(No Model.)

C. BRIDGES.

EQUALIZING APPARATUS FOR PUMPING AND OTHER MACHINERY.

No. 270,007. Patented Jan. 2, 1883.

Fig. 1.

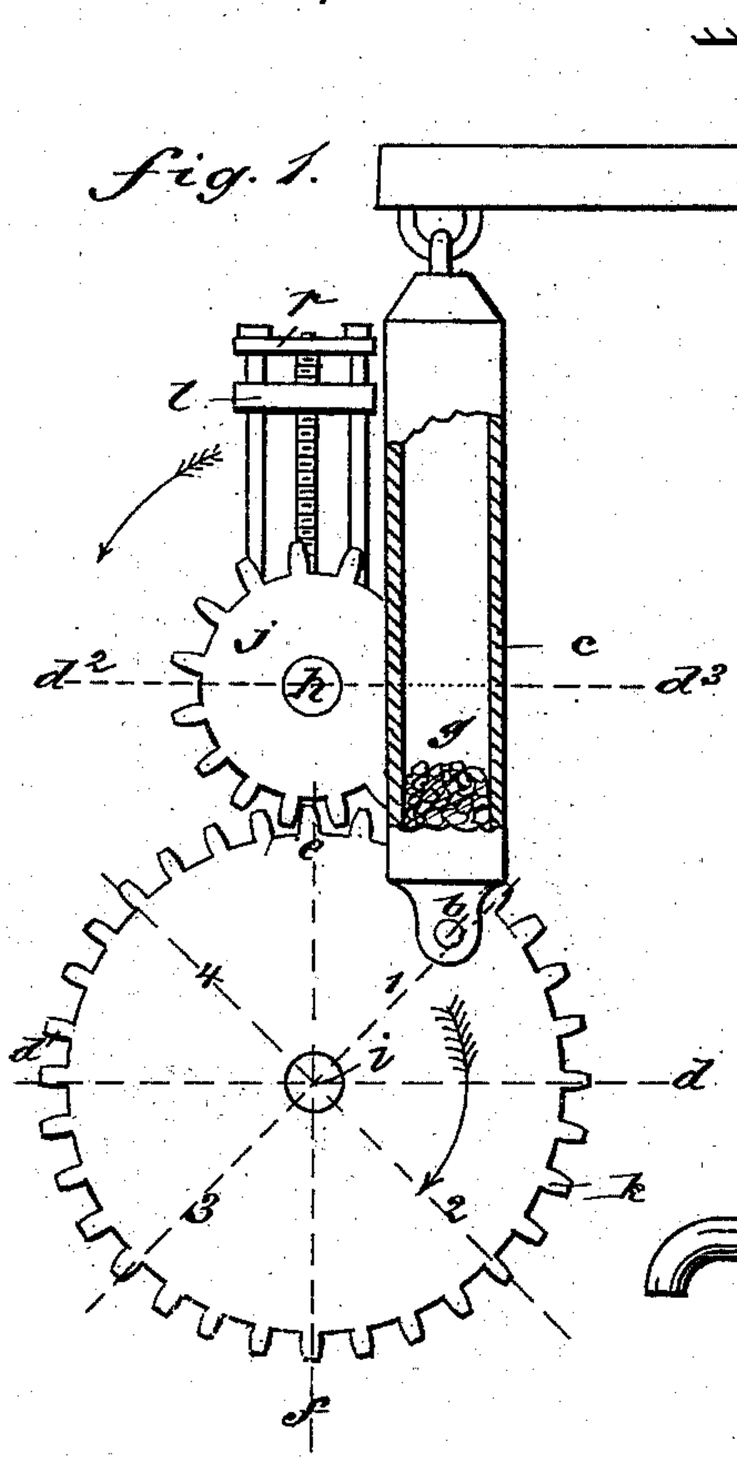


Fig. 2.

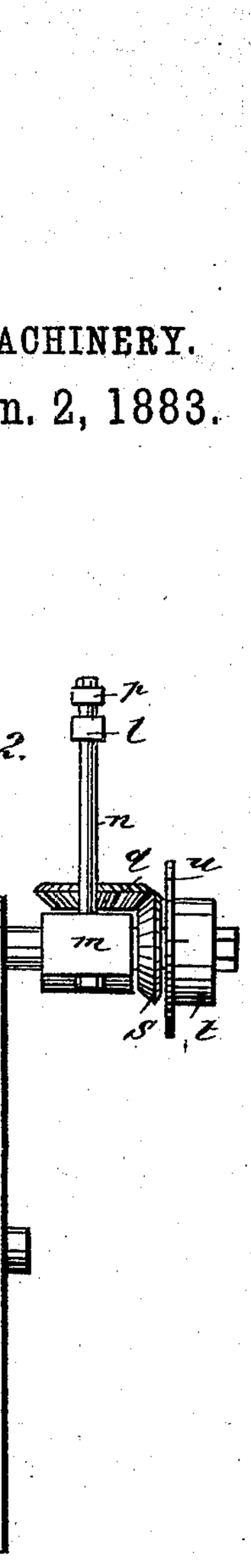
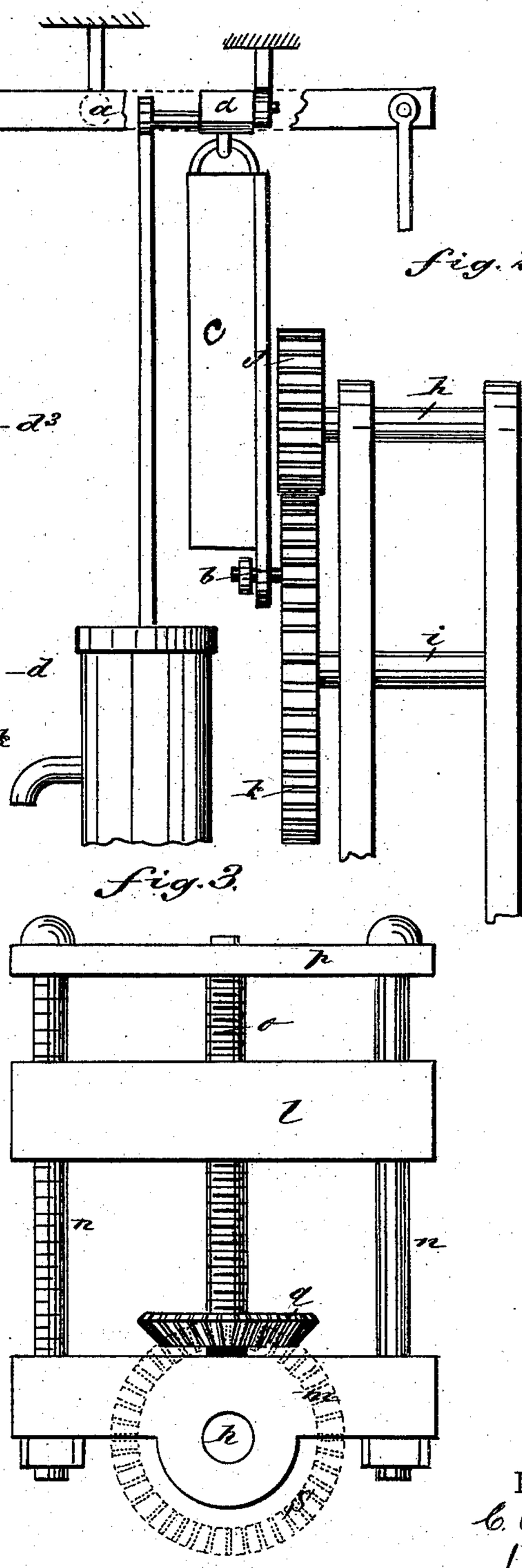


Fig. 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

CHARLES BRIDGES, OF SAN FERNANDO, CALIFORNIA.

EQUALIZING APPARATUS FOR PUMPING AND OTHER MACHINERY.

SPECIFICATION forming part of Letters Patent No. 270,007, dated January 2, 1883.

Application filed August 4, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES BRIDGES, of San Fernando, in the county of Los Angeles and State of California, have invented a new and Improved Equalizing Apparatus for Pumping and other Machinery, of which the following is a full, clear, and exact description.

The nature of my invention consists of the several combinations and arrangements of parts, substantially as hereinafter more fully set forth and claimed.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of my improvement as adapted to horse-power pumping apparatus, with a part sectioned. Fig. 2 is a front elevation of part of the apparatus adapted to other power for general work. Fig. 3 is a side elevation of part of the apparatus of Figs. 1 and 2 on an enlarged scale.

In Fig. 1, *a* represents a portion of a beam or lever for working the piston of a pump, which, for example, may be supposed to require a maximum force of eight pounds to lift when the crank-pin *b*, by which the power is applied, is at *d*, where the resistance of the load to the crank is greatest. As the crank applies no power to the beam or its connecting-rod *c* when passing the dead-centers *e* and *f*, it will be seen that the average power applied to raise the piston will be four pounds, which is expended during half the revolution of the crank-pin, and as during the other half of the revolution of the crank-pin the piston descends by its own gravity the average of power required for the whole revolution of the wheel will be two pounds. Therefore, to enable a motive force of two pounds working continuously to apply the power so as to exert the necessary eight pounds at *d*, I first counterbalance the pump-piston with a weight, *g*, of four pounds of gravel, or other suitable material, with which I load the hollow connecting-rod *c*, which is to assist in raising the piston when said rod is descending from *e* to *f* with an average effect of two pounds, but exerting four pounds at *d*, the power of said counter-balance being stored up in it on the rising side of the crank-pin, where a maximum of four pounds is required to raise it past the point *d'*. To enable the aforesaid motive force of two pounds to carry the pump-piston and the counter-weight past these points of maximum resistance I provide a counter-shaft *h*, and gear it with the crank-shaft *i* by pinion *j* and wheel *k*, or any equivalent means, so as to make two revolutions to one of the said crank-shaft, and on this shaft mount a secondary counterbalance-weight, *l*, which will exert a force of two pounds on the crank-shaft when the said weight is passing the points d^2 d^3, and I gear the said counter-shaft and crank-shaft together, as seen in Fig. 1, so that it begins its descent when crank-pin *b* is passing the quarter-line 1, and exerts its maximum effect of two pounds at d^2 when the crank-pin has the maximum resistance at *d*, falling to the vertical line *e f* when crank *b* has arrived at the second quarter-line, 2, and ascending while the crank-pin passes from line 2 to 3, where the resistance of the piston on the crank-pin is minimum, ready to descend again while the counter-balance *g* is passing from line 3 to 4, and lend its maximum effect to the raising of said weight past the maximum resistance-point *d'* thereof, thus enabling a constant motive force equal to the average of the power required, and being continuously in labor to work the piston over the greatest points of resistance, and so operating that the strains are balanced in all points and a steady action is obtained.

In order to be able to shift the weight *l* for adjusting it to have more or less effect, as may be required for variations in the force of the driving-power, I have attached it to the shaft *h* by a cross-head, *m*, and by rods *n*, on which it may slide, with a screw, *o*, for shifting it, said rods and screw being coupled at the outer ends by the cross-bar *p*, and to enable it to be shifted while running, as may sometimes be required, I have applied a bevel-wheel, *q*, to the screw, and another one, *s*, to the shaft *h*, and gearing with *q*, and having a pulley, *t*, connected with it, and both turning loosely on shaft *h*, so that by the application of a belt from another shaft for a short time the screw can be worked, the belt being put on straight to work it one way and crossed to work it the

other way. A slack belt with any temporary tightening device to be held in the hand may be employed. A brake applied to pulley *t*, so as to prevent it from revolving with shaft *h*, will turn the screw in one direction. The flange *u* is employed to prevent the belt from running on to the gears.

The pinion *j* may be geared with the wheel *k* at its side, instead of at the top, in which former case the shaft *h* may be extended the other way without interfering with the primary counterbalance connecting-rod *c g*.

In machinery not using a lever or walking-beam the primary counter-balance may be attached to an arm or crank of the crank-shaft, and with any other than horse-power, or that of like nature, and for any other purpose than pumping, or that of like nature, when the power is applied to the crank-shaft, as in a steam-engine, where dead-centers occur, the said primary counter-balance is not required, the secondary balance-weight *l* and its adjuncts constituting an effective equalizer.

In a windmill not using the walking-beam the primary counter-balance may be a weight attached to an arm opposite the crank.

The secondary contrivance is intended for such kinds of work as frequently require great variations in the power applied by the engine. For instance, in manufactories, where additional machinery is frequently started up or stopped, it is desirable to have equalizing-power correspondent with the whole power, used and capable of being shifted accordingly without stopping the whole work and causing delay.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in an equalizing apparatus, substantially as herein described, of the primary counter-balance *g* and the secondary counter-balance *l*, said counter-balances being geared together in the proportions and relatively arranged as to each other substantially as described.

2. The combination, with a driving-shaft, *i*, of a counter-balance consisting of a counter-shaft, *h*, geared with the shaft *i* in the proportions stated, and provided with a weight, *l*, substantially as described.

3. The combination of the adjustable counter-balance *l*, adjusting-screw *o*, and gears *q*, *s*, and *t* with the shaft *h*, substantially as described.

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Witnesses:
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R. A. HOWARD.