A great advantage of animal over artificial mechanism is that the animal frame adapts itself to the kind of work required of it; the muscles that come into play grow more and more capable of performing it. This point is well observed by comparing those whose labors affect one set of muscles chiefly with those accustomed to a great variety of motion—the hod carrier and the gymnast, for example.

The force of inertia is constantly experienced in every motion we make. We cannot even rise from a chair without leaning forward first, *i. e.*, placing our bodies in a position favorable for overcoming their inertia. In leaping, flying, etc., the initial effort is always the greatest, much less force being afterward required to keep up the motion. All these efforts result in fatigue proportional to their intensity. Thus, in walking on a level plane, the body is raised on an average 1·2 inch from the ground at every step. In walking up stairs the force expended is much greater. By the time a lady has ascended three flights of stairs, she experiences more fatigue than after walking around two blocks in New York. The study of animal mechanics may be productive of great advantage to us, by leading us to a better understanding of the laws of fatigue and rest.

Professor Trowbridge's paper was followed by a discussion in which Messrs. Newberry, Warner, and Martin took part. Attention was drawn to the wonderful instinct by which birds so adjust the resisting surfaces of their bodies as to be able to sail across and even against powerful currents of air with apparent ease, and to another cause of superiority of animal over artificial mechanism, namely, the mysterious nerve communication by means of which the different organs transmit their sensations to the brain of the animal, and in return receive instantaneous commands, enabling them to adapt themselves to every emergency. C. F. K.

Correspondence.

Alum in Baking Powders.

To the Editor of the Scientific American:

SIR: In your issue of the 7th inst. I noticed an article on the above subject by Henry Pemberton, Jr., as also some editorial remarks by yourself. With respect to Mr. Pemberton's remarks, I would state that it is evident he formed his opinion on entirely a theoretical basis. His opinion is one which would very probably be expressed by any number of persons who rely on theories instead of on facts. Mr. Pemberton states that when an alum baking powder is used in baking, the alumina of the alum is precipitated and becomes insoluble by heating. A very distinguished scientific man writes to me, and says: "This is a matter of experiment, and facts thus obtained are undoubtedly worth far more than conclusions derived from theoretical considerations." This last paragraph has embodied in it my views on this subject, and it strikes me it would have been proper for Mr. Pemberton to have made a few experiments with bread or biscuits made with an alum powder, to see if the alumina was really in an insoluble or in a soluble condition, before expressing so decided an opinion. I am perfectly well aware that when an alum baking powder is used in baking, the alum is transformed into another alumina salt, provided the constituents of the powder are combined in exact chemical equivalents. If, however, the constituents are not in exact equivalent proportion (which is more probable than otherwise, as chemical weights are seldom, if ever, adopted by manufacturers), there will be a certain per cent of alum left unaltered. There would, therefore, be present in the baked product in either case an alumina salt; and in the last, or more probable case, in addition to the alumina salt, some unaltered alum. So that, supposing a portion of the alum was transformed into an insoluble alumina salt (which has not been proved as yet in the baked product), it is evident persons eating the baked product would run the risk of taking into their stomachs the unaltered alum. It is true the per cent of this would probably be small, but by its continued use would certainly bring about serious disorders in the system. As regards the alumina salt, let us stop a minute. Wagner states: "The active principle of alum is evidently the sulphate of alumina, not the sulphate of potassa and ammonia." That alumina is the poisonous element of alum, I think the following provings clearly demonstrate, which I take from my Encyclopædia of Materia Medica: "It destroys the appetite, produces sour eructations, heartburn, pain in the abdominal ring, the rectum is rendered inactive, constipation or loose bloody discharges are produced." From these provings it will be seen that the effects of alumina on the system are substantially the same as alum. That is to say, that alumina bears the same relation to alum (being its active principle) as morphine does to opium or nicotine does to tobacco. Supposing, again, that the alumina salt formed in baking was in an insoluble condition (which I have already stated has not been demonstrated), and not considering the amount of alum left unaltered, I doubt if the public would be willing to run the risk of eating the baked product, for fear that the heat of the oven was not in the proper condition to render it all insoluble. Supposing, on high scientific authority, I should state that a salt of antimony (take for example tartar emetic) if added to a cup of tea would be completely neutralized by the tannin or rendered "insoluble" for instance. How many persons would I find willing to drink the tea? Not many, I am quite positive; and this is the view I think the public will take about alum baking powders. When they can obtain a number of powders on the market composed of wholesome constituents, I think they will not care to run the risk with alum powders. As to the alumina salt being in an insoluble condition, I shall, in a future article, have something more to say, to satisfy the scientific men; but I think the public will have received, after carefully reading the above, sufficient satisfaction or explanation to convince them that alum baking powders are most dangerous to use.

In answer to "Pro Bono Publico," I would state that my intention was in the beginning to expose injurious baking powders: not to advertise baking powders. It was necessary for me to select a good baking powder for comparison, which might have been any of the other powders other than the one selected, if I found it composed of wholesome elements. For me to publish the whole list and have my name on every baking powder can in the country, as I have been asked to do by a large number of manufacturers already, is more than I am willing to do, and also, I think, more than the public would think of asking of me. Respectfully,

HENRY A. MOTT, JR., Ph.D., E. M.

New York, November 28, 1878.

P. S.—Mr. Dooley insinuated to you that my analysis of his powder was not correct. Now, in justice to me and the public who wish only the truth, I suggest that Dooley publish in your paper a correct analysis of its composition. I found over 26 per cent of burnt alum in one sample.

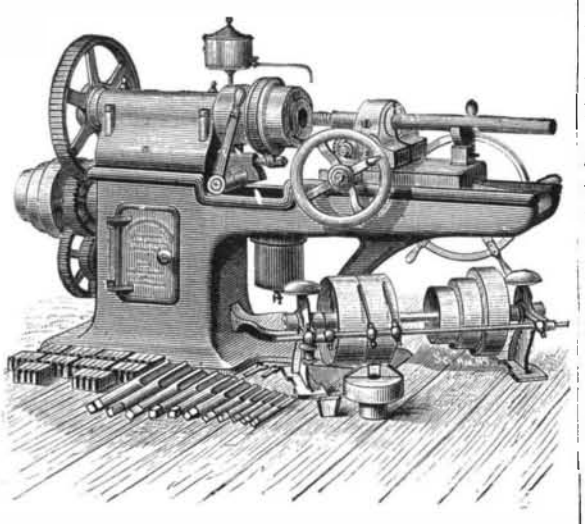
H. A. MOTT, Jr.

IMPROVED BOLT CUTTER.

The annexed engraving represents a machine for cutting screw threads on bolts, and is one of superior design. It is named the No. 5 National Bolt Cutter, and is adapted for cutting threads on bolts from one inch to two and a half inches in diameter. Among other good features claimed by the manufacturers the following may be mentioned as the most prominent ones.

The die head is constructed to receive blocks or cases, with inserted chasers, forming the dies, thus doing away with the labor of fitting each die or chaser to the head.

The chasers, four in number, are simply flat pieces of



THE NATIONAL BOLT CUTTER.

steel, averaging about an inch and a quarter in length, and which may be either planed or fitted in with a file from the rough stock. A small screw in the end of the case sets the chasers forward as it becomes necessary to dress over the dies. Another style of chasers is constructed upon the interchangeable system, with threads at each end, and are held in the cases by studs, thereby becoming as serviceable as two sets of dies. Broken or damaged chasers can be replaced by duplicates at little expense.

The adjustment of dies to the proper size is accomplished by merely turning a screw in the front of the head. The die head can be quickly stripped without removing it from the machine. One set of case dies can be removed and another inserted in the head in less than one minute by changing a stop pin, projecting from the sleeve, from its position when the machine is working, to a point opposite a hole in the flange at the rear of the head, then, by means of the lever, pushing the sleeve back to the flange, uncovering the cases, and permitting their removal and replacement by hand. The machine can be quickly converted into a nut tapper by removing the case dies and putting in their place a steel block to which is secured a universal chuck for holding taps that is furnished with each machine. All the working parts of the die head are protected from chips or dirt. The locking device is positive and requires but one movement of the lever for unlocking and opening the dies or closing and locking.

The die blocks are held rigidly by the inclosing sleeve when locked, and consequently cut bolts of more uniform diameter than is the case when the chasers or cutters can spring away from the bolt when cutting.

Machines of this description are made of various sizes, and for special purposes with the necessary modifications in gearing and proportions. They are supplied with all necessary adjuncts and facilities for lubricating the parts, and are constructed with the care and extreme accuracy for which this company are so well known.

Further information may be obtained from the makers, the Pratt & Whitney Company, of Hartford, Conn.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, December 28, 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.
Mars rises	4 51 mo.	Uranus rises	9 16 eve.
Jupiter sets	7 14 eve.	Neptune in meridian	7 52 eve.
Saturn sets	11 12 eve.		

FIRST MAGNITUDE STARS, ETC.

	H.M.		H.M.
Alpheratz in meridian	5 33 eve.	Procyon rises	6 45 eve.
Mira (var.) in meridian	7 44 eve.	Regulus rises	8 48 eve.
Algol (var.) in meridian	8 31 eve.	Spica rises	1 29 mo.
7 stars (Pleiades) in merid.	9 11 eve.	Arcturus rises	0 32 mo.
Aldebaran in meridian	9 59 eve.	Antares rises	5 35 mo.
Capella in meridian	10 38 eve.	Vega sets	8 57 eve.
Rigel in meridian	10 39 eve.	Altair sets	7 45 eve.
Betelgeuse in meridian	11 19 eve.	Deneb sets	0 07 mo
Sirius rises	7 10 eve.	Fomalhaut sets	8 21 eve.

MOON'S PLACE IN THE CONSTELLATIONS AT 7 P.M.

Saturday, *Aqua us*	9°	Wednesday, *Pisces*	27°
Sunday, *Aquarius*	21°	Thursday, *Aries*	9°
Monday, *Pisces*	3°	Friday, *Aries*	21°
Tuesday, *Pisces*	15°		

REMARKS.

Venus is still invisible, setting only 18 minutes after the sun. Saturn will be about 7° south of the moon December 30. The earth will be nearest the sun January 2, 1879.

Prof. James C. Watson, late of Ann Arbor, Mich., and Prof. Lewis Swift, of Rochester, N. Y., are, we believe, of the opinion that the planets discovered by them during the July eclipse are identical. Thus two planets were discovered within 2m. 52 seconds after the commencement of the search for them. Exclusive of comets, there are now 224 members of the solar system known.

There are now 190 asteroids known, unless others have been discovered since October 1. In 1875 there were 17 discovered, the greatest number in one year. Prof. C. H. F. Peters, of the Litchfield Observatory, Hamilton College, has discovered the greatest number—31. Professor Watson follows him in the list, having discovered 23. The following shows the number discovered in the different months, September being the lucky month:

January, 11; February, 15; March, 15; April, 24; May, 14; June, 8; July, 8; August, 21; September, 33; October, 16; November, 22; December, 3.

January 9 Neptune will be 10° 43m. 47 sec. south and 5° 10m. 48 sec. east of *a Arietis*. January 29 Neptune will be 10° 41m. 50 sec. south and 5° 12m. 45 sec. east of *a Arietis*.

A line from *Lambda* (91) *Ceti* through *Mu* (87) *Ceti* produced five degrees northwest, will pass very close to Neptune. *Lambda* and *Mu* form the northern side of a pentagonal figure (sides 3°–5°) in the Whale's head.

New Mechanical Inventions.

Mr. James Griffin, of Mendocino, Cal., has patented an improved Saw Guide, that may be adjusted by the operator when the saw is in the cut, which is of special advantage when sawing long timber, and by which the wear of the parts is taken up in easy manner, so as to keep the guide always in good working condition.

Mr. Charles Galigher, of Cairo, Ill., has patented an improved Millstone Curb and Chop Conveyer. In this contrivance the meal cannot choke up or become clogged, but falls freely from the vicinity of the stones as soon as it comes out from between them. Access of air is thus permitted to the stones, and the flour is not injured by detention between the grinding surfaces or by friction against the stone and curb.

Mr. Harrison W. Holley, of Hale's Ford, Va., has invented an improved Machine for Rolling and Cutting Tobacco, which consists, essentially, of three sets of pressure rolls, arranged successively close together, an endless feed belt passing through the first set of rolls, longitudinal knives on the second set, and transverse knives on the third set, all of said rolls being geared together, so as to press and cut the tobacco as it is carried through the machine by the endless belt.

Southern Factories.

According to a carefully prepared statement of Gen. L. P. Walker, of Alabama, that State has 2,118 factories, working 8,248 hands, with a capital invested of $5,714,032, paying annually in wages $2,227,968, and yielding annually in products $13,040,644. Florida has 630 factories, working 2,749 hands, with a capital invested of $1,679,930, paying annually in wages $989,592, and yielding annually in products $4,685,403. Georgia has 3,846 factories, working 17,871 hands, with a capital invested of $13,930,125, paying in wages $4,844,508, yielding annually in products $31,196,115. Louisiana has 2,557 factories, working 30,071 hands, with a capital invested of $18,313,974, paying in wages $4,593,470, yielding annually in products $24,161,905. Mississippi has 1,731 factories, working 5,941 hands, with a capital invested of $4,501,714, paying in wages $1,579,428, yielding annually in products $8,154,758. South Carolina has 1,584 factories, working 8,141 hands, with a capital invested of $5,400,418, paying in wages $1,543,715, yielding annually in products $9,858,981. Texas has 2,319 factories, working 7,927 hands, with a capital invested of $5,284,110, paying in wages $1,787,835, yielding annually in products $11,517,302. Aggregate number of factories, 14,884; aggregate number of hands employed, 80,948; aggregate capital invested, $54,824,303; aggregate wages paid annually, $17,514,516; aggregate annual value of products, $102,615,108.