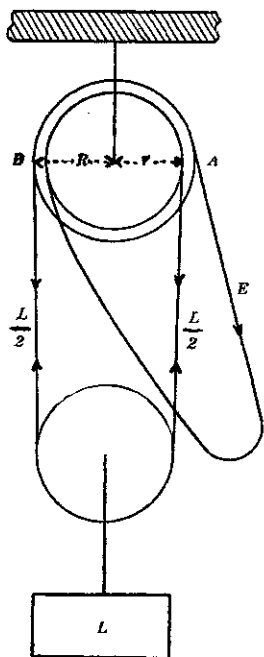


THE DIFFERENTIAL PULLEY OR CHAIN HOIST.

By W. F. ROECKER,

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1. Diagram and describe the construction.
 - (a) Why call it differential?
 - (b) How is it like ordinary pulleys? How different?
2. The velocity ratio is a measure of the mechanical advantage.



(a) Show that $\frac{L}{E} = \frac{2R}{R-r}$.

(b) How would you construct a differential pulley with a high mechanical advantage?

(c) Find the M. A. if $R = 10''$ and $r = 8''$.

3. $\text{Input} \times \text{Efficiency} = \text{Output}$.

(a) How is the input determined? The output?

(b) Define efficiency. How is it determined?

(c) What is the average efficiency of differential pulleys? Why is it so low?

(d) Why are sprocket wheels used?

4. Find the mechanical advantage and efficiency of a commercial differential pulley.

(a) Measure R and r and solve according to formula above.

(b) Measure D (effort distance) and d (load distance) and check against (a).

(c) Determine the force required to lift a member of the class; also determine the friction overcome.

(d) Calculate input, output and efficiency. Consider a lift of 5 feet.

5. Does the efficiency depend upon the load?

(a) Find the efficiency of this pulley in lifting a chair.

(b) How does this efficiency compare with that in (4)?

(c) Why is the efficiency not constant for small loads?

(d) How would you expect the efficiency to vary for larger loads, such as occur in actual service? See Ref. (b).

- (e) What makes the load self-sustaining?
6. Calculate what force will be necessary to lift a member of your class whose weight is known. Check it by actually lifting him.
7. Problem. If it requires a force of 500 pounds to lift the front end of an automobile, how great a force must be exerted on the chain of this pulley to raise the automobile, if the efficiency is 30 per cent under this load?
8. What distinct advantages does the differential hoist offer?

REFERENCES.

- (a) *Practical Physics*, Black and Davis, p. 30-31.
- (b) *Elementary Practical Mechanics*, Jameson, p. 228-232.
- (c) *Introductory Mechanics*, Bedford, p. 57-59.
- (d) *Shop Arithmetic*, Norris and Smith, p. 126-128.
- (e) *Encyclopedia Britannica*.

"THE HOLY LAND."

BY F. RENWICK.

How many visitors wintering in sunny Egypt have cast longing eyes towards the Holy Land but were afraid to embark on the short sea journey because of the uncertainty of landing at Jaffa! Now, they will be able to make the pilgrimage by rail all the way from Cairo to Jerusalem passing through a country of great biblical interest. Assuming the journey be made in the springtime, it will be especially delightful as the Plains of Philistia and Sharon are then carpeted with flowers. What a contrast to the sandy desert of Sinai first crossed!

Palestine still retains its unique attractions, both sentimental and otherwise. The traveler can now visit the various places of interest under conditions which never existed before.

Jerusalem, the capital, has a fine situation standing on four hills once divided by deep valleys which are now partially filled by the debris of successive destructions of the city. It did not suffer by bombardment in the recent campaign. Its ancient walls and picturesque buildings are just as before. Since the British occupation a number of improvements, mostly sanitary, have taken place and there is a feeling of security never enjoyed under Turkish rule. No longer is there any danger of falling among thieves on the way to Jericho. A dip in the Dead Sea (1,300 feet below sea level) or a swim in the River Jordan may be indulged in, with the certainty of finding one's clothes on the bank when required. The Church of the Holy Sepulchre can be visited, not once but several times, with pleasure and profit, there are many corners to explore and one just wanders around at will. The Mosque of Omar, standing on the site of Solomon's Temple, formerly only accessible to visitors escorted by a Turkish soldier and a consular canvass, can now be entered and all its details inspected at leisure while the dragoman points out anything of special interest.

The railway has been constructed from Ludd (Lydda) to Haifa. It is quite an interesting ride from Jerusalem to Haifa mainly along the Plain of Sharon. Just before reaching Haifa there is a good view of Athlit, the last stronghold of the Templars in Palestine and particularly interesting in view of the late war and re-conquest of the country by the crusaders of modern times.