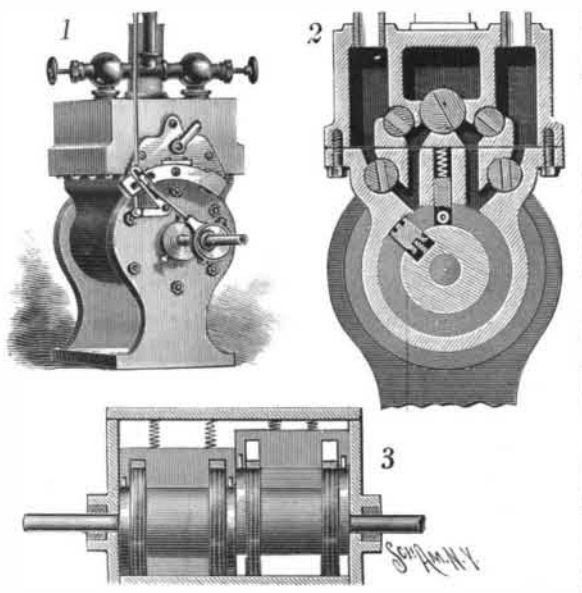
AN IMPROVEMENT IN ROTARY ENGINES.

The rotary engine illustrated herewith consists principally of a cylinder, in which a revolving piston is mounted; a spring-pressed abutment fitted to slide in the cylinder; cams which move the abutment outwardly against the tension of the springs; and valves which control the inlet and exhaust ports.

Of the accompanying illustrations, Fig. 1 is a perspective view of the engine; Fig. 2 a cross section; and Fig. 3 a side elevation of the piston.



AN IMPROVED ROTARY ENGINE.

The piston is duplex in form and turns concentrically with the cylinder. The two piston-heads are arranged diametrically opposite each other, and are pressed outwardly into the working chamber by means of springs, as shown in Fig. 2. Abutments placed at the top of the cylinder and provided with friction-rollers at their inner ends slide in a radially disposed guideway. As indicated in Fig. 3, one abutment operates in conjunction with one piston and its head, while the other abutment coacts with the other piston and its head. The abutment-rollers are pressed firmly into engagement with their respective pistons by means of springs (Figs. 2 and 3). Each abutment, as its corresponding piston-head approaches, will be moved outwardly against the tension of its spring by a cam formed on the piston, and will be returned to its normal position by the spring after the head has passed. Two chambers are, hence, always formed between the corresponding abutment and piston in each working chamber. As indicated in Fig. 2, two sets of ports and cut-off valves are provided, one for each working chamber.

In a lever connected with the valves, a slide-block is carried which is connected with an eccentric on the main shaft, and which is controlled by the governor-stem (Fig. 1). When the engine is in operation, the eccentric will rock the lever and the valves, in order to cut off or admit steam, the amount of cut-off depending upon the position of the slide-block controlled by the governor-stem and lever. In this manner the engine can be automatically caused to maintain a uniform speed.

The engine has been patented by its inventor, Charles G. Taylor, of Burlingame, Kans.

Acetylene for Street Lighting.

The city of Wabash, Ind., is soon to be lighted by an acetylene gas plant, now being installed by the Logansport and Wabash Valley Gas Company, otherwise known as the Deitrich Syndicate, says The Railway Review. The machinery and materials are now on the ground and the city authorities inform us that the street lights will probably be in operation shortly. The city has heretofore been lighted by artificial gas, in the usual way, and the substitution of acetylene for street lighting is an experiment which has been but little tried.

A NEW WAGON-JACK.

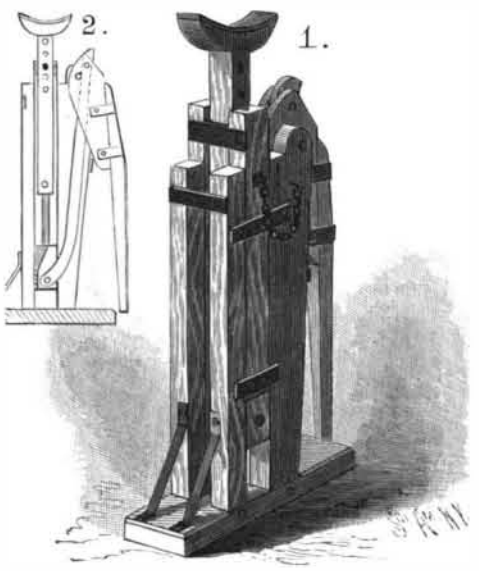
A wagon-jack has recently been patented by George W. Stoddard, of Billings, Mont., which is provided with means whereby the wheel-supporting standard can be adjusted in a lever-operated slide carried by the jack-body.

Fig. 1 of the annexed illustrations, is a perspective view of the jack, and Fig. 2 is a vertical section.

The jack-body is composed of connected side pieces, each made in two sections mounted on a base and spaced apart. One section of each side piece is provided with ears between which a lever is fulcrumed. Connected sliding bars are mounted between the sections of the side pieces. To the sliding bars a link is secured, as shown in Fig. 2, which link is so pivoted to the lever that it is virtually self-locking.

An apertured wheel-supporting standard carrying a supporting head for the wheel-hub has guided vertical movement in the space between the sliding bars and may be carried far beyond the upper ends of the sliding bars and held in adjusted position by passing a pin through a hole in the sliding bars and one of the apertures in the standard.

By moving the lever upwardly, the sliding bars are lowered. By carrying the lever downwardly, the sliding bars are raised and the wheel-supporting standard is forced up to elevate the wheel. When moved down, the lever prevents the standard from dropping or the sliding bars from moving down.



STODDARD'S WAGON-JACK.

SEVERE FIRE TEST OF THE MODERN "SKY-SCRAPER."

In the partial destruction by fire on the night of December 4 of the Home Life building, New York, the fire-resisting qualities of the tall skeleton building have been put to about as severe a test as could well be devised. Although this is by no means the first time that the skeleton-frame system of construction has been tested by fire, it is the first occasion on which a truly representative "sky-scraper" has been burnt out by a fierce fire, and the results of the trial are being noted carefully by all whose interests are in any way affected by this class of building.

By the courtesy of the New York Fire Department, we were given an early opportunity to visit the burned building, and, after a careful inspection of every floor from the eighth to the top, we must admit that it has fully demonstrated its fireproof qualities. Of course the term fireproof is an elastic one; but in this particular case the building has proved to possess all the fireproof qualities which the architects aimed to give it.

The building stands on Broadway, facing the City Hall Park. To the south of it on the same block is the Postal Telegraph building, a modern fireproof structure, while to the north of it, on the corner of the block, was a five-storied building occupied by Rogers, Peet & Company. The latter building was erected many years ago before the era of fireproof steel construction. It had the solid walls, wood floors, and cast iron columns common in earlier construction. The fire started in the basement of this building at 9:50 P. M., and spread with such rapidity that by 10:30 the roof had fallen in and the whole corner was one huge blazing furnace, the flames and heat from which were driven against the north wall of the sixteen-story Home Life building. The plan of the latter structure is in the form of the letter E, with the center of the letter removed. The open well or shaft thus formed was directly facing the fire, and up this shaft the flames of the adjacent burning building were drawn, setting fire to the woodwork of the windows, and starting fires on every floor from the eighth to the top. The heat of the fire was intensified by the fact that the heaviest gale of wind yet recorded in this vicinity was blowing from the northeast, the wind reaching a velocity of eighty miles an hour shortly before the fire started. Blowing from the northeast, the wind would come from the point of view at which our photograph was taken, and with this fact in mind the reader can understand to what a searching test the vast northern face of the Home Life building was subjected.

HOME LIFE BUILDING AFTER THE FIRE.

Not one of the windows on this side was protected by iron shutters, and the entrance of the fire through the windows on the several floors was only a question of time. The exposed upper portion of the building withstood the fire for about half an hour, but at 10:25 the flames ignited the woodwork of the windows, cracked the glass, and set fire to the office furniture. The firemen were able to do very little in the north and east of the building, the fierce gale driving the flames in upon them, and from the time the fire first gained a foothold until the combustible contents of the various floors had been burned out, the conflagration burnt with very little beyond the fireproof construction of the building to obstruct it.

The fireproofing was of the standard type and was fairly well representative of the best modern practice. The frame consisted of steel columns and girders incased in hollow, terra-cotta fireproofing, and the floors consisted of steel I-beams filled in with hollow, fireproof bricks, which overlapped and protected the bottom flanges of the I-beams. The sleepers upon which the wooden floor was laid were so placed that in case of a fire it would be impossible for any draughts of air to circulate

across and beneath the wooden floors and assist them in taking fire. In buildings of a later date this has been improved upon by filling in the voids between the brick arches and the wood floor with ash concrete.

The combustible material consisted of the floors, the doors, the windows, and such office furniture, books, etc., as the various rooms contained. This was completely burnt away without, as far as can be judged, seriously affecting the shell of the building. In no case have the main columns of the building moved out of plumb, nor is there any evidence of the girders or I-beams of the floor systems having deflected. In only one case, as far as we could find, had the brick arching of the floors given way, and in this case the collapse was due to an unusually heavy safe, which seems to have been standing exactly between two I-beams. The hollow fire-brick partitioning between the rooms has fallen down in some cases, but in many of the rooms it is intact. The most serious damage has been done to the outside walls. The Broadway façade, which was built of marble, has been badly calcined from the eighth story to the top, and this upper half will probably have to be rebuilt. The northern brick wall has been badly disintegrated by the fire and will also need repairs, if not replacing.

The fire has demonstrated the truth of the prediction made by Chief Bonner of the Fire Department that if the upper half of a tall building such as this caught fire, the firemen could do very little to save it from being burnt out. It is his opinion that the height should be limited to 150 feet, since it is impossible to bring effective streams of water to play upon a fire above this level.

While the burning of the Home Life building teaches us no new lessons, it strongly emphasizes several facts which were well known but little heeded before the fire:

1. That all the windows of such a structure that are above and overlook the roof of an adjoining building should be provided with either metal or metal-cased shutters. The presence of these would undoubtedly have kept the fire out of the Home Life building.

2. That, to render each floor fireproof, the window sashes and frames, the doors and door frames, the floor and all kinds of finish that is now in wood should be of metal, or of wood metal-cased.

3. The elevators and the stairways at each floor should be provided with sliding or folding trapdoors by which all communication could be shut off between the various floors, and a fire confined to the floor on which it started.

4. A tank of liberal capacity should be located at the top of all lofty buildings, and the service should be such as could readily cope with an outbreak on any of the floors. In the present instance, the hydrants were not far from the elevators, and they could not be used because of the terrific gale that drove the flames and heat in through the broken windows of the elevator shaft.

Taken altogether, and bearing in mind the fact that the absence of shutters and the pressure of a terrific gale of wind laid the whole side of the building open to the fiercest kind of attack, the behavior of the Home Life building is an indorsement of the fireproofing methods adopted by our architects. The term fireproof, as we have said, is relative. As applied merely to the shell of the building, we may use it in speaking of this building. But neither this nor any other building in this city is absolutely incombustible in whole as well as in part. If, however, a building were put up which embodied the four features enumerated above, as none of them do at present, it would be absolutely unburnable either from within or from without. If such a structure were burnt out, the combustibles would have to be brought into the building in the shape of the furniture, books, papers, or commercial wares of the tenants.

Concrete Facing on a Sandstone Bluff.

The use of concrete as a substitute for stone masonry has been conspicuous in several notable pieces of railway engineering now in progress or completed during the past season. The Railway Age recently illustrated an interesting use of concrete for facing a sandstone bluff at St. Paul. The line of the Chicago, Milwaukee & St. Paul Railway, at St. Paul, extends over an ascending grade along the face of the bluff. This bluff is of a character common to the Mississippi River bluffs in that vicinity, and is composed of soft sandstone capped with an irregularly broken ledge of friable sandstone above, mixed with loose sand, gravel, and bowlders. This sandstone disintegrates readily, and is so soft that it wears away rapidly under the influence of the weather. The detritus from the bluff has frequently to be removed or it would cover the railway tracks. The wearing away of sandstone undercuts the limestone ledge, threatening the safety of the trains on the track below. It has been found necessary to build masonry walls on the face of this bluff for the protection of the railway tracks.

In the summer of 1897 it was decided to protect an additional stretch of the bluff, and the Engineer of Bridges and Buildings, Mr. Bates, decided to use a concrete facing instead of cut stone masonry. He assumed that the stability of sandstone would be secured if it was protected from the rain or frost, and that a facing of concrete or brickwork would furnish protection equal to that of cut stone masonry, at a great saving of cost. The material was removed from the face of the bluff and brick pilasters were built under the angular outcrop of the limestone bluff. The pilasters varied from 6×12 feet wide and between 4 and 5 feet thick. The foundation for the pilasters and concrete facing is in the sandstone, 4 feet below the base of the rails. Supporting frames for the concrete between the pilasters were built as follows: Bolts were let into the sandstone at a distance of 8 feet apart horizontally and vertically. With special augers holes were bored in the sandstone of from 4 to 5 feet deep, inclining downward, so that the bolts were perpendicular to the face. The holes around the bolts were filled with mortar and they were allowed to project 18 inches beyond the face of the sandstone. They served to hold the plank uprights in place.

The uprights consist of two planks with the bolt passing between them. The planking supported the concrete work, which was placed against the inner edges of the uprights. This framework was built in horizontal sections, the uprights and planking used at the bottom being afterward used again higher up on the wall. To remove the planking it was only necessary to unscrew the nuts which held the uprights. The bolts which were necessary to secure the concrete frames were allowed to remain in the sandstone, and the value they gave in holding the concrete in place was gained without extra cost. It should be said that the great bolts had a second extension section secured to them with the aid of a nut. This section was, of course, removed, as it only held the planks. The concrete facing was continued from the top of the limestone ledge to the top of the bluff, and special care was taken to make the work tight to the top, so that water would not get in behind the concrete. No attempt was made to put in the concrete with uniform slope and it was allowed to follow the formation of the bluff. The total cost of the wall, which was 256 feet 6 inches long, was $6,787.36. The work was expensive, on account of the limited space for working between the railway and the bluff and the necessarily expensive nature of the concrete frames, but the cost per yard was less than if cut stone masonry had been used. The work has been in place for a year and no faults appear in it. The dam shown in this issue of the SCIENTIFIC AMERICAN is also built of concrete, and a comparison is useful, as showing how in the dam the concrete is made in pieces and joined together, while in the sandstone bluff the concrete was made in position.

A Chance for Inventors.

SISAL FIBER SEPARATION MACHINE WANTED.

Another Eli Whitney is in demand. The growers of sisal "hemp" are waiting for a machine that will be of as much benefit to them as the cotton gin with the Southern farmers.

Sisal "hemp" is the fiber of the Agave sisalona, a plant that belongs to the same family as the century plant, and which looks very much like it. The full grown plant has leaves from 4 to 6 feet long, thick at the base and tapering toward the spine-tipped points. Sisal is a distinct production of Yucatan; in fact, it takes its name from one of the cities of the peninsula. It has been grown with some success in Cuba, Porto Rico, Jamaica, and Southern Florida. The Hon. Joseph Chamberlain has a plantation on the Bahamas devoted to sisal. The plant does not need a rich soil; indeed, it grows best on barren, rocky land that is useless for other purposes. It is not affected by drought, except almost inappreciably.

But it has one drawback. There has not yet been invented a perfect machine for separating the fiber from the pulp of the leaves. The last bulletin of the Bureau of the American Republics describes the present machine, its work, and its imperfections:

"The machine in use at the present time consists of a horizontal wheel, on the face of which brass strips are transversely placed, forming dull knives. The leaf is introduced so as to bring one side in contact with the revolving wheel, which is run by a small engine. A brake then presses the leaf against the scrapers, while the butt is firmly held by a pair of pincers. The scrapers remove the outer surface and some of the soft tissues; then the leaf is taken out and turned and the other side undergoes the same operation, until only the fibers are left. These are then shaken out and hung in the sun for a few hours to dry. The result is a rather coarse fiber of much strength. The finest quality is nearly white, while the inferior grades are yellowish in color. In order to produce the best quality in fiber the leaves must be cleaned as soon as possible after being cut. One of the principal obstacles in the way of cheaper fiber is the need of a good machine for decorticating. Although much skill and money have been spent in attempts to invent a better machine, as yet such efforts have been unsuccessful."

The growing of sisal and the separation of the fiber is an important industry. The English Admiralty have adopted the sisal in preference to the hemp cable. The United States, in the fiscal year ended June 30, 1898, imported from Mexico over $5,000,000 worth of sisal, against $3,000,000 worth of hemp from the Philippines.

The French chargé d'affaires in Mexico has recently addressed a report to his government relative to the growing importance of the sisal fiber, which he states is very difficult for European houses to secure, as the United States practically monopolizes the trade in this article.

There is here certainly a chance for some American inventor to step into the breech and distinguish himself. Americans have invented pretty nearly everything they have attempted to, and it seems a pity that they cannot improve on a little brass-shod wheel in Yucatan.—The Hartford Courant.

Explorations Among the Ruined Cities in Montezuma Valley.

Mr. George H. Pepper, of the Department of Anthropology of the American Museum of Natural History, recently returned after a five months' tour of the Southwest, bringing a large quantity of specimens which he gathered during the summer. This is Mr. Pepper's third trip among the wonders of this comparatively little known country. A large quantity of photographs were also taken. He was accompanied by two young men of Boston, who went for purposes of study, and Richard Wetherill, one of the cowboys who were famous as the discoverers of nearly all of the marvelous ruined cities left by the mysterious cliff dwellers of Colorado. Days were spent in the famous cliff palaces near the Montezuma Valley. Here they found skeletons, stone utensils, and half a dozen bells of soft copper which are the only metal objects which have been discovered in these ancient settlements. They were preserved by the dryness of the air in the great cavern city. The party rode 400 miles on bronchos to see the snake dance of the Moqui Indians, which lasted twenty-seven minutes, and they secured some excellent photographs of the filthy, painted savages dancing around with live rattlesnakes hanging from their jaws. After the dance, the snakes are set at liberty. The performance is really a public prayer for rain.

The Population of Egypt.

"During the last hundred years the population of Egypt has shown a constant increase," says The Journal of the Society of Arts. "In 1800 it consisted of 2,460,200 souls, in 1846 this number had increased to 4,476,440, and in 1882 to 6,813,919. At the present time the population is estimated at 9,734,405, and if it continues to increase in the future in the same proportion as in the past, it will amount by the year 1912 to about 12,000,000. As regards the distribution of the sexes, there are 4,947,850 males and 4,786,555 females, and these figures include 112,526 foreigners. France has supplied 14,155, the United Kingdom 19,557. The most numerous of the foreign inhabitants are the Greeks, who number 38,172, then come the Italians 24,467, and (after the French and English) Austrians 7,117, Russians 3,193; Persians 1,301, Germans 1,277, Spaniards 765, Swiss 472, Americans 291, Belgians 256, Dutch 247, Portuguese 151, Swedes and Norwegians 107, Danes 72, and 923 of other nationalities. In lower Egypt there are 5,676,109 inhabitants and in upper Egypt 4,058,296. Public instruction leaves much to be desired, for of the entire population only 467,886 persons are able to read and write; there are, therefore, 9,266,819 inhabitants, or 95 per cent of the aggregate population, completely illiterate. What is even more extraordinary is the fact that 6,486,498 persons, or about two-thirds of the entire population, are without any trade or profession."

The Acanthus Column at Delphi.

M. Homolle, in the issue of the Bulletin de Corr. Hellénique, gives a detailed analysis and discussion of the remarkable acanthus column surmounted by dancing caryatids. The column, it will be remembered, was published in the Gazette des Beaux Arts, 1895, but since that publication many fragments have been added, and the monument is now certainly one of the most curious and interesting architectural discoveries made of recent years. M. Homolle thinks the style cannot be earlier than the second half of the fifth century B. C.; certain archaic peculiarities in the treatment of hair, eyelids, and chin in the faces of the dancers prevent its being dated any later. The question remains of its explanation and the motive of its dedication. It seems to have stood on the terrace of the temple of Apollo. The figures of the dancers in their short chitons are thoroughly Dorian, and suggest Sparta. They must be of the type of the Lacænae saltantes. The acanthus plant, by the sort of heraldic pun so popular among the Greeks, suggests the Thracian city of Acanthus, and M. Homolle is probably right in seeing in this curious and beautiful column an ex-voto in memory of the alliance concluded between the Spartan general Brasidas and the town of Acanthus during his Thracian campaign.