F..... 23, Y..... 22, P..... 20, B..... 17, M..... 17, W..... 16, V..... 14, K..... 5, J..... 3, X..... 1, Q..... 0, Z..... 0.

The alphabet was then formed by denoting the first letter in the table by the simplest character possible, that is a single dot; the second one is denoted by two dots, the third one by dot, space, and dot, thus:

Table mapping letters to Morse-like symbols: E (dot), N (two dots), T (dot space dot), A (dot dash dot), I (dot dash dash dot), S (dot dash dash dash dot), R (dot dash dash dash dash dot), L (dot dash dash dash dash dash dot), C (dot dash dash dash dash dash dash dot), O (dot dash dash dash dash dash dash dash dot), D (dot dash dash dash dash dash dash dash dash dot), H (dot dash dash dash dash dash dash dash dash dash dot), U (dot dash dash dash dash dash dash dash dash dash dash dot), G (dash dot), F (dash dash dot), Y (dash dash dash dot), P (dash dash dash dash dot), B (dash dash dash dash dash dot), M (dash dash dash dash dash dash dot), W (dash dash dash dash dash dash dash dot), V (dash dash dash dash dash dash dash dash dot), K (dash dash dash dash dash dash dash dash dash dot), J (dash dash dash dash dash dash dash dash dash dash dot), X (dash dash dash dash dash dash dash dash dash dash dash dot), Q (dash dash dash dash dash dash dash dash dash dash dash dash dot), Z (dash dash dash dash dash dash dash dash dash dash dash dash dash dot).

Addison, Mich.

JOHN MILLIS.

Utilization of Exhaust Steam.

To the Editor of the Scientific American:

Some mechanics hold that exhaust steam cannot be practically used for heating purposes on account of the back pressure on the engine, which has sometimes resulted in producing greater loss than profit, both mechanically and economically.

Mr. James F. Smith, of this city, a practical engineer, has recently overcome this obstacle by making the heating pipes of the full area of the exhaust. At the end of the building so heated, it is necessary to exhaust upwards, and work down with the drips. It will, of course, require larger piping, and the pipes should be laid with sufficient descent to carry off the waste water. A child can be easily regulate the throttle for each room; and the rough and unsightly crates now in use can be dispensed with.

Orange, N. J.

New Safety Elevator.

We have lately examined, at the shops of the Holske Machine Company, in this city, No. 279 Cherry street, the working operation of their new elevator, for warehouses, stores, offices, and other purposes. One of the distinctive features of the improvement is a novel clutch, by the shifting of which, by the usual cord, the motion of the rope drums is changed, and the elevator made to ascend or descend, as may be desired. Another improvement relates to a safety clamp attached to the elevator platform, so arranged that, in case the lifting ropes should break, the platform instantly locks itself between its guides, and cannot fall. As a practical trial, we saw two men mount the platform and sever the lifting rope while they were upon it; but the platform barely settled four inches before it was solidly locked fast.

Another point of improvement is an additional safety device, for locking the main gears in case the driving belt fails or breaks. The device for this purpose is simple but effective. Altogether the improvements appear to be admirably adapted for practical use, and contain every appliance for safe and reliable operation which the best experience can suggest. All elevators are of course more or less alike. They consist of a platform on which the goods or passengers are to ride, wire lifting ropes to raise and lower the same, winding drums to operate the ropes, and steam power to perform the work. These things being equal, that will be the best elevator which likewise supplies the most effective devices for ensuring safety and preventing accident. In these respects it will probably be difficult to find anything superior to the improvements above described.

Sleeplessness.

To take a hearty meal just before retiring is, of course, injurious, because it is very likely to disturb one's rest and produce nightmare. However, a little food at this time, if one is hungry, is decidedly beneficial; it prevents the gnawing of an empty stomach, with its attendant restlessness and unpleasant dreams, to say nothing of probable headache, or of nervous and other derangements, the next morning. One should no more lie down at night hungry than he should lie down after a very full dinner, the consequence of either being disturbing and harmful. A cracker or two, a bit of bread and butter or cake, a little fruit—something to relieve the sense of vacuity, and so restore the tone of the system—is all that is necessary.

We have known persons, habitual sufferers from restlessness at night, to experience material benefit, even though they were not hungry, by a very light luncheon before bedtime. In place of tossing about for two or three hours as formerly, they would soon grow drowsy, fall asleep, and not wake more than once or twice until sunrise. This mode of treating insomnia has recently been recommended by several distinguished physicians, and the prescription has generally been attended with happy results.—Scribner's Magazine

Good Words for the "Science Record."

The following words, from three of our friends in remote places, who have just received the SCIENCE RECORD, express the sentiments of many others, which we refrain from printing on account of our limited space:

"Received SCIENCE RECORDS today; they are a splendid reward for a little work."—Martyn F. Gilbert, Racine, Wis.

"The SCIENCE RECORD came to hand this morning; upon examination I find that it far exceeds my expectations, and would be a valuable addition to any man's library."—Jas. D. Hollister, Salisbury, N. C.

"Many thanks for the SCIENCE RECORD; it is well worthy of going to any trouble to get. I hope I may be able to get you more new subscribers."—Francis Carroll, Manager, N. O. Gas Works.

Any person having paid for a volume, or being entitled to one for obtaining new subscribers to this paper, and not having received it, will please notify the publishers at once, as copies have been mailed to all the names upon our order books.

The SCIENCE RECORD for the years 1872, 3, 4, 5,—four volumes—will be mailed on receipt of \$8, or a single copy of either year for \$2.50.

DR. FOTHERGILL says in the Popular Science Monthly that the intellect is more than normally brilliant when the person is affected with the first stages of pulmonary consumption or with chronic gout.

THE Suez canal has earned a profit equivalent to seven per cent on its cost, during the year ending in September last.