

(No Model.)

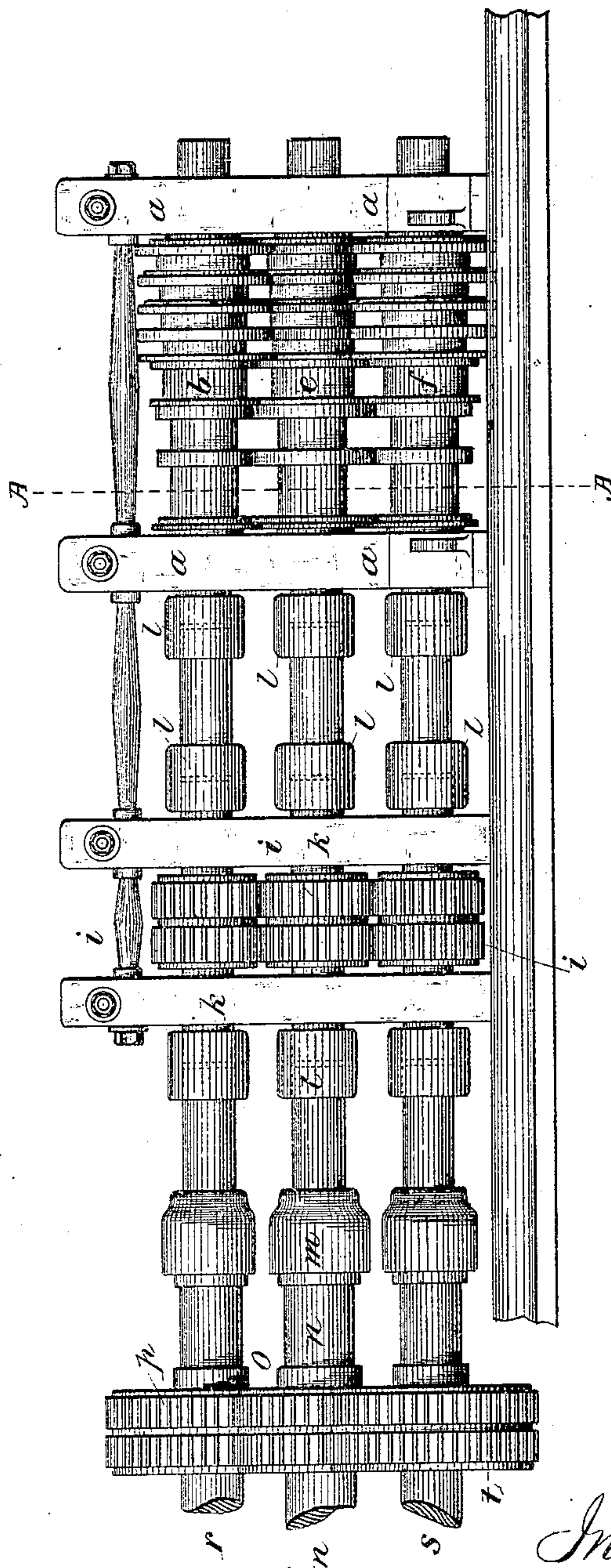
2 Sheets—Sheet 1.

P. KIRK.
ROLLING MILL.

No. 270,441.

Patented Jan. 9, 1883.

Fig 1.



Attest:
Geo. P. Smallwood Jr.
Esq.

Inventor:
Peter Kirk.
By *Knights Bros*
attys

(No Model.)

2 Sheets—Sheet 2

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Fig 2.

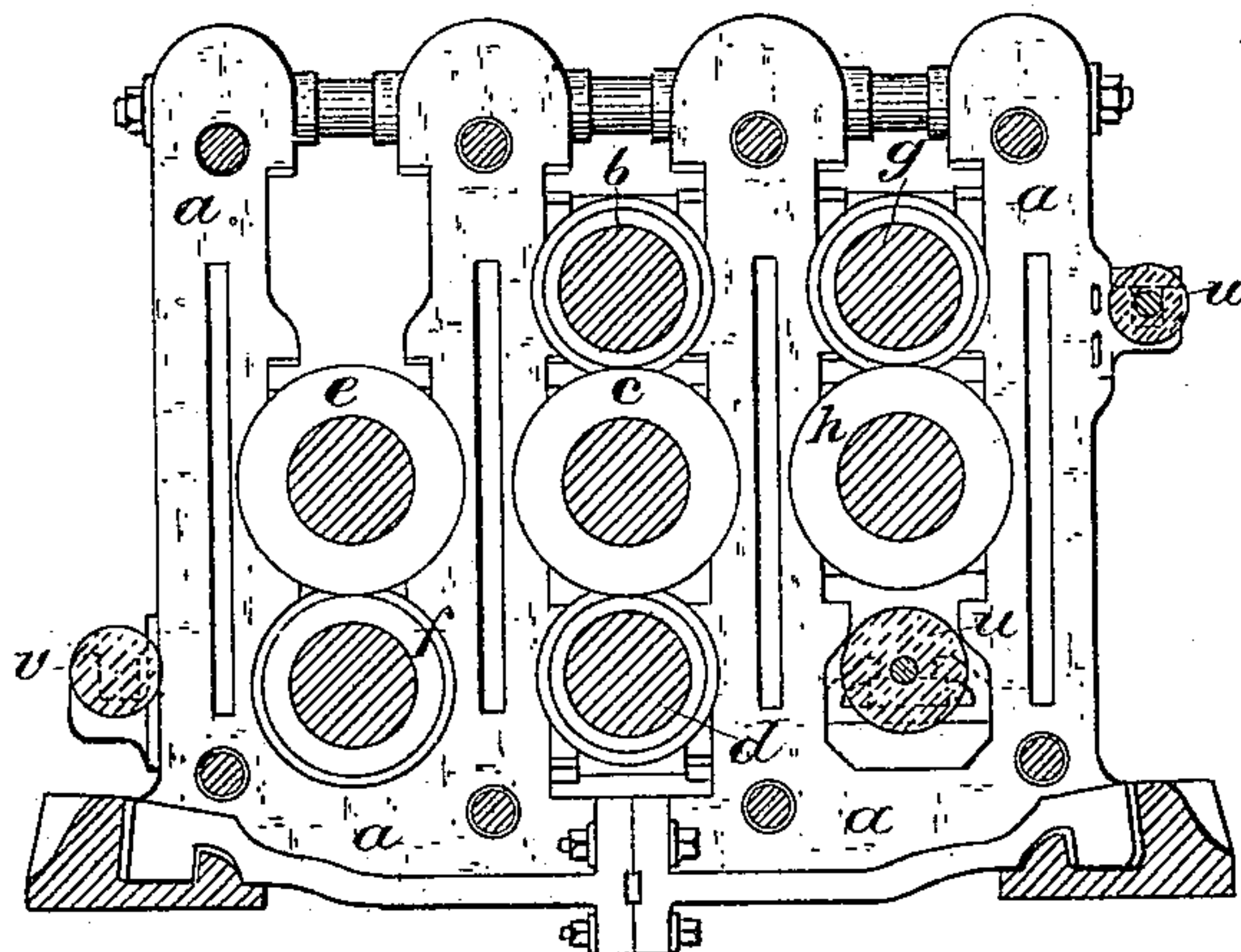


Fig 3.

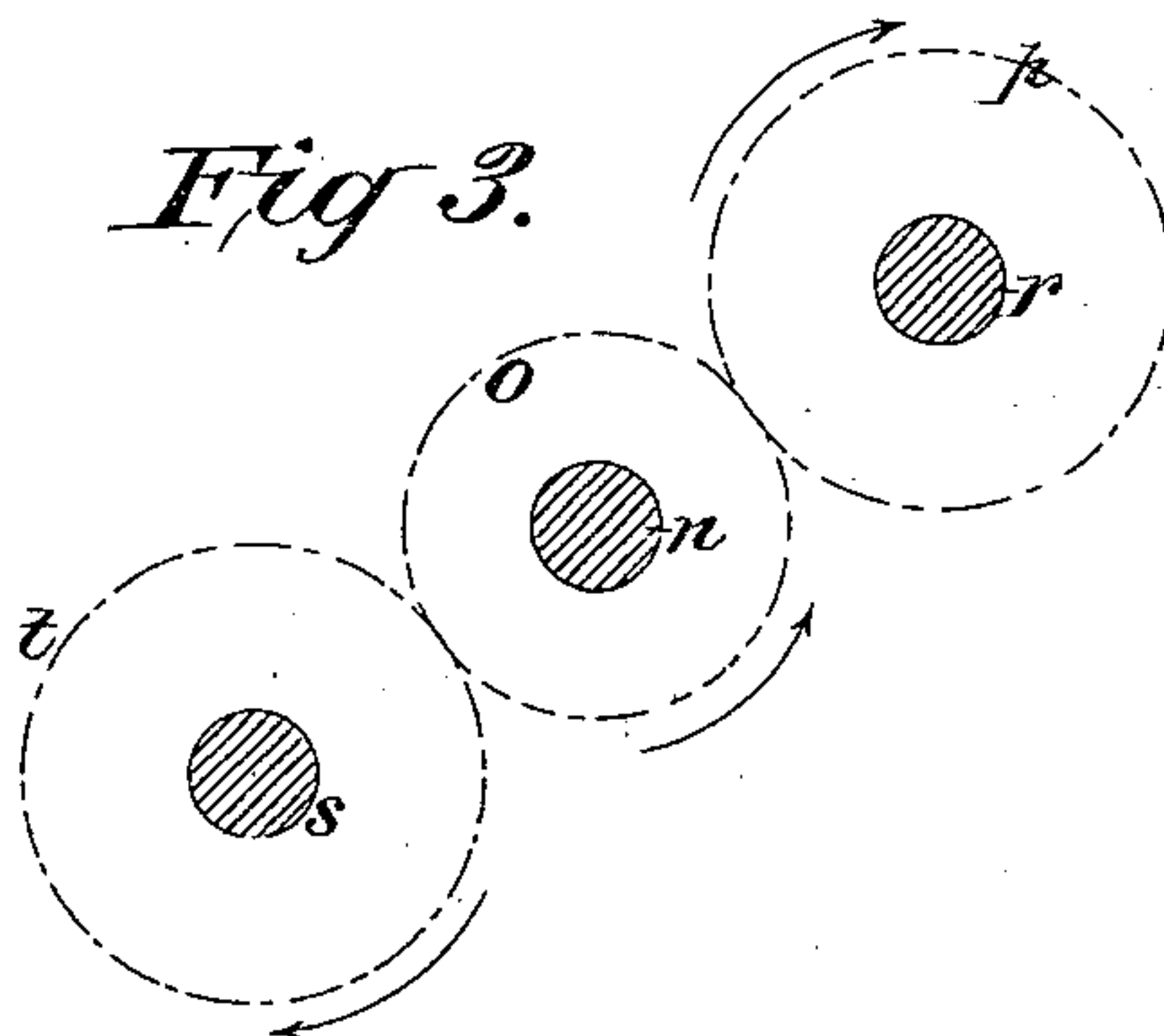
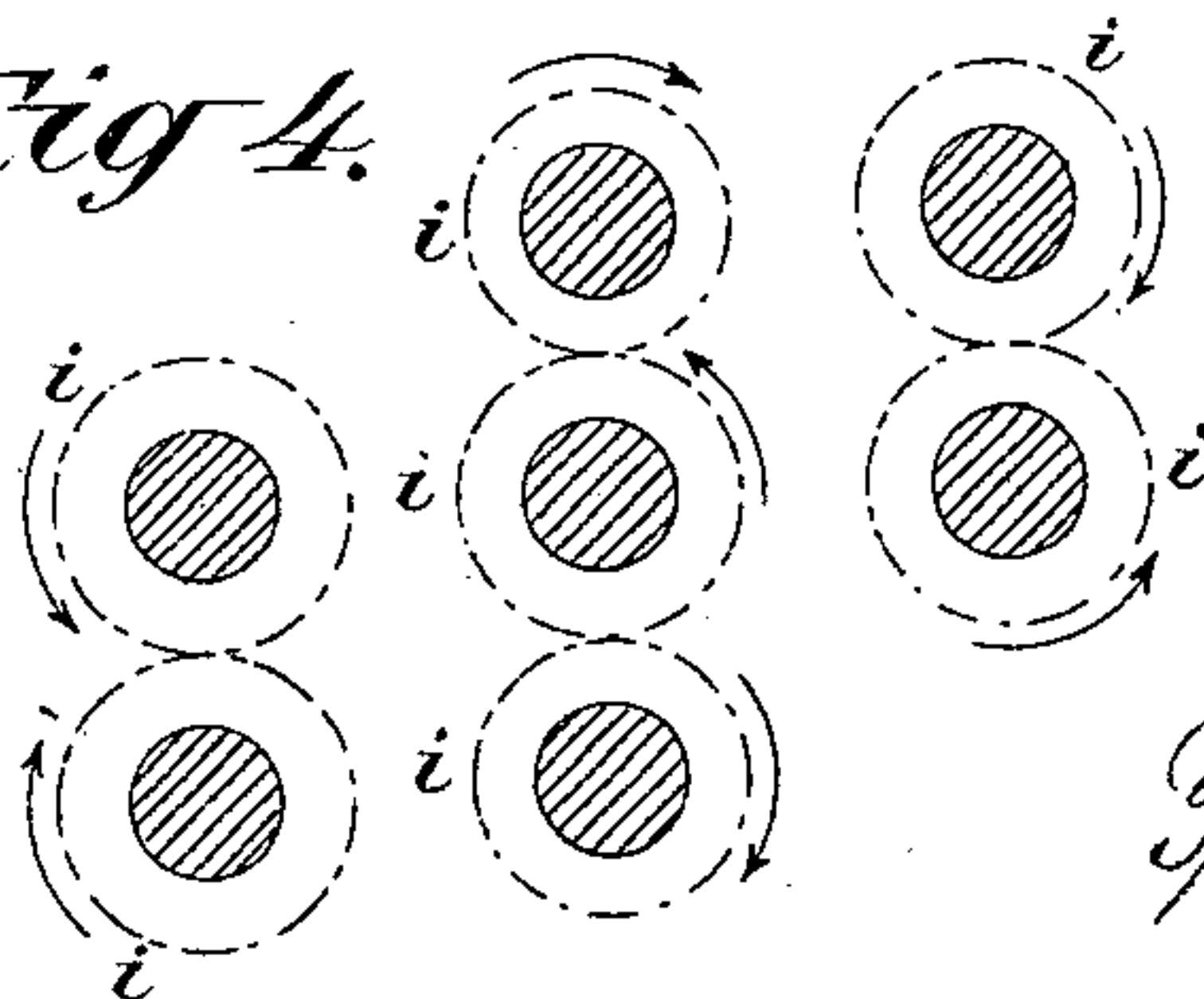


Fig 4.



Attest:
Geo T. Smallwood Jr.
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Inventor:
Peter Kirk.
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UNITED STATES PATENT OFFICE.

PETER KIRK, OF WORKINGTON, COUNTY OF CUMBERLAND, ENGLAND.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 270,441, dated January 9, 1883.

Application filed April 17, 1882. (No model.) Patented in England February 15, 1881, No. 637.

To all whom it may concern:

Be it known that I, PETER KIRK, of Workington, in the county of Cumberland, England, iron - manufacturer, have invented Improvements in Rolling-Mills employed in the manufacture of iron and steel, (for which I have obtained English Letters Patent No. 637, bearing date February 15, 1881,) of which the following is a specification.

My invention relates to rolling-mills adapted more particularly to be employed in the production of iron and steel rails and of heavy bars, but is or may also be useful in the construction of mills for rolling other descriptions of iron and steel.

In the carrying into effect of a former invention, for which I obtained English Letters Patent No. 470, bearing date February 5, 1876, I employed five rolls—that is to say, I combined a set of “three-high rolls” with an ordinary two-roll mill, the intention being to obtain two reductions by passing the ingot or bloom between the lower rolls, and then to obtain a further reduction with the same heat by lifting the ingot or bloom to the upper rolls in the three-high set.

The object of my present invention is to still further increase the duty of the mill, principally in order to be able to complete rails and heavy bars by rolling down from the ingot or bloom with one heat. To this end I combine with a set of three central rolls and a set of two outer lower rolls an additional set of two upper outer rolls in such a manner as that I can obtain two reductions by passing between the lower rolls, and then two reductions by passing between the upper rolls, or vice versa, according to the arrangements.

In the arrangement which I have adopted when carrying my invention into effect, I form the housings in standards, each of which is principally composed of two suitably strong castings firmly bolted and secured together at the top and bottom. The set of three rolls is housed in a space between the two castings, each casting containing a pair of rolls, so that there is a vertical set of three rolls in the center and a set of two rolls on each side. In the case of one of the outside sets the upper roll is about in line with the upper roll of the set of three, and in the case of the other set the

upper roll is about in line with the middle roll of the set of three. To drive the mill, I couple the center roll of the middle set to the main shaft and gear up the lower roll of one outer set and the upper roll of the other outer set with the same shaft, or with a shaft coupled therewith, and I gear together the rolls which run together at the same surface-speed in the ordinary manner. I prefer to enter the bloom between the rolls of the lower outer set and return it between the rolls of the upper outer set, the rolls of the center set in such a case running faster than the rolls in the outer sets. I employ a revolving roller below the upper outer rolls to carry out the bloom or bar and an upper revolving taking-in roller in front of the upper outer set. When the bloom or bar is lifted to be returned it comes into contact with the said taking-in roller, which helps to run the bloom or bar in.

In order that my invention may be fully understood, I will describe it with reference to the accompanying drawings.

Figure 1 represents a longitudinal elevation of the improved mill, Fig. 2 representing a vertical section on the line A in Fig. 1. Figs. 3 and 4 are diagrams illustrative of the manner in which I gear together the rolls in the mill.

In Figs. 1 and 2, *a a* are the standards in which the rolls are housed. Each standard is principally composed of two strong castings firmly bolted and secured together at the top and bottom. In the space between the two castings are housed three center rolls, *b, c,* and *d,* and each casting is also fitted with housings for two outside rolls, *e f* and *g h*. The standards are each formed in two principal parts for convenience, but I do not confine myself to this formation. It will be seen that the upper roll, *e,* of one of the outside sets is about in line with the middle roll of the center set, and that the upper roll, *g,* of the other side set is about in line with the upper roll of the center set. The rolls in each set are geared together by means of spur-wheels *i,* which are fixed upon short shafts which are housed in the standards *k k,* and are connected with the rolls by means of the couplings *l l*.

Fig. 4 represents the pitch-circles of the connecting-wheels *i*. The axle of the center roll,

5 *c*, of the entire series is connected by the couplings *l* and *m*, and the intermediate shaft, which is housed in the standards *k k*, with the main shaft *n*, which in practice is the crank-shaft of the driving-engines. Upon this shaft
 10 is fixed a spur-wheel, *o*, which gears with a wheel, *p*, which is fixed on a shaft, *r*, which is coupled with the roll *g*. Upon a shaft, *s*, is fixed a spur-wheel, *t*, which also gears with
 15 the wheel *p*, and the said shaft *s* is coupled with the roll *f*. The pitch-circles of these three wheels are represented in Fig. 3, wherein it will be seen that the gearing is so proportioned that the three rolls in the center set will re-
 20 volve more quickly than the rolls in the two outer sets. A roller, *u*, is housed below the roll *h*, and is driven from the central axle, or from any suitable part of the mill, by means of a pitch-chain or by gearing. (Not represented
 25 in the drawings.) The said roller sustains and carries out the bloom or bar as it is passed between the rolls *c d*. Two carrying-in rollers, *v* and *w*, are also mounted to revolve in brackets which are secured to the standards, and
 30 the said rollers are suitably driven to cause them to carry in the bloom or bar toward the rolls. The bloom or ingot is entered, in the first instance, between the rolls *e f*, and, passing between the rolls *c d*, is carried out by the as-
 35 sistence of the roller *u*. The bloom or bar is then lifted to pass between the rolls *g h* and *b c*, the roller *w* assisting to carry in the said bloom or bar. It will be seen that four reductions are obtained by passing the work through the mill from one side and returning it from the other side. I prefer the arrangement for driving whereby the metal is passed through

the mill and returned in the manner set forth; but, if preferred for any reason, the outer rolls may be driven at a greater speed than the 40 central set and the metal be entered, in the first instance, between the rolls *c d* or *b c*, and pass thence to one or the other of the outer sets of rolls; but it will be seen that such an arrangement would increase the strain upon the cen- 45 tral or main shaft.

Having now fully set forth and indicated the nature of my said invention and the manner in which I carry the same into practical effect, I would have it to be understood, in con- 50 clusion, that the following is what I claim as new and desire to secure by Letters Patent:

1. The combination of an outer lower set of two rolls, a central set of three rolls, and an upper outer set of two rolls, for reducing the 55 metal four times by being passed once through the two sets of lower and two sets of upper rolls, as set forth.

2. The combination, with the set of two outer lower rolls, set of two outer upper rolls, and 60 central set of three rolls, of the lower carrying-rollers, *v* and *u*, and upper carrying-roller, *w*, as set forth.

In witness whereof I, the said PETER KIRK, have hereunto set my hand, in the presence of 65 two witnesses, this 29th day of March, in the year of our Lord 1882.

PETER KIRK.

Witnesses:

WM. J. WEEKS,

RUDOLPH CHAS. NICKOL,

Clerks to Messrs. I. Newton & Sons, Public Notaries, 31 Lombard Street, London.