

Burroughs Price Brunner.

Mr. Burroughs Price Brunner, who died in San Francisco, June 4, at the age of 52, was an engineer and inventor of some note. When but a youth he invented a linseed oil press which is still in use and substantially unimproved. Before the war he was for twelve years superintendent and engineer of the Charleston, S. C., Gas Works. Losing his property in the South he made his home in San Francisco in 1864. He constructed the gas works in King street in that city; planned and constructed the Pacific Rolling Mills—an institution which now gives employment to from 400 to 500 men—and invented a great deal of the machinery used in it, notably that employed in utilizing old steel rails. He also planned and built the Pacific Oil and Lead Works, and the construction of the Virginia City and Truckee Railroad as a steam road was largely due to his influence. At the time of his death he was superintendent of the Gas Works, Rolling Mills, and Pacific Oil and Lead Works.

IMPROVED HOISTING APPARATUS.

We give an engraving of an improved apparatus for lifting variable loads which is both safe and portable. The invention consists in a block provided with differential gearing of novel construction, provided with a safety-stop device and automatic brake acting by the weight of the load.

In the engraving Fig. 1 is a side elevation of the apparatus; Fig. 2 is a central vertical section; Fig. 3 is a vertical section showing the brake mechanism, and Fig. 4 is a detail view of the chain wheel.

A is the main shaft of the mechanism, having at its ends chain wheels, *a a'*, on which are endless hand chains, *b b'*. The wheel, *a*, is loose on the shaft, and has on its hub a pulley, *c*. The wheel, *a'*, which is fast on the shaft, is formed with a rim flange and internal gear. *d* is a secondary shaft carrying fast pinions, *e e'*, that mesh with pinions, *c*, and wheel, *a'*, respectively. The shafts, *A d*, are journaled in cheek plates, *f f'*, which at the upper end are connected by a yoke or bar, *g*, that is fitted with a hook, *h*, for suspension of the apparatus. At the lower end, the cheek plates, *f*, are connected by a bar, *p*, on which is hung an eye-piece or ring, *i*. On the shaft, *A*, between the plates, *f*, a chain wheel, *k*, is keyed, on opposite sides of which there are two wheels, loose on the shaft, having their hubs extended through the plates, *f*. On the shaft, *d*, is loosely hung a bent guide piece, *l*, that laps over the chain wheel and prevents the chain from rising. The hoisting chain, *m*, passes around the wheel, *k*, and its end having the hook, *k'*, may be attached to the load, or when double power is required the chain carries the block, *n*, and has its end connected to the ring, *i*. The brake wheels, *l*, have their faces next to wheel, *k*, formed with ratchet teeth, and the wheel, *k*, is provided with four spring pawls, *o*, two on each side, consisting of straight pins set in mortises, with spiral springs behind them, so that they are projected and engage the ratchets. The rims of the wheels, *l*, are formed with V-grooves.

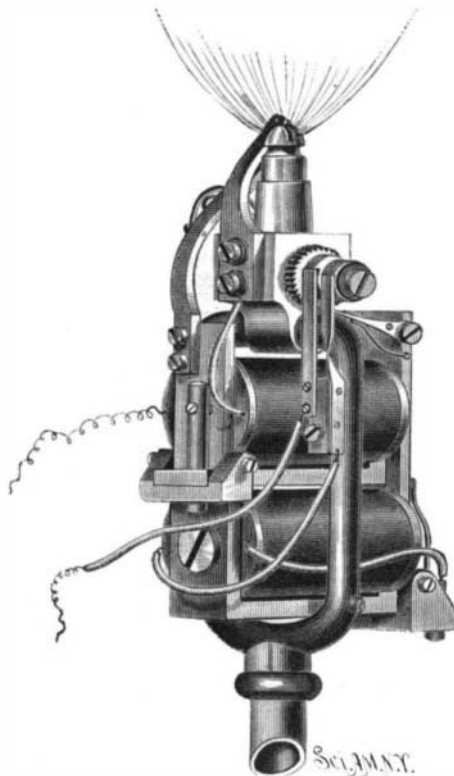
There are two curved toggle bars, *q q'* (Fig. 3), hung on the lower crossbar, *p*, beneath each wheel, *l*, and extending around them at opposite sides. The upper ends of each pair of bars are connected by a right-and-left-hand screw rod, *s*, to allow of their adjustment, and the bars carry brake blocks entering the grooves of this disk, *l*. The brake blocks are in two portions—the outer portions, *r*, that are attached to bars, *q*, by bolts passing through slots, as shown in Fig. 2, and the loose V-shaped portions, *r'*, placed between the portions, *r*, and brake wheels, *l*. The adjustments of these parts may be made so that the brake blocks shall give exactly the pressure required to hold the load suspended from the shaft, *A*.

The load is raised or lowered by operation of either hand chain, according to the power required. The chain on the wheel, *a'*, gives the greater speed, and with heavy loads may be first used to tighten the hoisting chain and the other hand chain then used. As the chain wheel, *k*, turns in raising the load, its pawls engage the ratchets of wheels, *l*. The load on shaft, *A*, is sustained by brake wheels, *l*, resting on blocks, *r'*, which, in turn, are supported by bar, *p*, so that the brake is continuously applied and the chain wheels arrested by the ratchet devices the moment the hand chains are left free. In lowering the load the hand chains are to be run backward, and the chain wheel, *k*, will then give revolution to the wheels, *l*. The load will thus be at all times under the control of the operator.

It will be seen that with this apparatus four rates of speed are attainable. The apparatus is also safe and portable, and can be made of comparatively small size and used for heavy loads. The brake wheels have sufficient holding power, though made of small size, for the reason that the whole load resting on the axle is taken by the brake blocks at opposite sides of the wheels. The resistance can be varied by shifting the blocks to change the angle of resistance. This invention was recently patented by Mr. George Speidel, 933 Buttonwood street, Reading, Pa.

LIGHTING GAS BY ELECTRICITY.

Undoubtedly the quickest, safest, and cleanest method of lighting gas is by means of electricity; but before the invention of the electric lighter shown in the engraving, attempts to make a lighter which could be used to light either a single light or a large number of burners did not prove altogether satisfactory. Two electro-magnets are connected with a cock and with ratchet wheels and circuit springs, arranged in such a



RHODES' ELECTRIC APPARATUS FOR LIGHTING AND EXTINGUISHING GAS.

way that one circuit and magnet turn the cock around until it is open, and the spark is produced at the same time to light the gas. The ratchet wheel has blank spaces, so that after the gas is fully on the cock cannot be turned any farther by that electric circuit, no matter how many times the spark-producing lever is operated. The second line-wire and magnet are employed for turning off the gas, and in so doing the other ratchet wheel is brought to the position where the first pawl can act upon it, when the same is moved by the first magnet in turning on the gas and lighting it. When the gas

has been turned off, the circuit to the second magnet is broken, so that the further rotation of the cock is arrested.

The upper magnet operates an armature lever carrying a pawl, which acts upon a mutilated ratchet wheel on the plug of the cock, and rotates the plug until a blank space in the wheel is reached, when the plug will not be turned further by the vibration of the armature; but each movement of the latter breaks the circuit at a point opposite the slit in the burner, and the spark of the extra current which passes at this point ignites the gas.

The vibration of the armature of the lower magnet closes the cock by a similar operation, and puts the ratchet wheel by which the cock is opened into position to be engaged by the pawl carried by the armature lever of the upper magnet. With this construction all that is necessary to be done is to gently press the button belonging to the particular burner to be lit, when the gas will be turned on and ignited instantly; by pressing another button the gas is extinguished.

The action of the device can be made entirely automatic, so that the opening of a door or window will turn on the light. Used in this way it forms an effective safeguard against the attacks of burglars.

In the sickroom or nursery, or wherever it is desirable to have a light occasionally through the night, this invention is very desirable; and it must be admitted that the device does away with great risks from fire, since no matches, tapers, or lighters are required.

For particulars, address the inventor, Mr. T. H. Rhodes, 638 Monroe street, Brooklyn, N. Y.

Behavior of Metals in Solidifying.

For some years it has been well known that water is not—as was formerly supposed—the only substance that expands in solidifying. The recent investigations of Nies and Winkelmann go to show that it is rather the rule than the exception for metals to expand in solidifying.

The fundamental experiment was putting the solid metal into the fused metal. In some cases the difference of density could be measured. They found then that tin in solidifying is increased in volume 0.7 per cent; zinc is increased 0.2 per cent; while solid bismuth is as much as 3 per cent less dense than the fused metal. The fact of expansion in solidifying was also demonstrated for antimony, iron, and copper. With lead and cadmium the results were indecisive; the former presented difficulties in the probably very small difference of density as a solid and as a liquid, its small heat conductivity and heat of fusion; the latter in the fact that in fusion it passes first into a viscous state. Thus, of the eight metals examined, six showed distinct expansion in solidifying, and the same may occur in the two others.

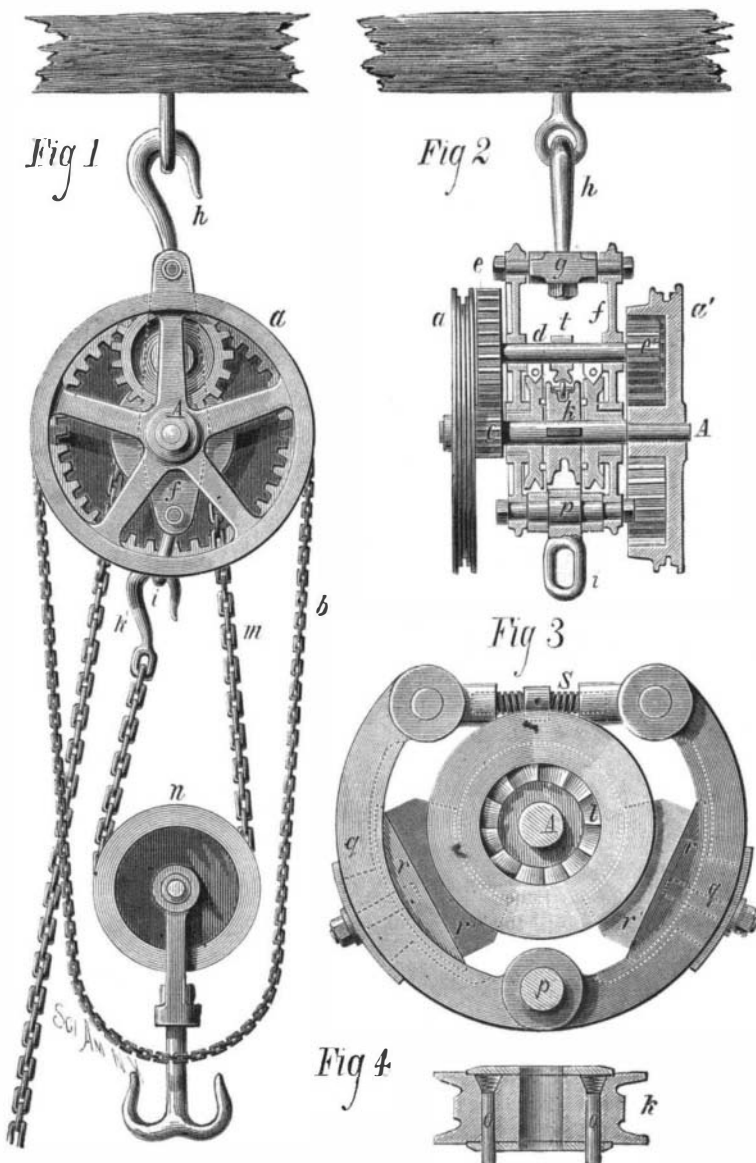
Cutting a Railroad along a Cliff.

The passengers on the Hudson River steamers have lately been entertained by the sight of gangs of workmen swarming along the face of a bold cliff jutting into the river near Cornwall, many of them suspended by ropes. A *Sun* reporter says:

The cliff was crowded with men, who, clinging like lizards to the face of the rock, were working seventy-five feet above the surface of the water; and here and there were laborers hanging (for the foothold they had obtained was hardly worthy of the name) by ropes fastened many feet above their heads, and circling their waists. All the passengers gazed with amazement at the singular spectacle; and when one of the men, turning toward the steambot, waved his hand, cheered, and, falling off, swung for a moment, and then, getting his feet to their former place on the rock, renewed his work at cutting into its face, the spectators from the river sent back an answering cheer, as the boat swept around the point that hid the workmen from their sight, and left them discussing what they had just seen.

Greatly interested by the sight the reporter left the boat at Newburg and returned to Cornwall to inquire about the mid-air workers. He found that they were employed by the Ontario and Western Railroad Company, constructing the new North River Railroad. It is under contract to be completed by June 1, 1882, and is to run from Jersey City to Cornwall, and thence west to Middletown. The country through which it passes is so rocky and mountainous that much of the work has to be done by blasting, and this is especially the case between West Point and Cornwall. At West Point a tunnel 150 feet deep and 500 feet long has been cut through Target Hill, and many other bores, nearly as extensive, have been made. But the point already mentioned, near Cornwall, presented, perhaps, the greatest difficulties to the engineers and contractors. About eighty men are employed there, and they were selected on account of their activity and freedom from nervousness.

"They are not active enough, however," one of the surveyors said to the reporter, "to retain their foothold in every place, and at



SPEIDEL'S HOISTING APPARATUS.

certain spots it is necessary for them to work bound, as it were, to the rock, for a drop of seventy-five feet into the river below, or possibly upon some of the straggling stones that rise above the surface of the water at the base of the cliff, would undoubtedly serve to reduce our staff of workmen. Had they been sailors they might, perhaps, have managed better so far as clinging to the rock is concerned, but they could not have done the work."

The workmen are, for the most part, Italians, although a few of other nationalities are employed. Italians, however, are best adapted to the peculiar work, not only because they are lithe, light, and active, but on account of their ability to stand the fierce heat that beats down on the exposed face of the rock.

Population and Temperature.

A census bulletin shows the distribution of population in the United States in accordance with temperature. Arranging it in groups by 5 degrees of mean annual temperature, it is found that no less than 98 per cent of the total population live between lines marked by 40 and 70 degrees Fah. The cotton region is above 55 degrees, sugar and rice above 70 degrees, and tobacco between 50 degrees and 60 degrees. The prairie region of the Mississippi valley lies almost entirely below 55 degrees, while the great wheat region of Minnesota and Dakota is mainly below 40 degrees of mean annual temperature. The highest maximum temperature is in southwestern Arizona and southeastern California. Of the entire population, 89 per cent are found in the classes which have a maximum temperature between 95 degrees and 105 degrees. In considering minimum temperature, it is seen that 95 per cent of the inhabitants of the United States live between the lines of 35 degrees below zero and 10 degrees above, for extreme cold.

From this it is evident how population tends to increase in regions rather north of medium temperature; or, more correctly speaking, between isotherms of low degree.

PANEL DECORATIONS FOR EATON HALL.

The Duke of Westminster has recently made extensive additions to what was already an immense mansion, known as Eaton Hall. In the decorations for these new apartments great expense has been incurred to produce novel effects, and the designs for some of the rooms possess rare novelty. A small drawing room has been ornamented with twelve painted panels by Mr. H. S. Marks, R.A., who took for his models rare and curious birds from the Zoological Gardens of London. Ourengraving represents a specimen of the panels produced by the artist. The *Art Magazine*, from which we take our illustration, says of the artist and his subjects:

"The birds which Mr. Marks loves to give us are those which serve best to illustrate his peculiar humor. They are all funny birds with strange characteristics, fond of quaint attitudes, and given to odd ways.

"There are no more comic birds than the crowned crane, the bird of all others Mr. Marks delights in painting. It is obvious from their manner that they possess in themselves the keenest sense of humor. Now upon one leg, the other tucked up close and out of sight, they rest quietly

and solemnly brooding over affairs of state; next, they commence an absurd and ridiculous dance, threading the giddy maze in and out, and round and round, as keen and excited as any bipeds indulging in intricate quadrilles. To the dance will succeed a stately and majestic walk; after which, apparently without any rhyme or reason, they will range themselves against the fence and start off on a wild foot race.

"Compared with this extraordinary bird, the scarlet ibis, although a curious bird, has nothing very remarkable about it except its shape and color, the latter being of a glowing scarlet, which commends it to the artist for purposes of decoration. For the same reason he has selected the flamingoes which figure in the upper wood-cut. These splendid creatures, which measure from five to six feet in height, are magnificent in color, ranging from a deep scarlet to various tones of a bluish pink and faint red.

"The skill of the artist has been further proved by the

other birds introduced in these two panels, which have been cleverly selected, make a strong contrast, and strengthen the effect. Nothing more appropriate could well be conceived than the funny puffy little penguin looking up at the giant flamingo; or the modest robin, a bird of home affections, looking at these strange looking foreigners.

"Bird lovers, no less than lovers of art, must be grateful to Mr. Marks for these his last and most charming efforts in decoration."

Antiquarian Research in Mexico.

The *World's* intelligent correspondent at the City of Mexico says, in a recent letter, that the American explorer, Captain Eavans, had just returned from San Juan Teotihuacan, and had brought some Toltec relics and other antique objects, which he believes belong to an earlier civilization. These antiquities are, according to an agreement made with the Mexican Government, to be placed in the National Museum, in this city. After a thorough examination of the pyramids of "The Sun" and "The Moon," Captain Eavans commenced excavating on the site of the ancient city of Teotihuacan. The ruins of that place consist of heaps of stones and *débris* placed on some 20,000 little mounds, which formed the bases of the dwelling houses. That this city was destroyed by fire is clearly demonstrated by the heaps of charcoal and ashes

structure is made of adobe, stone, and the *débris* of a former civilization." In conversation to-day, as on former occasions, Captain Eavans expressed a decided opinion that the Aztec civilization has been greatly over-estimated. He believes that many monuments attributed to them, for instance the "Calendar Stone," belong to the Toltecs, or even a more ancient race.

At Teotihuacan some skulls were taken from the sepulchers, and it was found that they corresponded with those discovered in the Indian mounds of the United States, not only in size, but in the peculiar flattening of the occipital region. Captain Eavans mentioned that the pottery, especially the circular dishes, in these Mexican ruins were almost identical with those found in Arkansas, and he entertains the idea that the great Toltec Empire was overrun by Indians from the north as well as by the Aztecs and by tribes from Central America. He remarked various indications that

communication had existed between these races. Among other things he said: "This can be proved by implements of obsidian being discovered in the mounds of the United States, and as that substance does not exist in those northern regions the probabilities are that it came from Mexico."

A Census of the Rocks.

The Census Bureau has undertaken an interesting and valuable work in collecting information relating to quarries of building stone and the like in all parts of the country. The inquiries cover not only the location and extent of building, roofing, flagging, ornamental, and other stones and rocks, but the amount of capital employed, the annual output, methods of quarrying and dressing the stone, the number of hands employed and wages paid, methods of transportation and their cost, the number of structures of all sorts made of each sort of stone, and so on.

The aim has also been to secure duplicate samples of four inch cubes of

found on the mounds. The walls of one building excavated and traced out were 140 by 120 feet. The stucco on the inside wall was very fine, of a bright red (which fades by exposure) and elaborate design. A piece shown your correspondent was of a beautiful crimson and white color, interspersed with mica or powdered quartz, which must have made an apartment "light up" beautifully.

You may recollect that when Mr. Charnay made excavations in Teotihuacan about a year ago he reported the finding of strata of pavement or

stone work which he decided indicated three different epochs of occupation or civilization. Captain Eavans differs materially from the French explorer. He said to me: "Actual excavations and careful examination have fully convinced me that these three strata, or the pavements, as Mr. Charnay called the layers, which in one place are but two feet apart, and in others only separated by six inches of earth and pebbles, are simply the foundations on which the city was built. I found beneath these layers of stone several sepulchers. Some of these tombs contained human remains interred in a manner similar to those discovered in Indian mounds in the United States. In them were also vases in which food had doubtless been deposited for the dead. There were also implements, etc. made of obsidian." Last week Captain Eavans examined the Pyramid of Cholula. He differs from others who have described it, and says: "There is no natural hillock or elevation; the entire

rough rock from each quarry, for physical and chemical examination. This part of the work is being done jointly by the Census Office and the National Museum, and is in charge of Dr. Geo. W. Hawes. "One of the objects of this investigation," said Dr. Hawes to a reporter, "is to find out what minerals each one of the building and ornamental stones contains, to ascertain how each will act under different conditions as to temperature, etc., to discover the strength of each—in a word, to know all about our rock resources. Here are a half dozen different kinds and colors of granite, all unlike in structure and yet all called granite. Quarrymen and stonecutters can tell nothing about them except what you can see for yourself. Now here," said the Doctor, turning to a large block of coquina from Florida, "is a stone which answers admirably for a building stone in Florida, but if you were to build a house of it in New York it would soon tumble down. On the other hand, those granite blocks which are apparently indestructible and which are so valuable a building stone in New York, would soon deteriorate—rot, so to speak—in the Florida climate. Of course, in a scientific investigation like this we naturally solve some important economic questions and make some discoveries which will be of very great practical interest and value. For example, we know that Portland sandstone when quarried and set on edge, as it is in the walls of so many buildings in New York, will in a few years begin to scale off and give the building a ragged appearance. Again, we received some samples of rock from the only quarry in Florida—a kind of sandstone. Well, after a thorough examination and analysis of this stone we found that it contained about sixteen per cent of phosphoric acid. It is consequently a great deal more valuable as a fertilizer than it is as a building stone, but that fact had never before been discovered."

In the workshop where the stones are being polished and tested the correspondent was shown examples of the more familiar stones. A piece of Quincy granite was seen, under the microscope, to be full of pentagonal cells containing air and water. Under the action of heat the water is converted into steam and bursts the stone; hence the tendency of Quincy granite to fly to pieces in a fire.

In polishing the different faces of the sample cubes many important discoveries have been made. Sandstones and limestones, which have never been thought worthy of any better place than in the foundation or wall of some rough structure, have been smoothed and polished, and it is found



PANEL DECORATIONS FOR EATON HALL.

