J. EMERSON.

Dynamometer.

No. 79,561. Patented July 7, 1868.

Fig. 3.

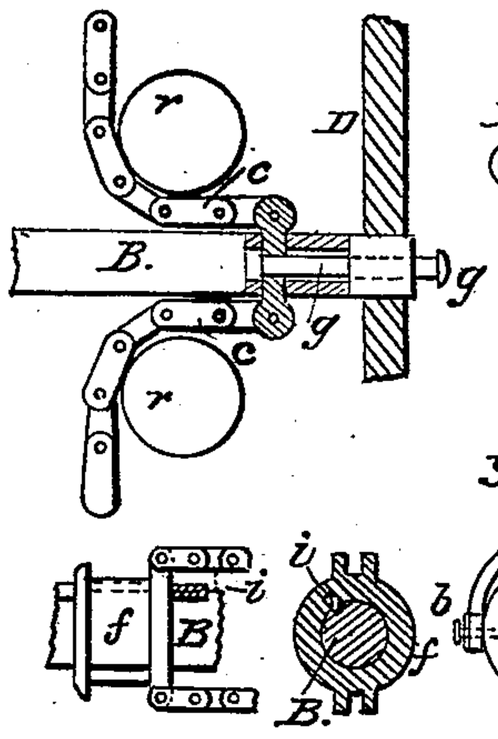


Fig. 4.

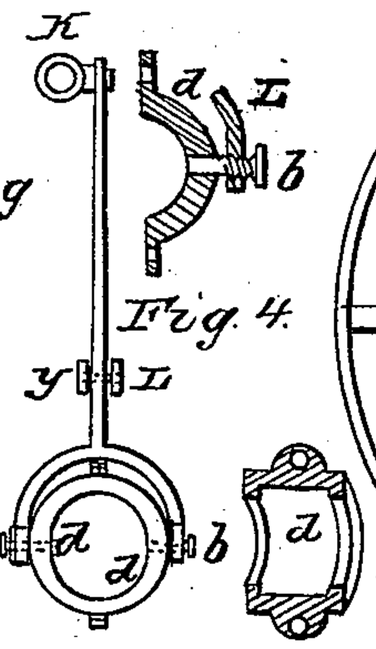


Fig. 2.

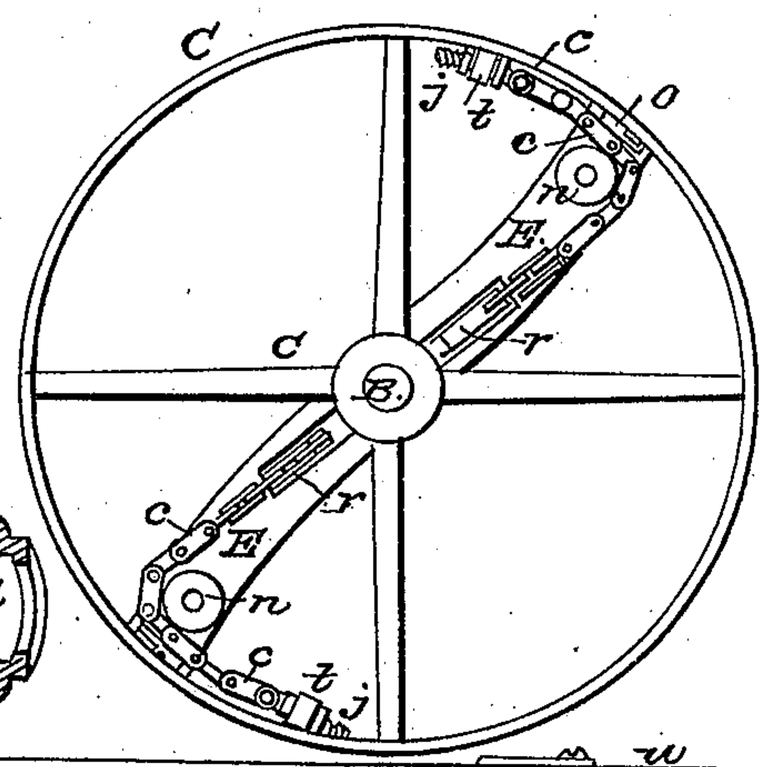
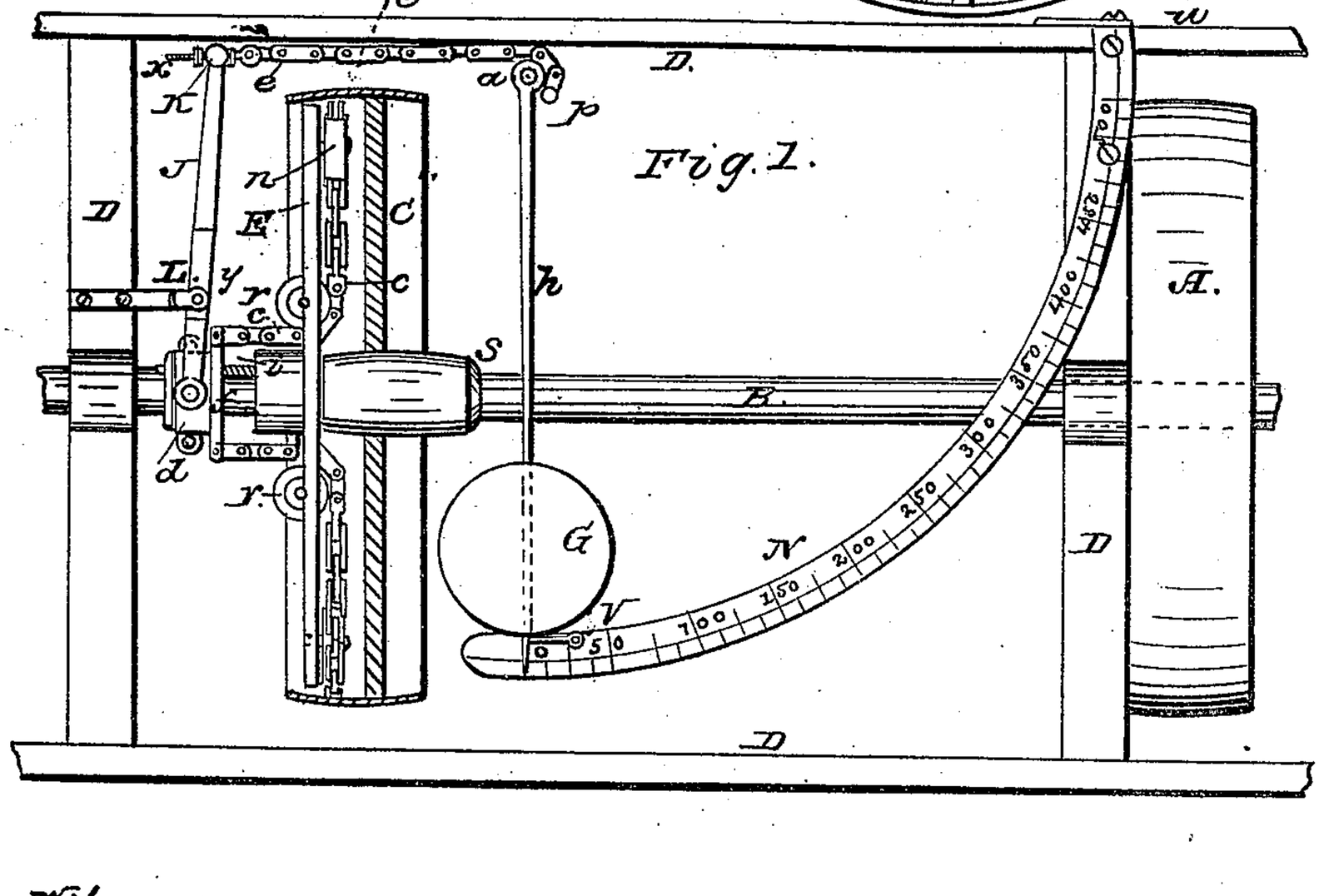


Fig. 1.



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JAMES EMERSON, OF LOWELL, MASSACHUSETTS.

Letters Patent No. 79,561, *dated July* 7, 1868.

IMPROVEMENT IN DYNAMOMETERS.

The Schedule referred to in these Letters Patent and making part of the same.

Be it known that I, JAMES EMERSON, of Lowell, county of Middlesex, and State of Massachusetts, have invented an Improved Device for Weighing Power; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the annexed drawings and letters of reference marked thereon.

Figure 1 is a side elevation, one-half of the rim of the pully C being removed.

Figure 2 is an end view of the pulley C and the flat side of the spider E.

The other drawings are separate parts in detail, and in some cases the letters referred to will only be found with the separate pieces.

The object of my invention is to obtain a reliable dynamometer, so simple and cheap in its construction and operation, that all using power may be able to have the use of it.

I will now proceed to describe its construction and operation.

D D D is the frame, in which the shaft B is supported. The pulley C is the main driving-pulley, receiving its power direct by belt from the motor. It is placed loosely on the shaft B. The collar *s* prevents the pulley from working to the right. Close to the left end of the hub of pulley C is firmly keyed the spider E, over which the rim of the pulley C projects, as shown in fig. 1.

On the face of the spider, near its ends, are placed the sheaves *n n*. These sheaves work loosely on a steel stud, through their centre. The sheaves *r r*, near the hub of the spider, are placed as shown in figs. 1 and 2. They also work on pins through their centre.

On opposite sides of the pulley C are the holders, *t t*. These are cast to the rim of the pulley C, with holes through them, in which the screws *j j* are placed. These screws have a nut on them, each side of the holder *t*. The heads of the screws are slotted or forked, to receive a link of the chain *c*, to which it is permanently connected by a rivet, as shown in fig. 2. The chain thus being connected to the rim of the pulley C, is carried in a line with the rim of the pulley to the end of the spider, then around the sheave *n*, towards the centre of the spider, until it reaches the sheave *r*, partially around that, out through the spider, in line with the shaft, until it reaches the sliding collar *f*, to one of the ears of which it is secured by a rivet, as shown in fig. 1. A quarter turn is made in the chain, between the sheaves *r* and *n*, as shown in figs. 1 and 2.

The collar *f* slides freely on the shaft B, but is prevented from turning on the shaft by the spline *i*. The collar *d*, shown in section, is made in halves, and chambered, that it may be packed with felt, to hold oil. It is not round inside, but oval, the longest diameter of the opening being vertical. This form is used to prevent it from ever resting on the neck of the collar *f*, producing friction.

After the halves are packed, they are placed around the neck of the collar *f*, and secured together by screws, through the ears, at the top and bottom. The fork of the lever J is then placed outside of the collar, as shown in Figure 4, and the screws *b* inserted through the prongs of the lever J.

The holes in the collar, for the points of the screws, must be large enough to allow the collar to turn freely on the screws.

The collar *d* being secured in the fork of the lever J, the lever is then suspended in the fork of the projecting piece L, which is bolted to the frame D. As the collar *d* swings in the fork of the lever J, it describes the arc of a circle, the radius of which is equal to the distance between the screws *b* and the pin *y*, by which the lever J is suspended in the fork of the piece L. Thus it becomes necessary to have the inside of the collar *d* more oval vertically than if it moved level with the shaft B.

Through the top of the lever J, working loosely, is the eye-bolt K. Through this eye-bolt the screw *x* is placed, with a nut each side of the eye-bolt, the head of the screw being slotted or forked, to which is attached the chain *e*. In the same manner the chains *c* are connected to the screws *j j*.

The chain *e*, after being connected to the lever J by the screw *x*, is carried to the right until it reaches the

roller *a*, passing around the said roller to the under side, and is there made fast to the roller by the eye-bolt *p*, as shown in fig. 1. The roller *a* is suspended from the frame D by a small steel bolt through its centre, on which it works loosely. From the roller projects the arm *h*, to the lower end of which the ball G is attached, as shown in fig. 1.

The eye-bolt *k* is of sufficient length to carry the chain *e* and roller *a* to one side of the shaft B, so that the ball can swing up by the shaft without striking.

The index N is made of any suitable material, and secured to the frame, as shown in fig. 1. The piece marked *u*, above the index, is to swing out, to hold up the ball G when necessary. At the lower end of the index is the spring *v*. The end of this, next the point of the arm *h*, stands out from the index sufficiently to prevent the arm from passing by it unless it is pressed back against the face of the index.

The spider E is forked at each end, and the forks are placed astride of the blocks *o o*, which are cast to the rim of the pulley C. When the rim of the pulley C is connected to the ball G, by the chains *c* and *e*, sliding collar *f*, &c., and the point of the arm *h* pointing to zero, one prong of the fork of the spider should rest against the blocks *o*, as shown in fig. 2, and the fork of the spider should be of sufficient width to allow the pulley C to turn on the shaft B enough to raise the ball G nearly level with the roller *a*. Then the other side of the blocks *o o* strike the other prongs of the forks of the spider E, and prevent the ball G from being raised any higher.

The pulley A is keyed to the shaft B, and is only one of the many pulleys that may be placed on the shaft to drive different machines.

A portable dynamometer for weighing separate machines may be made in a light frame, but in that case I would advise that the chains *c* be connected to the T-shaped piece marked *g g*, in Figure 3, instead of the connecting-collar *f*, before described.

The T-shaped piece can only be used when the dynamometer is placed close to the end of the shaft, a mortise being made through the shaft, inside of the bearing in the frame D, and near the hub of the spider E. A hole should then be drilled in the centre of the shaft B, from the end outside of the bearing in the frame D, to the mortise, the T-shaped piece being placed in the shaft, the chains *c* connected to the short arms of the T, and the long arm projecting through the bearing, and out from the end of the shaft, as shown in fig. 3, and the lever J should be connected to it the same as to the collar *f*.

I should use this arrangement to carry the connection as near the centre of motion as possible, to avoid friction, and in all cases the bearing-pins that support the lever J, the sheaves *n* and *r*, roller *a*, and the shaft where the pulley C works, should be as small as is possible consistent with safety; and the longer the lever J, and the greater the diameter of the pulley C, the sheaves *n* and *r*, and roller *a*, in proportion to their bearing, the better; and the advantage the T-piece has over the collar *f* depends on its difference in weight and the size of its neck where the lever J is connected with it.

Operation.

When power is communicated to the pulley C by belt from the motor, the pulley would turn on the shaft, as it is not keyed to it, if it were not for the rim of the pulley being connected to the ball G by the chains *e* and *c*, collar *f*, and the screws *j j* and *x*, but as the chains *c* run over the sheaves *n*, on the end of the spider E, and as the spider E is rigidly secured to the shaft B, the spider acts as a fulcrum for the connection of the rim of the pulley to the arm *h*, and the pulley can only go back on the shaft B as the ball G is raised.

As the connecting-lever J is supported by the side frame D, as shown in fig. 1, the action of the arm *h* has a tendency to draw the line of shafting to the left. This is stopped by having the hub of the pulley A strike the bearing in the frame D, but when the power used is great, the pressure is heavy, and if the dynamometer is kept in use all of the time, the end of the hub of the pulley A requires frequent oiling, and it is found best to use the dynamometer only when required.

To allow of this, the ball G is raised up and supported on the piece *u*. While in that position, one prong of the forked ends of the spider E strikes against the stop *o* on the rim of the pulley C, clutching the pulley to the spider, so that they run together as they would if the pulley were keyed to the shaft, stopping all end strain on the shaft. Then, by simply dropping the ball, the weight is shown at any time.

When starting, the power is generally uneven, and the arm swings wildly, so much so as to endanger its safety. For this reason the spring *v* becomes necessary. As the ball drops once past the spring, it is caught by it, and it can swing no more until released.

To mark the index N, place everything in its proper position, then hang a hundred pounds on the side of the pulley C, rap the pulley until the point of the indicator stops, make a slight mark, then raise the arm, and rap or shake the pulley, and see if the pointer will indicate as at first. When that point is established, hang on two hundred pounds, and repeat as at first, and continue to do so until the index is graduated.

By connecting the ball G directly to the rim of the pulley C, there can be no multiplication of errors. Whatever strain comes on the pulley is communicated directly to the arm *h* and weight G.

To obtain the amount of power used, multiply the amount shown by the indicator by the speed of the pulley, and it will give the foot pounds per minute.

What I claim as new and my invention, is—

1. Connecting the rim of the pulley C to the automatic indicating-arm *h*, when constructed substantially as described for the purpose named.

2. I claim the arrangement of the stop *o*, in connection with the forked ends of the spider E, so that the pulley C will be clutched to the spider when the arm *h* is raised as described, for the purpose of taking the end pressure from the shaft, and to save the dynamometer from useless wear.

3. I claim making the collar *d* oval in form, to prevent its resting on the neck of the collar *f*; also chambering it as shown, to hold packing for the purpose of constantly lubricating the neck of the collar *f*.

4. I claim the arrangement of the screws *j j* and *x* with nuts, each side of the eye-bolt *k*, and the holders *t*, that the connecting chains may be properly adjusted in length.

5. I claim the spring *v*, for the purpose named.

6. I claim pivoting the eye-bolt *k* in the arm J, in the manner and for the purpose substantially as described.

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Witnesses:

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