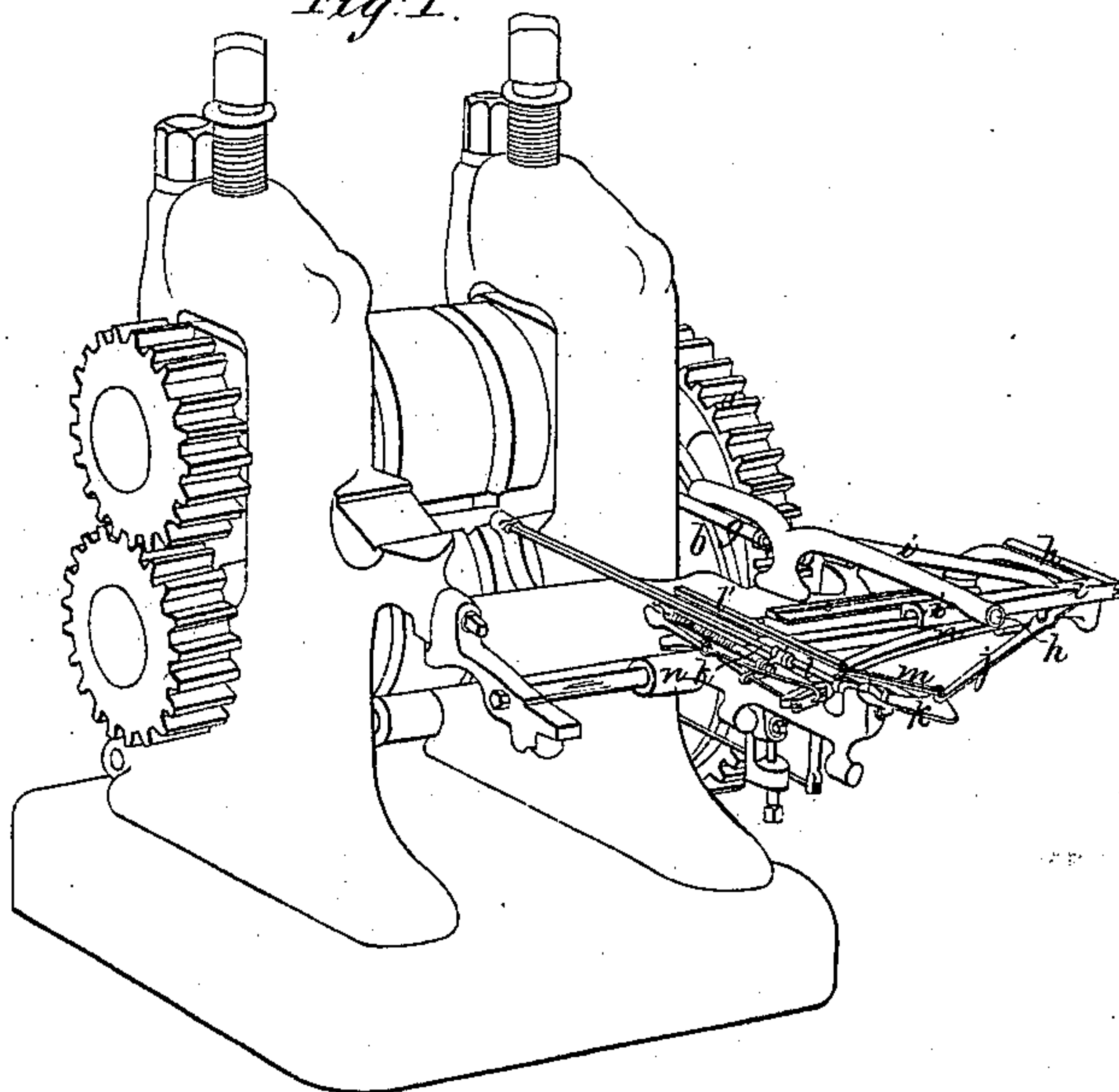


*H. Waters.*  
*Rolling Die.*

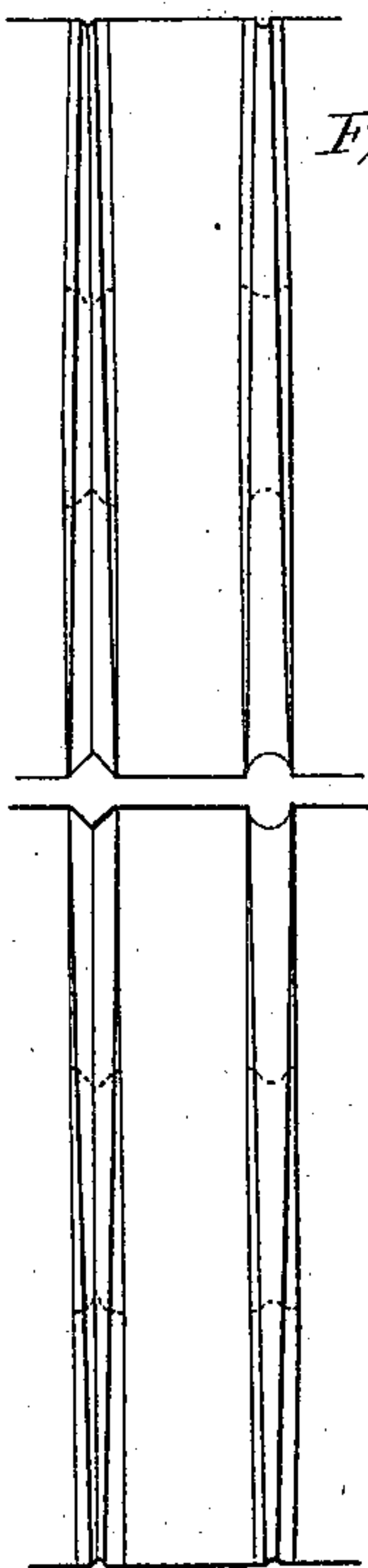
*N<sup>o</sup> 59,488.*

*Patented Nov. 6, 1866.*

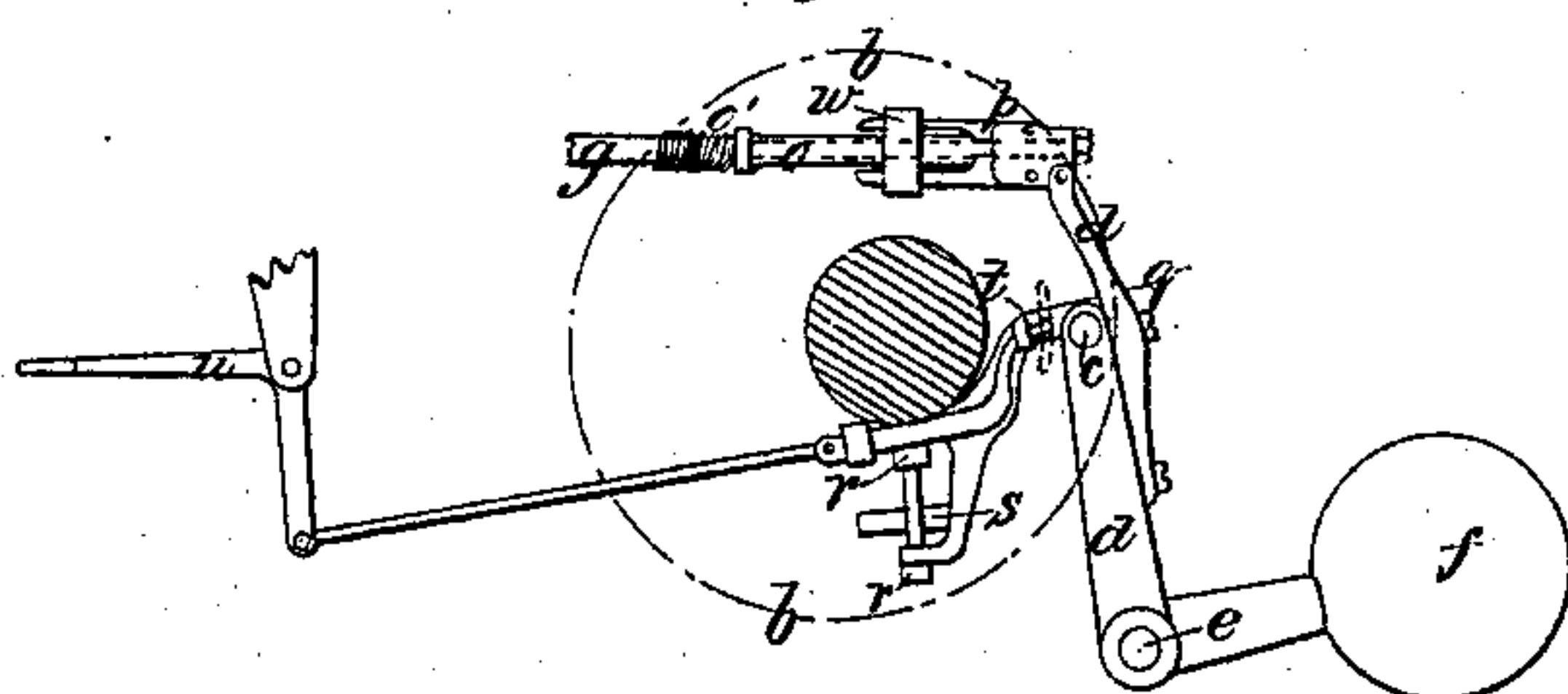
*Fig. 1.*



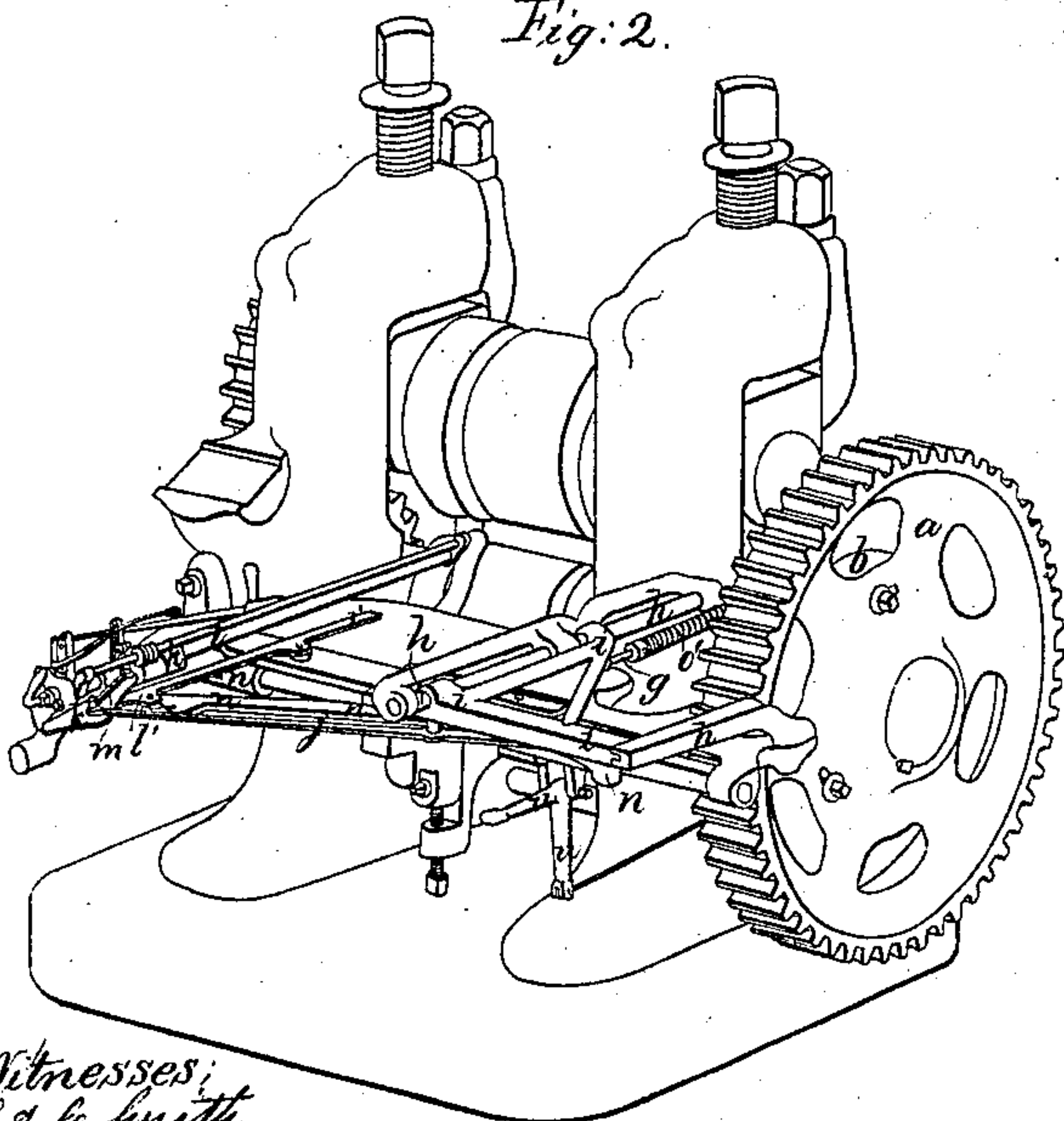
*Fig. 3.*



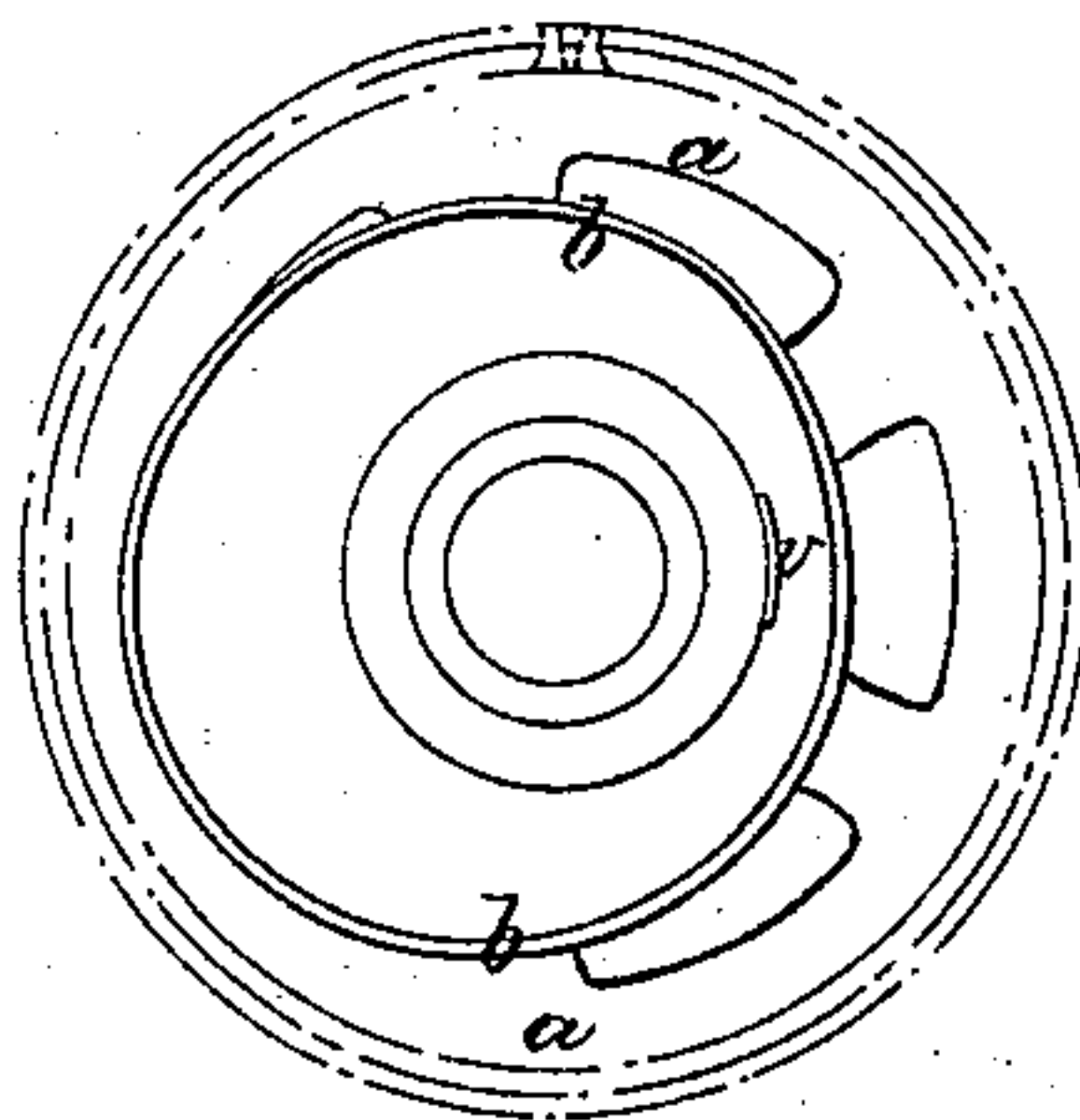
*Fig. 5.*



*Fig. 2.*



*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

HERVEY WATERS, OF BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN ROLLING-DIE APPARATUS.

Specification forming part of Letters Patent No. 59,488, dated November 6, 1866.

*To all whom it may concern:*

Be it known that I, HERVEY WATERS, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machines for Shaping and Reducing Metal by Rolling; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

The machine shown in the drawings, and embodying my invention, is of that variety in which the rolls operate on the metal with a part only of their peripheries, the rolls being so formed as to leave an open space between them during a portion of each revolution, so that the metal to be rolled may be thrust through said space at such times, to be seized by the die-shaped grooves formed in those portions of the rolls which come into or nearly into contact, and will be returned by the rolling action toward its starting-place.

My invention relates, chiefly, to the combination with such rolls of means for positively moving the metal to the die-grooves and withdrawing it therefrom, when so arranged as to admit of variations from such movements, this preventing breakage of the mechanism by which the metal is held and moved in its passage to and from the die-grooves of the rolls; and my invention consists, first, in combining with such rolls and a cam and weight in connection therewith, and a tongs or holder of the metal to be rolled, a spring so arranged that it may yield to allow the cam to move the mechanism which actuates the tongs faster than the metal held by the tongs is permitted to move, by the action thereupon of the die-grooves; also, in combination with the rolls and any suitable means for working the tongs, of yielding nippers, which, in case of accident or derangement, permit motion of the prime motor of the tongs without corresponding movement of these, or breakage of the connections therewith.

Of the drawings, Figure 1 is a perspective view of the machine looking toward the right, and Fig. 2 is a similar view looking toward the left.

Of the parts of the machine which perform the actual labor of rolling I propose only to

describe the form of the die-grooves, which may be seen developed in Fig. 3, this showing one groove designed for rolling round taper shapes—such as rat-tail-file blanks, for example—and another groove for rolling square taper shapes, the development being on an enlarged scale, and the dotted lines showing sectional shapes of the grooves at the places indicated.

It will be observed that the flare given to the grooves beyond their real forming shape extends less than half the distance from the surface of the roll to the apex of the angle of the square groove, and correspondingly in the example of the round forming-groove, so that any metal moved by the rolling operation into the space of the flared widening of the grooves will at the next operation of the rolls, when the tongs are turned ninety degrees, be presented to and shaped by the bottoms of the grooves.

To the gear-wheel *a* on the shaft of the lower roll, and by which the mill is driven, is secured the cam *b*, so as to be capable of adjustment thereon, this wheel and cam being shown in detail in Fig. 4 as removed from the mill, with their inner faces exposed. This cam *b*, rotating with the die-rolls, operates, by the roll or pin *c*, the rocker-arm *d*, to which it is fixed, this rocker-arm and other parts therewith closely connected being most clearly shown in Fig. 5, which exhibits the mechanism concealed from view between the gear *a* and its adjacent housing.

The rocker-arm *d* is fixed to rocker-shaft *e*, which is mounted in a suitable bearing on each housing, and to this rocker-shaft there is secured the weight *f* by means of an arm, the design and tendency of the weight *f* being to keep the pin *c* of the rocker-arm *d* pressed against the cam *b*.

The rocker-arm, by means of the link *g*, reciprocates on the ways *h* the cross-head *i*, and this, by means of a pin in lever *j*, which enters a slot in the cross-head, vibrates said lever and gives motion to the tongs-carrier *k*, reciprocating it on the slides *l* *l'*, the lever *j* being connected with the tongs-carrier *k* by a link, *m*.

The lever *j* is pivoted to a carriage, *n*, which may be moved laterally with respect to the rolls, so as to bring the piece to be



rolled opposite any of the grooves which may be formed therein, the slot in the cross-head *i* permitting this change of position in the carriage *n* without affecting the movements imparted to the tongs-carrier by means of lever *j*.

On the link *g* is fitted so as to slide thereon a sleeve, *o*, and spiral spring *o'*, bearing against a stop fixed on link *g*, near its point of attachment to the cross-head *i*.

The connection between the rocker-arm *d* and the link *g* is obtained by means of nippers *p*, which are held closed together by means of a spring, *w*, which forces the jaws of the nippers into a groove turned in the sleeve *o*, so that under ordinary circumstances the nippers will hold in the groove, and will, through the spring *o'*, give movement to the link *g*; but if from any cause the cross-head *i* is kept from moving back from the rolls, the jaws of the nippers will slip out of the groove in the sleeve when the positive action of the cam *b* shall have considerably compressed spring *o'*, and then the nippers will be carried over the smooth surface of the sleeve *o* to the extent due to the action of the cam *b* on the rocker-arm *d*.

It may now be seen that the movement of the tongs-carriage toward and from the rolls is intended to be, and will be, relative to the movement given the cross-head *i* by the cam *b*, said cam being so made that the movement imparted thereby through the described connections in causing the tongs-carriage to retreat from the rolls shall be coincident with the movement imparted to the piece of metal by and under control of the rolls.

When from the turning down of the rolls, necessitated by the wear thereof, the movement given thereby to the metal in the act of rolling, the tongs-carrier is kept from moving as fast as it would be moved from cam *b*, or when, from any other cause, this is the case, then the cam *b* will, in its positive movement, compress spring *o'*, and may cause the nippers to slip on the sleeve *o*.

It will also be seen from the organization described that the cam *b* acts positively in preventing the weight *f*, or its equivalent, from forcing the tongs-carrier suddenly against or up to the rolls, while at the same time the cam is negative in its action in not compelling the tongs-carrier to approach the rolls, so that in case of obstruction or derangement, the effect produced is the lack of proper presentation of the work to the die-rolls, and not the breakage of the mechanism governing the movement of the tongs.

Inspection of the drawings will show that the tongs themselves may be rotated on the longitudinal axis of the piece to be rolled, and that they are provided with a gage or index, which determines the number of degrees of such turning; also, that they are provided with a system of levers by which they are conveniently operated to grasp and release such

pieces of metal as it is desired to present to the action of the die-rolls, and that the tongs are so attached to their carrier that by compressing a spiral spring on one member of the tongs, they may yield slightly without effecting the lifting of the weight, thus giving time in which to overcome its inertia.

Mechanism for locking the lateral carriage *n* so as to bring the work opposite either groove found in the rolls and retain it there is also provided, but needs no description here, as it will form no part of the matter herein claimed.

Having described the means for presenting the work to the action of the rolls, and of retracting it therefrom, and the operation and conduct of those means under the varied conditions which are likely to occur, both normal and accidental, I will now show how the connection between the rolling-mill *per se* and the work-carrying mechanism is made and broken, it being a well-understood condition that it is desirable to keep the rolling-mill constantly in motion, and to make the action of the carrying mechanism intermittent, as and when desired by the operator. To effect this a latch, *q*, is provided, and is so arranged that by means of a spring, *s*, it will catch and hold the rocker-arm *d* in the position given it by the extreme throw of cam *b*, which farthest removes the tongs from the rolls, so that continued rotation of the mill will not cause movement of the rocker-arm till it is released from the latch, so that the weight *f* will bring the pin *c* into contact with cam *b*. This latch is pivoted to bearings *r r*, made fast to the side of one of the housings, the spring *s* pressing it constantly toward the rocker-arm *d*.

Connected with the body of the latch so as to move therewith, and also to move relatively thereunto, is a bolt, *t*, which can be moved forward into the position shown in Fig. 5 by the operator in depressing the horizontal arm of the bent lever *u*. When so depressed, the bolt *t* is in the path of rotation of the projection or cam *v*, fixed on the wheel *a*, so that when the cam *v* strikes the bolt *t* the latch *q* is moved sidewise, and releases the rocker-arm *d* from its hold, and the weight *f* then causes the arm *d* to move, keeping its pin *c* in contact with cam *b* while it rotates, and causes the tongs to move up to the rolls.

In the continued rotation of cam *b*, the weight *f* is elevated and the tongs are retracted to their greatest extent, in which condition the latch is forced, by spring *s*, upon and holds the rocker-arm from vibration, the operator having released bent lever *u*, and a spring connected therewith having retracted the bolt *t*, so that the cam *v*, in its rotation, will not again release the rocker-arm from the latch till the operator again thrusts the bolt *t* forward.

I claim—

1. Combining with the rolls, and a cam and weight in connection therewith, and a tongs



or holder of the metal to be rolled, a spring so arranged that it may yield to allow the cam to move the mechanism which actuates the tongs faster than the metal held by the tongs is permitted to move, by the action thereupon of the die-grooves, substantially as described.

2. The yielding nippers, in combination with

the rolls and any suitable means for working the tongs.

HERVEY WATERS.

Witnesses:

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S. B. KIDDER.